RIO ANAPU-PACAJA REDD PROJECT

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1 SUMMARY OF PROJECT BENEFITS

The Anapu-Pacaja REDD Project in Portel, Para is protecting 165,707 hectares in a highly critical region of the Brazilian Amazon. The high levels of land grabbing, land conflict and instability in the region has allowed the project to strongly focus on bringing stability to all the areas that surround the project area by paying for and helping the local residents known as Riverine people and traditional rural villagers to gain land tenure documents and eventually full freehold title deeds. The project to-date has surveyed, paid for and completed the paperwork on 127 family plots. The project also provided cook stoves to 50 families with the goal to help further families as carbon credit sales take place.

Brazil is not on the list of Least Developed Countries (LDC), due to the wealthy and prosperous south and the farm regions. This wealth causes the overall Gross Domestic Product Per Capita to be too high. However the region of Portel, Para and Melgaço, Para (the neighboring municipality) is the poorest region in all of Brazil without even basic sanitation in Melgaço, Para, making it in far more need of development than even some places in LDC African countries. Excluding the GDP created from illegal and legal loggers which have minimum positive impact in local economy, as most logs are removed from Portel and brought to Belem for processing. The region is living on less than 3 dollars per day per person, for those living in the Leakage Management Area of the Anapu-Pacaja project the living wage is less than 2 dollars per day.

1.1 Unique Project Benefits

Table 1: Outcome or Impact Estimated by the End of Project Lifetime

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) The project will provide protection and conservation to 165,707 hectares of private property land in a highly unstable municipality of Portel, Para. This results in the protection of flora and fauna across a large area.	2.1.1
2) The project pays for every family that directly boarders the project area, and within several kilometers of the project area to gain title for their land. Land title will prevent displacement and will result in prevention of land grabbers entering the area.	2.1.1
3) The project will help almost more than 127 families in between 2016-2045 to get the Cadastro Ambiental Rural Certificate from the Brazilian government, currently which is being implemented all over Brazil, a kind of agricultural certification program.	2.1.1
4) The project has an aim to distribute around 500 eco-stoves to the communities in the periphery of the project area. The project aims to train around 150 people in monitoring the fauna that would enter the area in the vicinity of their homes. They will be trained to use their cell phone cameras to take pictures and record the animals that they saw.	2.1.1
5) The project is to build up the local economy by focusing on Jatai medical grade honey production, which is a high dollar product that greatly improves the local economy without requiring deforestation. The project starting in 2020 will deliver bee keeping equipment.	2.1.5

6) Developing the region by helping all inhabitants gain title as well as developing the local economy should make it possible, where by 31st December 2045 the forest will no longer be under threat.	2.1.1

1.2 Standardized Benefit Metrics

Table 2: Standardized Benefit Metrics

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the project area, measured against the without-project scenario	N/A	
	Net estimated emission reductions in the project area, measured against the without-project scenario	39,489,204	2.1.17
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	165,707 hectares	2.1.5
	For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	NA	-
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	NA	-
	Number of hectares of non-forest land in which improved land management practices are expected to occurred as a result of project activities, measured against the without-project scenario	5,000 hectares	4.4.1
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	50 families	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	50	4.4.1

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

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Employment	Total number of people expected to be employed in project activities,[5] expressed as number of full-time employees[6]	11	2.3.15
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	3	2.3.15
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities	193	2.1.6
	Number of women expected to have improved livelihoods or income generated as a result of project activities	50	2.1.6
Health	Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	193	2.1.19
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	50	2.1.19
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	43	4.2.1
	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	22	4
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	150	4

[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
	scenario		
	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	50	4
Well-being	Total number of community members whose well-being[8] is expected to improve as a result of project activities	193	4.2.1
	Number of women whose well-being is expected to improve as a result of project activities	93	4.2.1
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	5,000	5
	Expected number of globally Critically Endangered or Endangered species[10] benefiting from reduced threats as a result of project activities,[11] measured against the without-project scenario	5	5

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

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

Rio Anapu-Pacaja REDD Project seeks to combine elements of conventional integrated conservation and development projects (ICDP) with a "payments for ecosystem services" (PES) approach when designing and implementing the project. REDD has at times been conceived narrowly as simply a system of conditional performance-based payments (PES), (Sills et al. (2009), The evolving landscape of REDD projects). The project has gone further to create benefit permanence by helping the traditional people in the project area gain a permanent title document in exchange for their support for the project. Through assessments from anthropologist's hired by the project, it is believed that title will bring stability and stability will bring reduction in illegal logging and land invasion. Due to this the project has made the goal of helping all gain title as the top priority.

Baseline scenario of the project area ~~are~~ is unplanned timber logging and grazing activities.

Project is mainly focused on conserving the native forest through protection and the avoiding further actors of deforestation who are seeking to degrade, the native forest conservation will be able to support and protect more flora and fauna.

The project goal it to prove out the economic feasibility of preserving the forest in regions that are highly hostile to preservation efforts, and the illegal wood trade is extreme, and where it is still considered socially acceptable to convert forest to agriculture. The previous owner was careless in his management and did not have financial wherewithal to even perform simple security against illegal loggers. Thus, the project has had to re-establish control over the private property of the project area.

The project is not located within a jurisdiction covered by a jurisdictional REDD+ program.

Climate Description Summary

The Climate objective of the Project is to avoid and prevent unplanned deforestation in native forests thus avoiding the net emission of 39,489,204 tCO_2e through a period of 30 years of Project's crediting period.

Such objective are achieved by managing the land in the form of a "private reserve" by monitoring and operating a pre-designed plan. This operation is ever changing as we learn new things about the forest, the riverine people community and traditional rural villagers and adapt to government related policy changes as well as more sophisticated strategies adopted by illegal drivers of deforestation. The operation includes rigorous enforcement, anthropologist professional, social workers, survey technicians, attorneys, satellite monitoring, and government database monitoring, to come together to maintain such a large area of property.

The long term hope is to change the mentality from this region from a lawless conflict region to a stable region where everyone has title and no one fears land grabbers or have to spend excessively on legal fees to remove landowners.

The medium term goal is to allow forest regeneration by reducing the area of cassava, by focusing on crops that are alternatives, and smaller foot print crops and result in higher profits. Thus, increasing the amount of carbon sequestered in the forest.

Community Description summary

The community is a “traditional peoples” community known as Ribeirinhos, or in English Riverine people. This means River people and traditional rural villagers. They are actually all related to each other, as the original families came in 1950’s and have intermarried with each other.

The Project has provided the first stage of land tenure process to over 127 different households in the region (next to the project area), with all the households in the project area receiving what is known as the Cadastrol Ambiental Rural otherwise known as CAR. This is the Environmental Certificate that both demarcates the boundary of the area of their land and places the name of the owner in the government database showing who owns the property. This provides land tenure security to riverine households living within the Project Boundaries but outside the Project Area. For those living outside the Project Boundary, capacity building workshops on land titling have been held to provide clear information about which steps the project is taking to make sure each house in the LMA gain title.

Further CAR documents are planned to be completed in the future outside the Leakage Management area, to further bring title stability to the region. Stability means investment, investment means more wealth and income, wealthier and income means a better livelihood that is less likely to depend on extractive activities.

The biggest threat to the land in the project area is from the land grabbers who enter the region and state with a plan to destroy the forest lands. “Land grabbing is most common in and around the project area as this region is a conflict region, thus they use the fact the riverine people don’t have title as an excuse to call the region a conflict region and proceed with efforts to encroach. The common thought of the general population is that each riverine should have just a few hectares, which leaves them as 2nd class citizens, as illegal land grabbers can claim up to 1500 hectares per person, illegal persons enter the area and grab the land for timber. (Source: ITERPA)

Geo-referenced information has been gathered by the technicians in order to set up a new governance structure for a new association that the project has set up to coordinate activities, which helps enhance community’s organizational capabilities for a better management of the social projects that have been conducted already and the social projects that are planned.

Finally, the Project has provided a one-on-one course for agroforestry systems and on implementation of energy efficient cook stoves for cooking and cassava production to households within and nearby the Project Boundary. The project has ordered 300 cook stoves that are planned for delivery to the people in the region fromJune to December 2020 with the goal to provide cook stoves to all riverine people in the Project Area, Leakage Management Area and in select communities outside the Leakage Management area.

There have been community meetings at each household, but the real communication and the real training has been found to have been most successful during one-on-one communications. Interviews and discussions were carried out either by the technicians doing the survey work for the land tenure certificate known as the Cadastro Ambiental Rural (CAR) or anthropologist the project hired to have a better understanding of the customs of the riverine people and traditional rural villagers. Thus, as they are structured in households, the community is seen as a whole, as there is very little deviation between the wants and the needs of the households. The main difference found between households is organizational level within the household, where some households are very well organized and are well operated and others are very poor and have low education, but from a response and social interaction they all want the same results 95% of the time.

Biodiversity Benefits:

Project has created the concept of animal corridor by creating a larger critical mass forest area with the National Reserve of Caxiuana. This creates a larger corridor for animals. Also, since the government has opened up sustainable forestry to the Caxiuana National Forest, there has been a large increase in

activity in this old growth forest. The project area next to this is a sanctuary maintained by the government. Since, the REDD project is being developed around the sanctuary area, it will create an animal corridor naturally so that the animals are more safe than before.

2.1.2 Project Scale

Project Scale	
Project	
Large project	X

2.1.3 Project Proponent (G1.1)

Organization name	Brazil Agfor LLC
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2.1.4 Other Entities Involved in the Project

Organization name	Association de Ribeirinhos e Moradores de Portel, Para Ltda.
Contact person	Michael Greene
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2.1.5 Physical Parameters (G1. 3)

1. Location of the Project

General Location

The Project is located in northwest of Brazil, in the State of Para, micro region of Portel, municipality of Portel. Main transportation means to arrive in Portel is by boat. The trip takes approximately, 12 hours from Belém. About 50% of Portel population is rural. Main source of income in the municipality is wood extraction and subsistence agriculture, specifically, *cassava agriculture. Map 1 shows the location of the Project in Brazil and in Pará.*

2°30'10.16"S 51° 3'2.35"W

2°42'20.84"S 50°53'31.76"W

2°11'16.43"S 51°17'49.24"W

2° 0'43.77"S 51° 8'56.24"W

2°39'58.80"S 51°22'21.97"W

Figure 1: Project location in Brazil

Figure 2: Project Location in relation to General deforestation in the Amazon

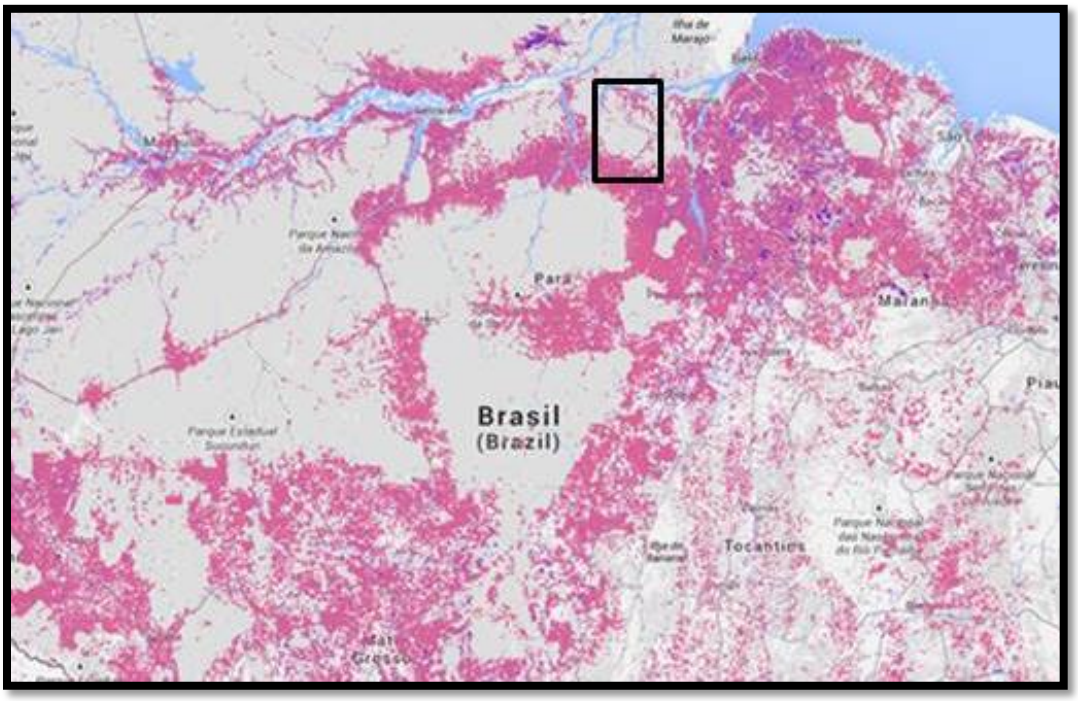


Figure 3: The Municipality of the Project Location in the Amazon

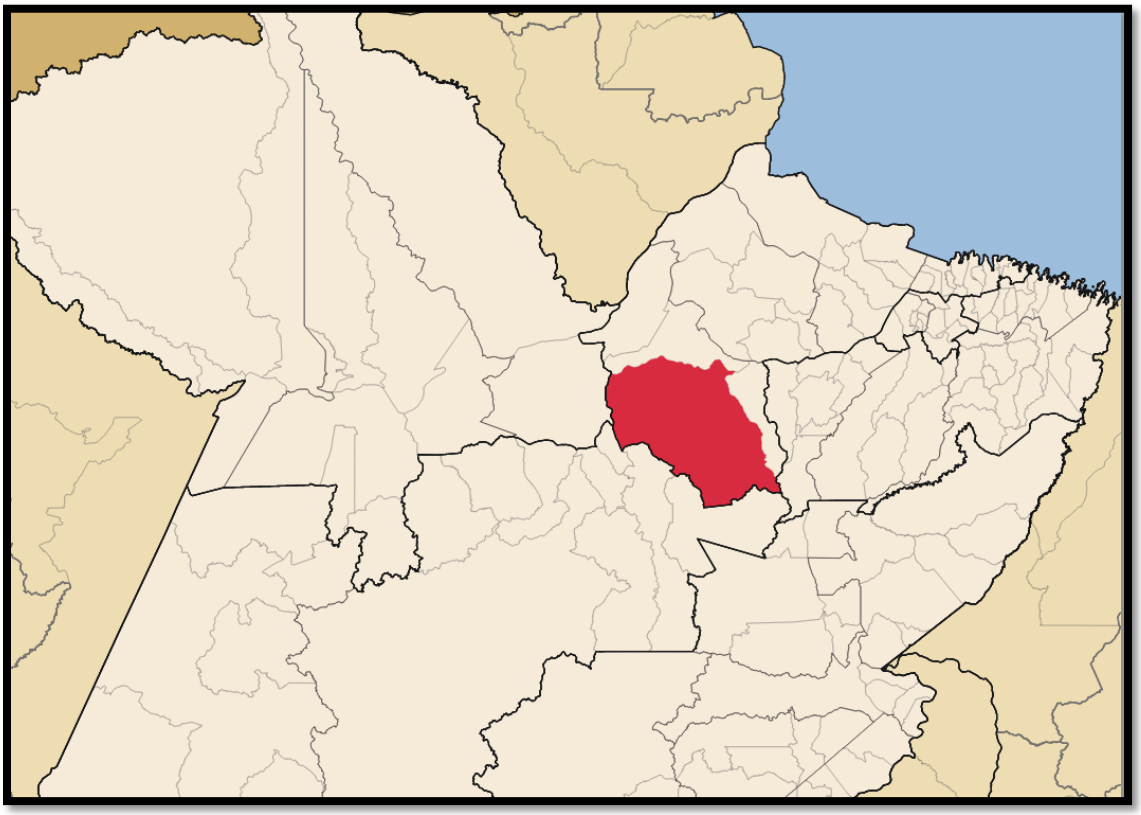
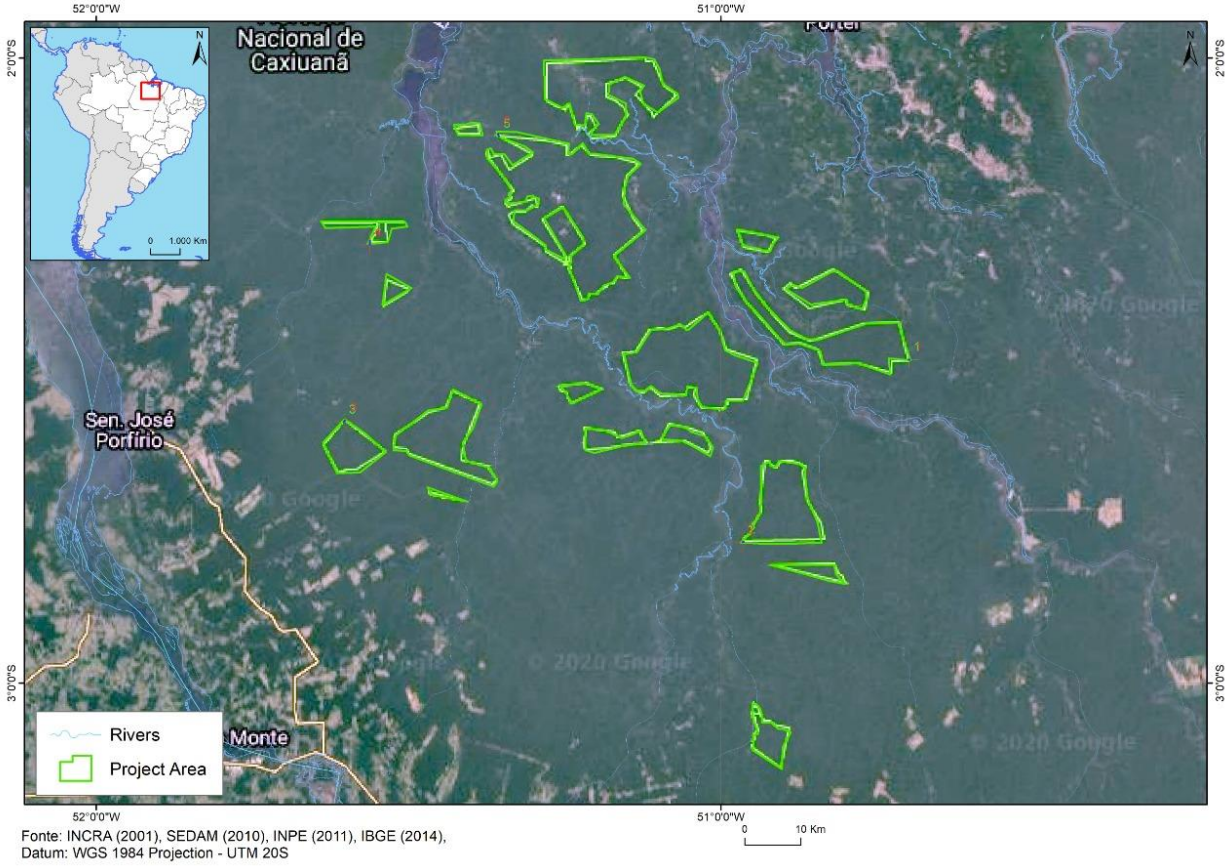


Figure 4: Project Area Map 165,707 hectares



Project Boundary

182,210 hectares, including the project Area and the Leakage Management Area.

Project Area

The Project Area has an area of 165,707 ha and it is constituted by 36 individual titled properties that contain forest and non-forest land. The forested land within the Project's Boundary constitutes the Project Area. With all the Riverine peoples and traditional rural villagers' properties identified as neighboring the project making up the Leakage Management Area (LMA), this results in 16,503 ha. The Project Boundary (Figure 4), leakage belt (Figure 5) and Reference Region for Deforestation (RRD) are shown in Figure 6.

Leakage Management Area – 16,503 hectares in yellow, along the border of the project area.

The projects leakage management areas is based on non-owned properties occupied by Riverine people and traditional rural villagers along the shore. A large part of the leakage management area was owned properties but this has been sub-divided out.

Figure 5: Project physical Boundary and Project Leakage Management Area (16,503 hectares as shown in red)

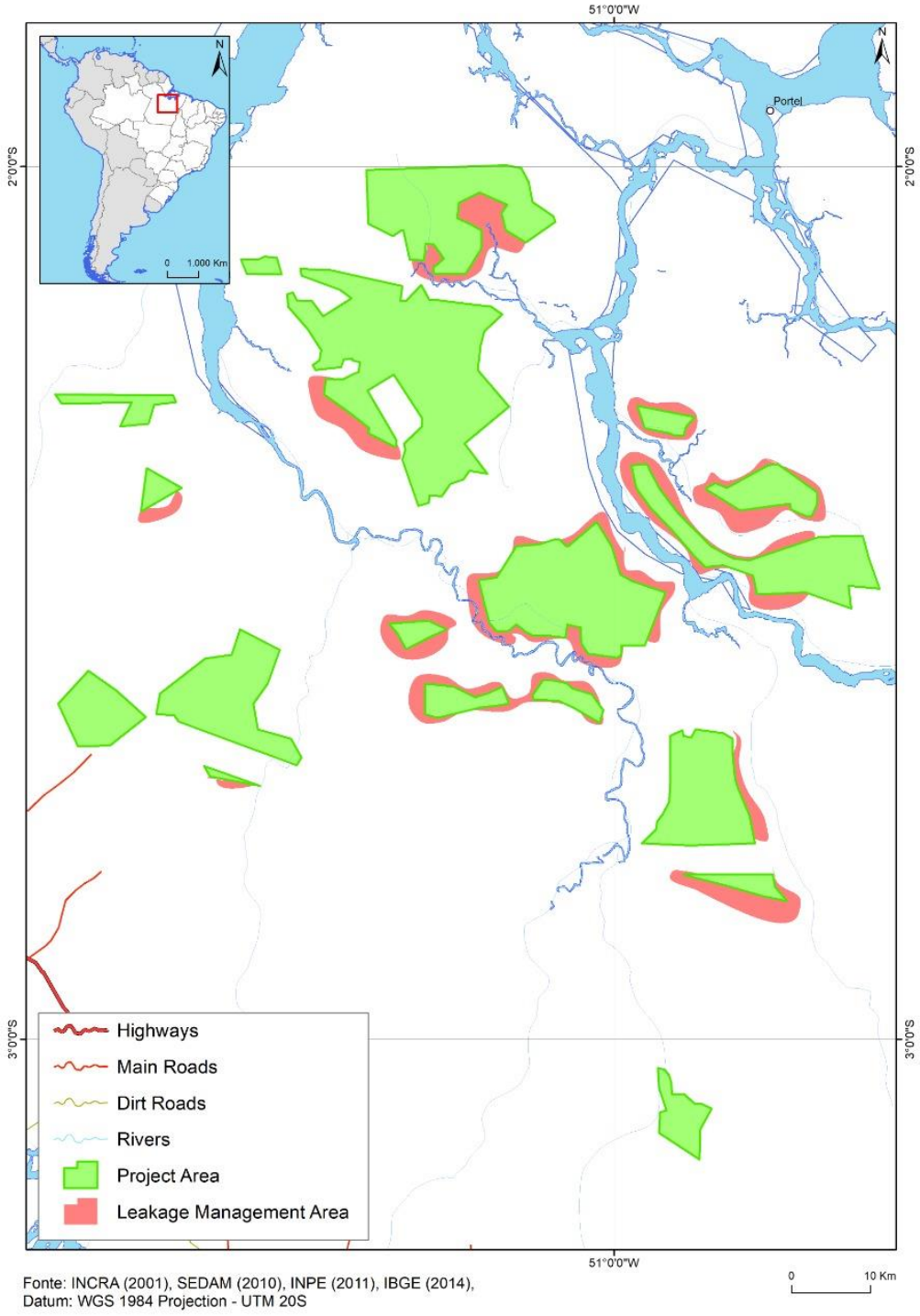
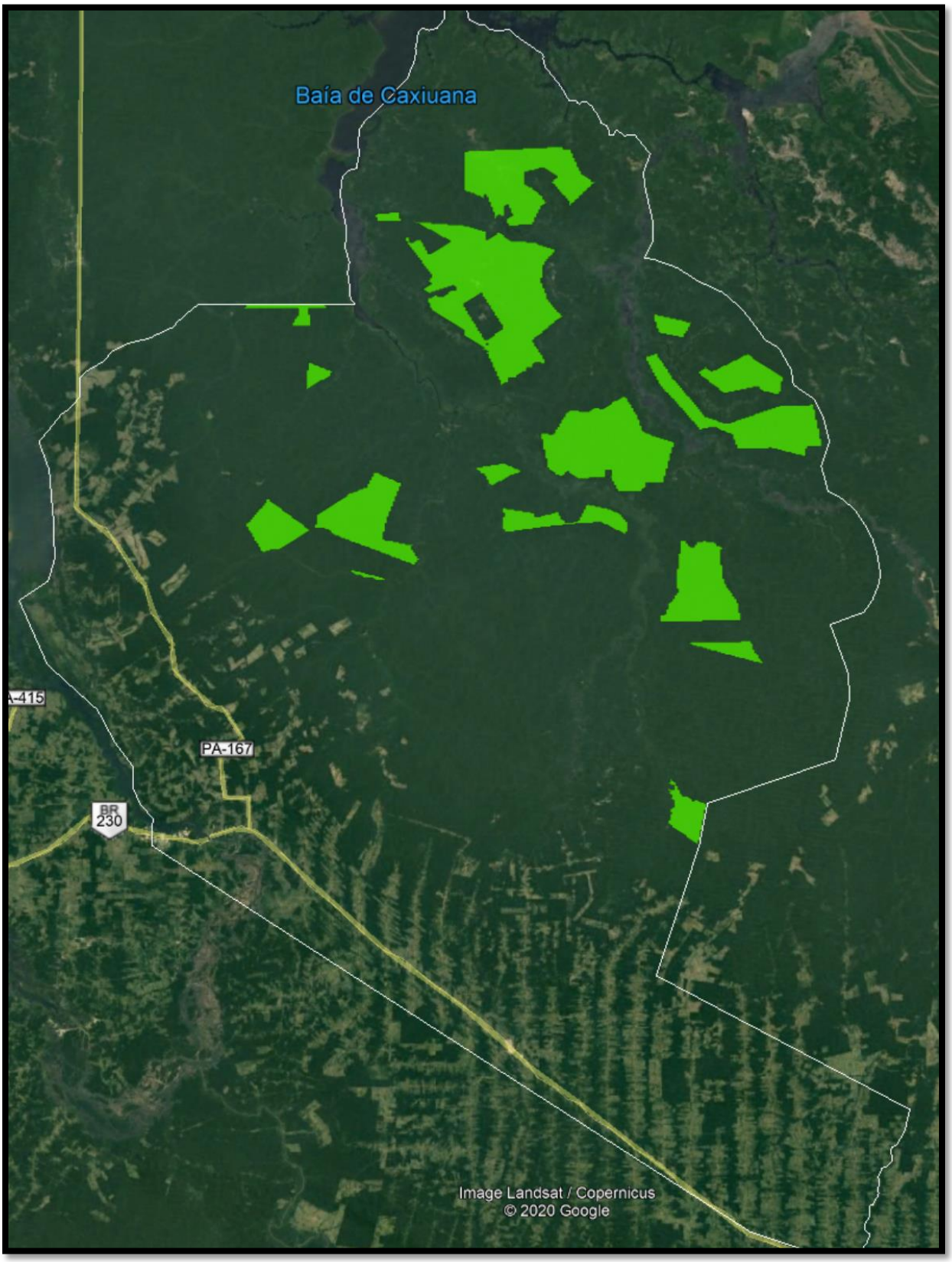


Figure 6: Reference Region 1,991,227 ha (Project area 165,707 hectares)

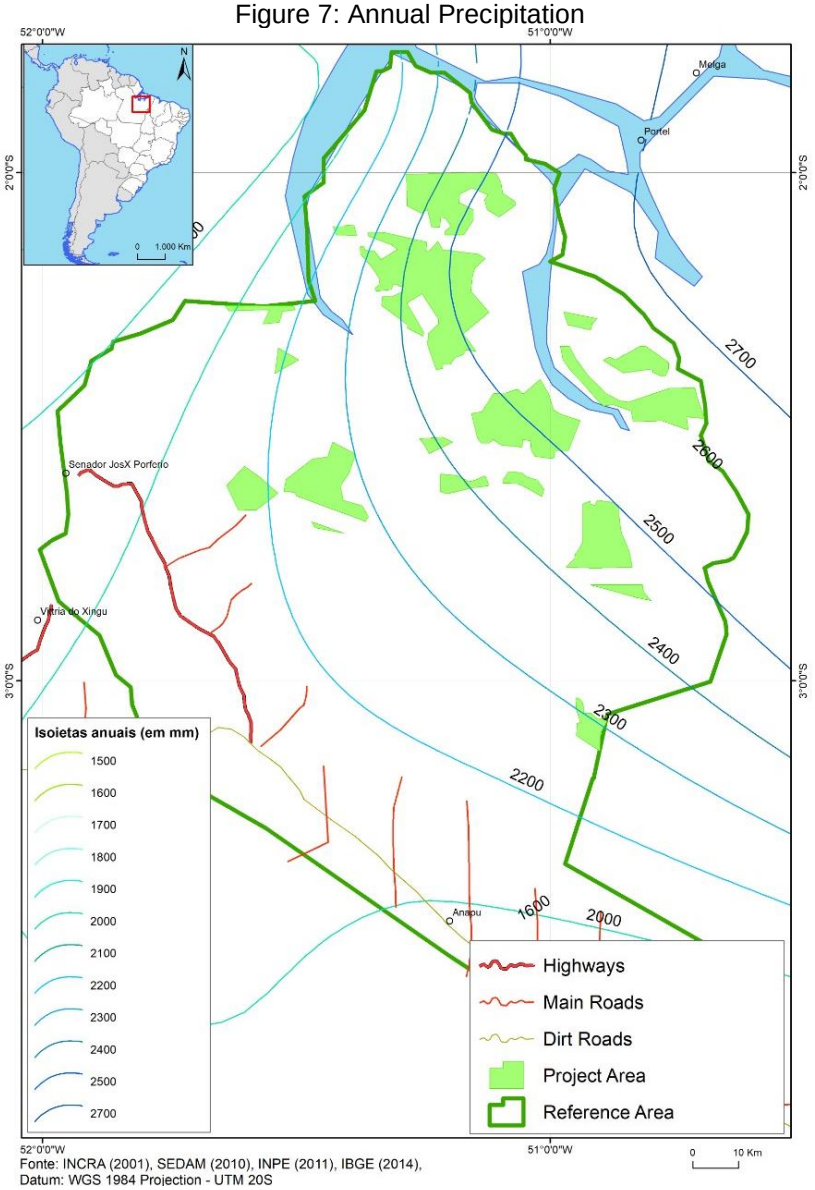


2. Basic Physical Parameters

Climate

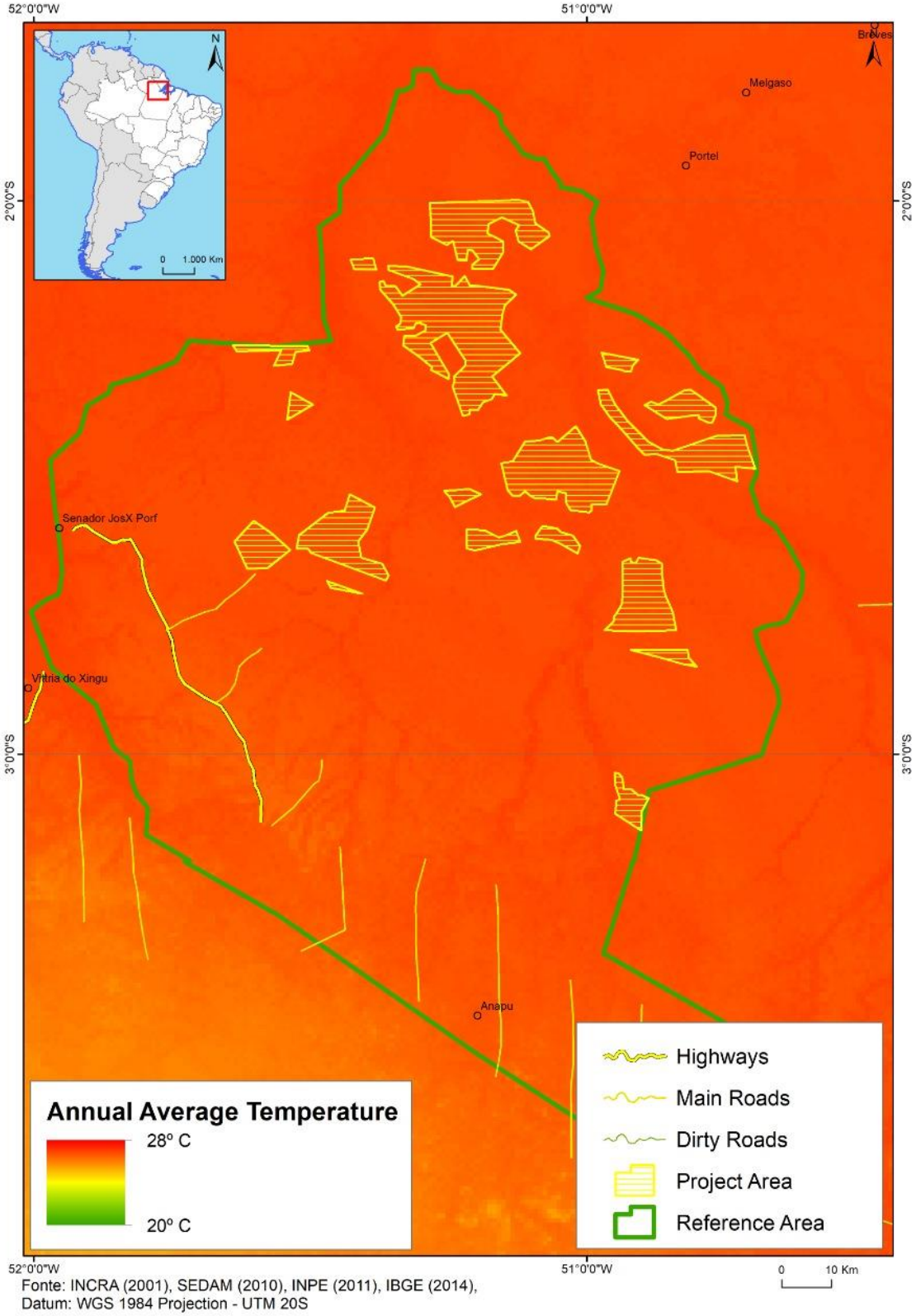
Climate in the Marajó region, as it is in the great Amazon region, is tropical rainy. The average annual temperature is never above 27 degrees Celsius and rainfall ranges between 2,800 and 3,400 mm with relative humidity 85%. Rain is concentrated during six months between January and June. The summer is dry with sparse rain from August to December. It is a humid tropical climate with 350mm of precipitation in April and 60mm in October. The rainiest season is between February and April while the driest months are August, September and October (annual precipitation 2.200mm).

Figure 7: Annual Precipitation



Fonte: INCRA (2001), SEDAM (2010), INPE (2011), IBGE (2014),
Datum: WGS 1984 Projection - UTM 20S

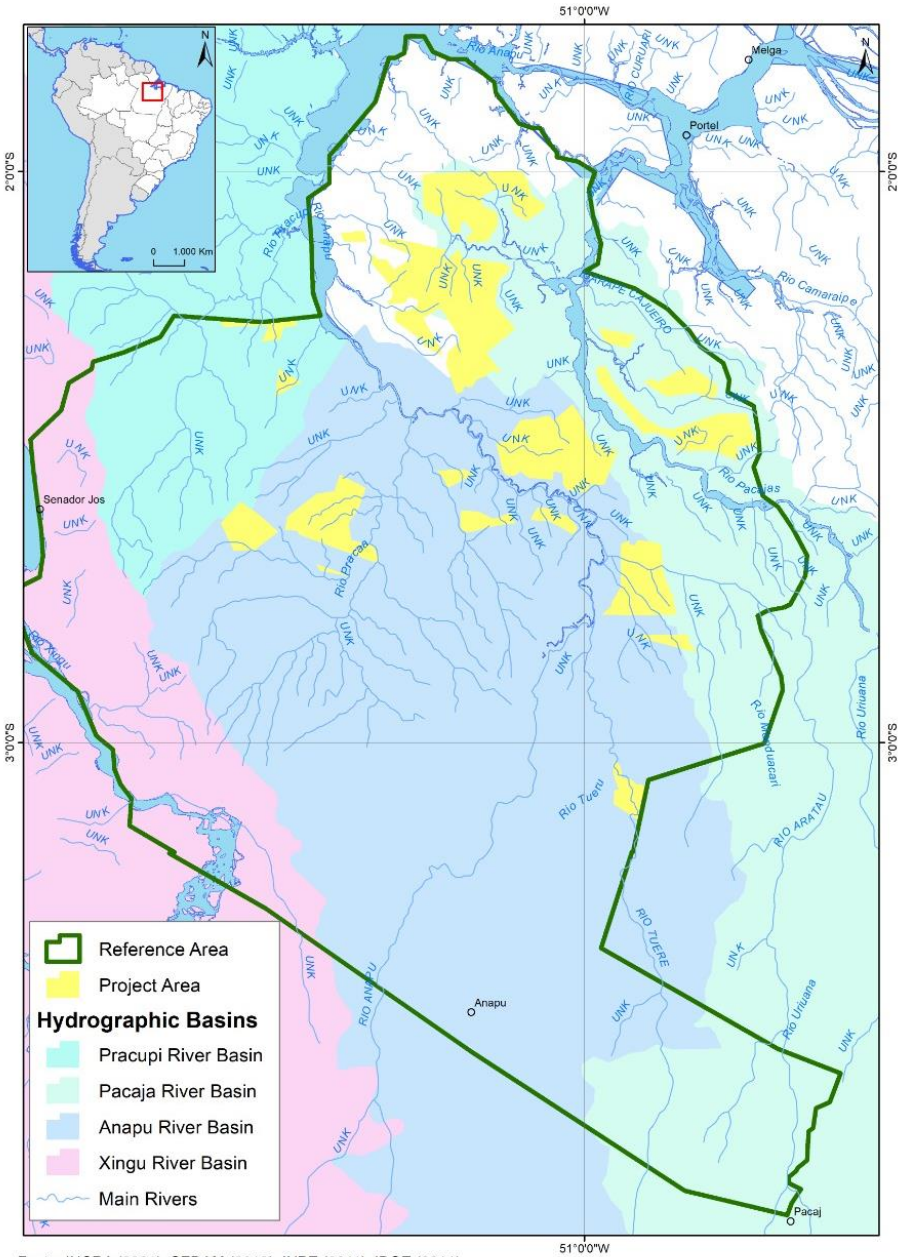
Figure 8: Annual Temperature



Hydrography

This municipality has 3 big rivers that drain the entire region: Anapu River, Pacajá River, and Camairapiri River. They flow from south to north. The Anapu river flows to the Pracui bay and Caxiuana bay and the major tributaries are: from the right – Marinahu river, Tueré, Mapareua, Mandaquari, Jacaru Puru river and the igarapés: – Itatira, Muirapiranga, Janal, Umarizal, Marapua, Atua and Majua. From the left – Pracuruzinho river, Curio river and Pracupi river, and the igarapés: Carunbé, Itatinguinho, Tatingao, Cocoajá e Tapacú.

Figure 9: Hydrography

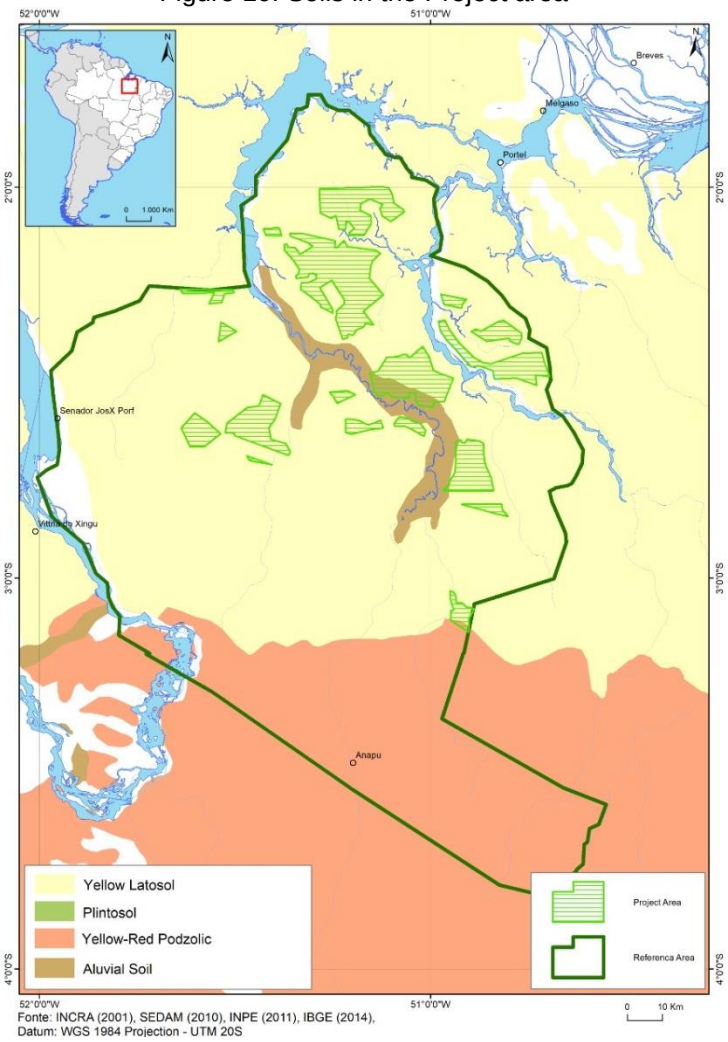


Fonte: INCRA (2001), SEDAM (2010), INPE (2011), IBGE (2014),
Datum: WGS 1984 Projection - UTM 20S

Soils

Soils in the Project Area appear to be mostly Latosol Amarelo, with some Agrisol Amarelo and some minor areas of Neosol Fluvico, according to the Brazilian System of Soil Classification (EMBRAPA 1998). Soils in the Project Area and its surroundings are showed in the map below.
Latossolo Amarelos contain clay B-horizon with a range from 15% to over 60%. It is possible to define a sort of intermediate texture of the soil (15% to 35% of clay), clay (35% to 60% of clay) and other clay (more than 60% of clay). With reference to land use possibilities, Rodrigues et al. (2003) mentions that Oxisols, due to their chemical characteristics unfavorable for agricultural activities, requires correction, especially in relation to high acidity and high aluminum content. The application of lime and chemical and organic fertilizers easily correct these limiting characteristics in order to increase concentration and retention capacity of soil nutrients. Soils in the Project Area are showed below in Figure 10.

Figure 10: Soils in the Project area

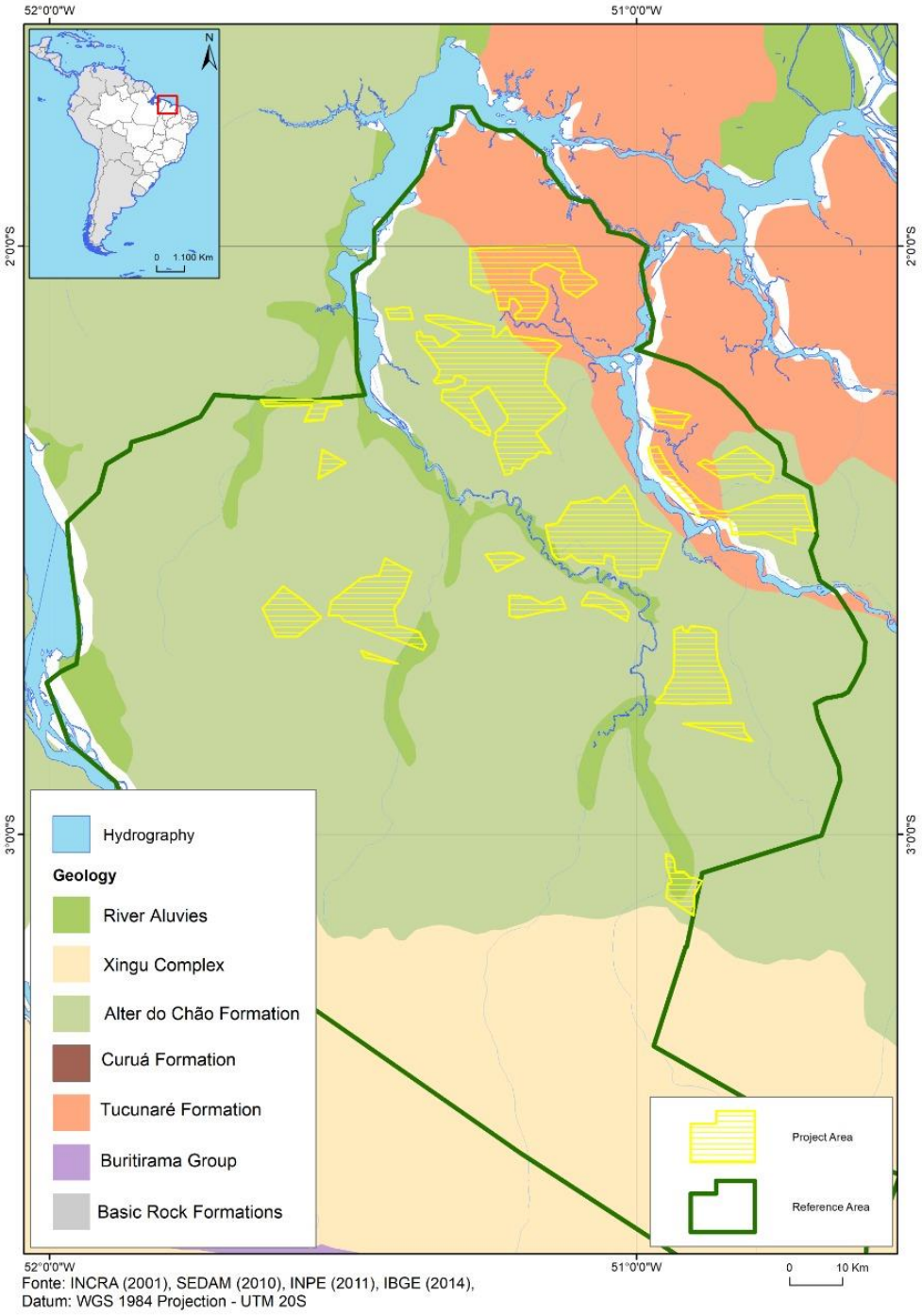


These source rocks of the sandy-argillic and argillic-sandy soils are with concretions over which Yellow Latossolos, Argissolos amarelos and Plintossolos Petricos are developed. On these rocks predominate reliefs of ramps and hills. Fluvial deposits, fluvio-lacustrine and estuarine: these Quaternary deposits are associated with the basin of the Tocantins River, whose deposition formed large alluvial subject to tidal action. These unconsolidated deposits consist of fine sand, silt, clay and gravel, which develop sandy-argillic soils.

Geology

Geologic formations for the project area belong almost entirely to one single class Formacao Alter do Chao with some areas with Tucunare formations and a little of Fluvial alluvium. Geologic formations in the project area are shown below in Figure 11.

Figure 11: Geology in the Project area



Land Use

Most of the project boundary is constituted by primary and secondary ombrofile dense forest with very small patches of human activity. These small patches constitute small-scale cassava agriculture (conducted by riverine people and traditional rural villagers using slash and burn technique). From a social assessment conducted by Anapu-Pacaja there is now a conversion taking place with the current presidential administration to expand sustenance farming to higher use farming.

Figure 12: Forest Cover Type in the Project Area

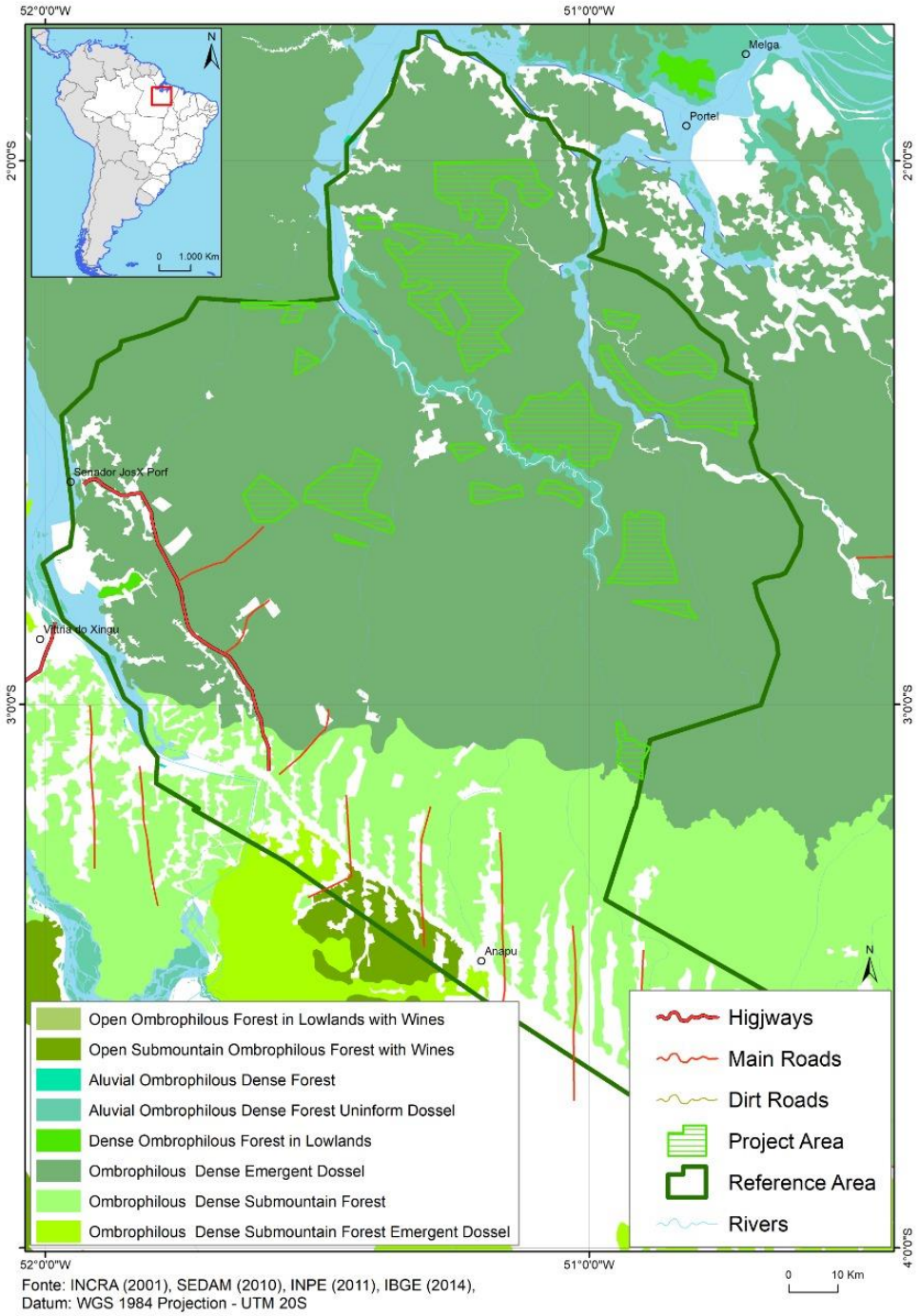
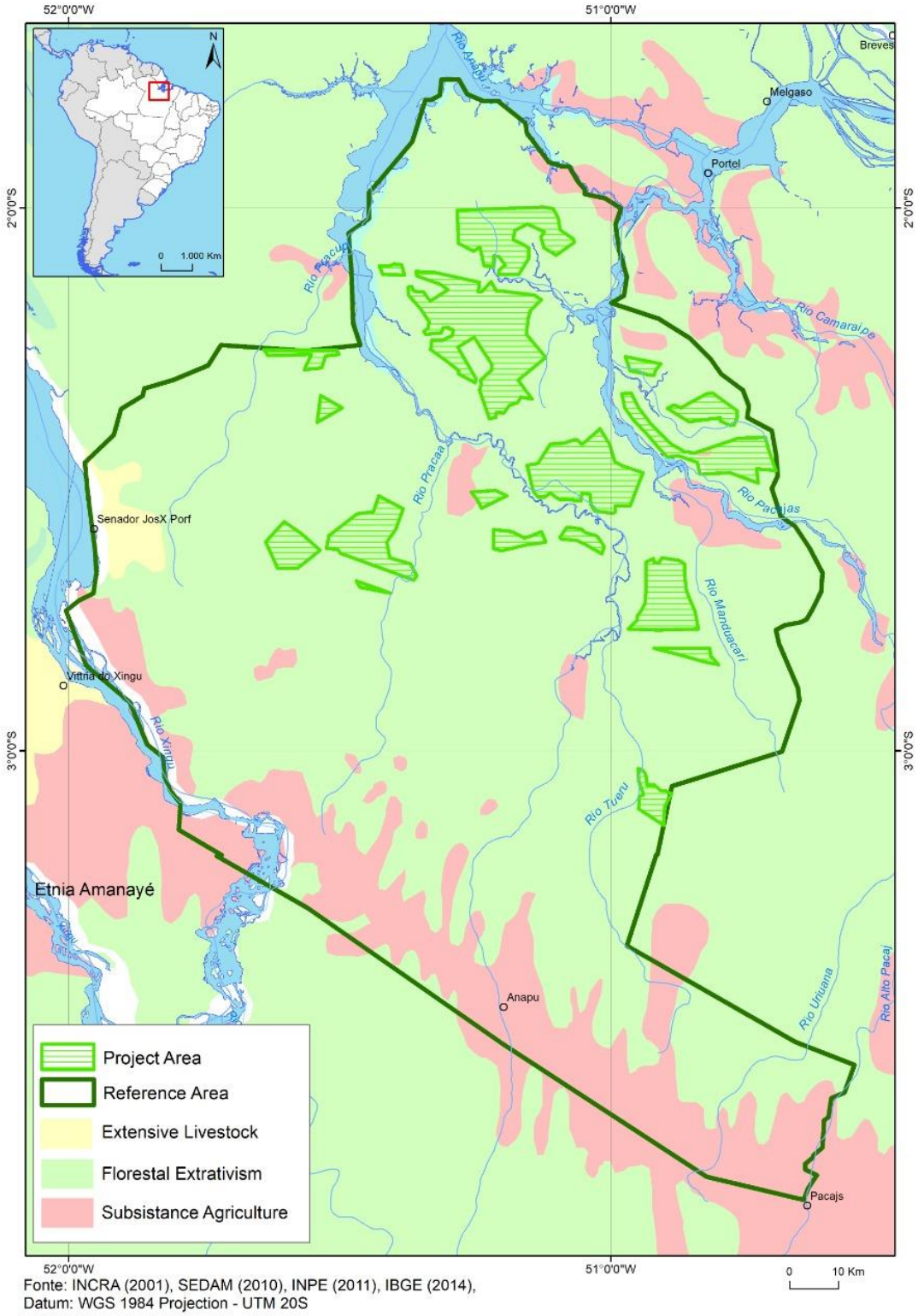


Figure 13: Land Use in the Project area



Fonte: INCRA (2001), SEDAM (2010), INPE (2011), IBGE (2014),
Datum: WGS 1984 Projection - UTM 20S

2.1.6 Social Parameters (G1.3)

From June 5, 2012 through January 2016 the only activity implemented by the Project has been monitoring and enforcement to remove squatters and illegal loggers. Although some interaction with local households took place, it was with the sole purpose of spreading the word about the Project's Boundary being private lands. According to the information provided by the landowner the approximate number of riverine people and traditional rural villagers contacted in this pre-project time frame were only random contacts in order for security personal to stay at their houses while they did patrols.

Given the fact that monitoring activities from 2012 until 2016 didn't involve or affect households, the Project has not conducted a Free, Prior and Informed Consent (FPIC) process prior to January 2016. It is only in 2016 that an initial Participatory Rural Appraisal (PRA) takes place when the Project contemplates the opportunity to implement activities with local households, to improve local livelihoods, and to scale-up forest surveillance.

Prior to July 1, 2016, Participatory Rural Appraisals (PRAs) were conducted in the area constituted by the Project's Boundary and a 15 km buffer in populated area to gather socio-economic information. All the information presented in this section is derived from such study. It should be remarked that the Project couldn't find available official demographic and socio-economic information at the household level for the sampled area so it was necessary to conduct an exploratory fieldwork to gather as much information as possible from primary sources. It is worth mention that the Project's limited economic resources and time availability neither allowed to identify nor to perform a census of all the households within the sampled area. As a result, surveyed householders were resulted in 127 households visited with an additional 140 households that were contacted, and preliminary meetings and communication occurred with a planned follow on visit to gain specific data so the project can insert the CAR for each of these families.

The Project conducted a thorough census in the Project's Boundary and Leakage Belt to identify all affected households and to geo-reference active and resting agricultural plots. This census already took place by July 2016.

Census Protocol

Intervention area:

The total area of the project has an extension of 165,707 ha located between the Anapú and Pacajá rivers in the municipality of Portel, State of Pará in Brazil.

The intervention area has settlements called "riverine households" and traditional rural villagers which are made up of 3 to 13 homes. Such population share common settlement characteristics, economic activities and livelihoods, fairly adapted to the existent conditions. The social baseline study has not identified indigenous peoples dwelling in the project area. Funai the federal indigenous agency has clarified there are no indigenous people in the area and no reserves in the area.

20 years ago the local Riverine people and traditional rural villagers have confirmed that "homeless" indigenous peoples" have arrived in the region looking for a new home after their previous home was destroyed, but FUNAI removed the indigenous and placed them on a reserve.

General Achieved Objective

The project completed a census in the intervention area. The Project to obtain definite and total information about the reality of the territory and the populations settled in the LMA in order to implement the strategies and indicators to be followed in the monitoring plan, upon approval by the populations through a process of Free prior and informed consent (FPIC).

Specific Objectives

1. Share with local riverine and traditional rural villagers the results of the PRA developed by Anapu-Pacaja and the proposed Project's activities. Such information has been assessed and potential impacts and benefits to local livelihoods have been identified in a participatory approach with local households. These participatory evaluations have constituted the base information for a Free, Prior, and Informed Consent assessment of the Project by local riverine and traditional rural villagers living in the Leakage Management Area.
2. Participatory construction of social and environmental indicators for a Social Monitoring System of the impacts of the project in the quality of life of the population.
3. The project has obtained, update and systematize socio-economic and organizational information of all the riverine and traditional rural villagers' population in the project area.
4. The project has obtained spatial information and maps the natural resources extraction areas, crops and the settler's territories.

Methodological proposal

Selection of the technical and professional staff for the development of the activities

Anapu-Pacaja has directed the execution of all the activities through its local specialists who are in charge of the designing a definite methodological proposal for this work, selecting the technical staff, work functions distribution and the initial follow-up of the field work.

The project has a team of local professional technicians trained as survey engineers with experience in conducting rural workshops, land survey and communitarian management. The PP, through its social teams, have completed social related field activities, establish contact and negotiation with local leaders, carry out interviews with key informal actors from the community and completed community meetings in each household.

The social teams included field technicians, who were properly trained for the collection of relevant information through surveys, obtaining geographical information and assist the personnel in the workshops and assemblies with the population.

Logistics and work distribution

The PP supervised one team of 6 technicians, 1 cook, 2 security personal and support staff on one large boat to complete the fieldwork throughout the Anapu and Pacajá rivers. Three anthropologists were on the team as well for 1 month as well as a support staff who was a non-professional photographer to record the operation and take a picture of each house with each family standing in front of the house in order to provide a photo so that future teams can properly identify a name with a face.

The work was 7 to 10 days (or when the fuel on the boat was running low) to visit for each locality depending of the location, the household distribution and the amount of households. The total time it took to complete workshops and follow up meetings was 90 days of field work, including back and forth time and re-supply times. The activities for each locality were distributed as follows (Table 3):

Table 3: Census activities

Day	Activity	Brief description
Day 0	Inform the communal authorities about the visit	Two days before the visits to each locality, one team formed with each team leaders has informed the communal authorities about the project activities and visits, ask for

		their consent to carry out the project and request the support to the planned activities from the dwellers in each locality. This is conducted by Sergio/ Camerao, who alert to the specific household that the team is coming.
Day 1, day 2 and day 3	Informative assembly to inform about the details of the project and PRA results. Participatory assessment of the project activities and the impacts in involved households. Request free, prior and informed consent to implement the project. Workshop for planning of activities and the construction of social and environmental indicators	One assembly with the population was carried out in order to inform about the details of the project. A simplified and short version of the PD in Portuguese was distributed and explained for those who cannot read. Such version was being developed in a simplified language without leaving out any important details. Project activities were assessed jointly with the households and a participatory evaluation was carried out in order to know local perceptions. Comments were collected and used to improve/adapt the activities to local expectations The project has developed a Free prior and informed consent –FPIC (see section G.5.3.) protocol in order to promote awareness and participation in the decision-making processes and avoid future possible setbacks with the population. Once FPIC is obtained, one workshop was carried out to detail and plan several activities and also determine the participation of the population. The indicators to monitor the benefits of the projects were constructed in a participatory manner.
Day 4, day 5 and day 6	Community census and mapping	The census and surveys, agricultural parcels mapping, natural resources extractive areas and the community territory determination were carried out.

Specific Objective 1.- Share with local Riverine and traditional rural villagers the results of the PRA developed by the PP and the proposed Project's activities. Such information has been assessed and potential impacts and benefits to local livelihoods have been identified in a participatory approach with local households. Such participatory evaluation has constituted the base information for a Free, Prior, and Informed Consent assessment of the Project by local riverine living in the Leakage Management Area.

The communitarian representatives/leaders have been asked to support a communal assembly where the results of the Social Study and the Participatory Rural Diagnosis, carried out prior to July 2016, were presented. For this purpose, a simplified version of the PD has been distributed and explained for those who cannot read. This simplified version of the PD as well as the presentation has been done in Portuguese, in a friendly format and in an easy-to-understand language. Also, flipcharts with didactic

images have been used, always looking to account for the particularities of the local reality of each household.

Figure 14: Assembly Meeting

Figure 15: Assembly Meeting

Figure 16: Two Security, Two anthropologist and 3 of the Technicians and the local cook

Figure 17: Lead Anthropologist

Afterwards, the Project's activities have been presented and assessed in a participatory approach with each riverine and traditional rural villagers person identifying the potential impacts and options to mitigate them. All the feedback from these participatory workshops has been recorded. There were no negative impacts discovered in the one-on-one meeting besides a concern by the households of actual follow-thru.

As told by most households: NGO's show up and never come back again, thus making some community member skeptical of all outsiders. This concern was remedied by setting expectations low, thus any and all future benefits are better than the original expectation.

The project has asked for the population conformity on the planned activities and their free, prior and informed consent to implement the project. All those that participated in the Project's activity signed a document that states that they received all appropriate information about the Project and that they have participated in a participatory rural appraisal to identify impacts and mitigation activities.

Later, the representatives were invited to the workshop or one on one meeting designed to plan the project activities and construct the social-environmental indicators for the social monitoring of the project.

Figure 18: with Riverine person filling out the receipt

Specific Objective 2. - Participatory construction of social-environmental indicators for the social monitoring system of the impacts of the project over the quality of life of the population.

One workshop carried out to detail and plan the activities related to the participatory census and determine the participation modality of the settlers according to their level of specific knowledge in order to accompany the project technicians.

Afterwards, the Project team worked with the population on the construction of social environmental indicators that are easy to understand and manage to them, allowing an assessment of the impacts of the project about the quality of life of the community and the establishment of a monitoring system to measure the benefits for the project. These indicators were included in the social monitoring plan.

Specific Objective 3. - Census, systematization and updating of the social-economic and organizational information.

Figure 19: The project's six Technicians

The households participating of the activities in each location were identified based on if they had a house or physical shelter in the LMA area, and several visits were carried out in the totality of households in which the surveys were taken place with the head of the family or and elder.

All the surveys applied were organized and completed by the end of the work day in each locality.

The information was uploaded in a database in SPSS by the end of the field work and was systematized in a final report of the indicators that did allow measuring the impacts of the project in the population during its implementation.

Specific Objective 4 - To collect spatial information and mapping agricultural parcels, relevant areas intervened by the population and the territories occupied by riverine and traditional rural villagers.

The areas utilized by the population were identified in a workshop, based on the maps elaborated by PRA and/or satellite images provided by the project. Geo-reference activities of the total amount of agricultural parcels were carried out in order to know the areas being used, the ones being prepared and the lands that have been abandoned in the previous year. Likewise, the limits indicated in reference to the area utilized by each community and other relevant areas for the project and the population was identified.

The riverine and traditional rural villagers people did accompany the mapping activities carried out by the project specialists were selected in a workshop in accordance to their knowledge over the territory.

These people were trained in the use of GPS technology and registration templates filling in order to support the technicians in the activities of geo-referencing relevant land spots.

Agricultural parcels were identified for each dweller, were also be geo-referenced to the center of each parcel, data were collected (according to local terminology and/or estimation in meters), cultivated species, agricultural technologies and productive timeframes.

The natural resources areas exploited by the riverine were identified in the workshops and several spots in specific locations, or relevant to the project, were taken if possible.

Likewise, the communitarian territory, the area indicated to be occupied by the riverine and traditional rural villagers were mapped.

All the information collected in regards to households, households and parcel locations were geo-referenced. Pioneer roads and pathways in the project zone were collected.

Isolated households

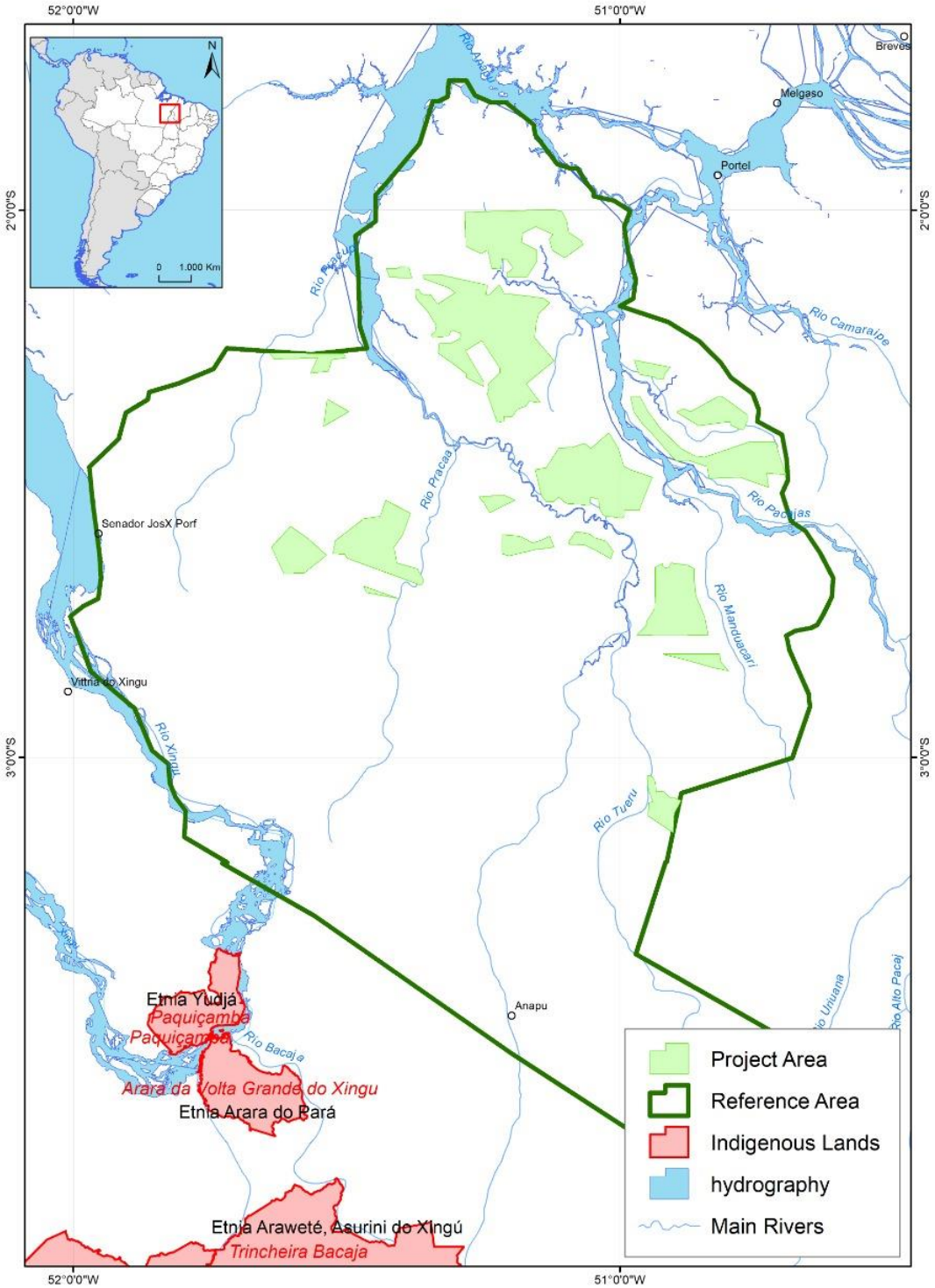
There were no isolated households as the project team went to each point, no matter how remote using a motorized canoe known as a rabeta.

It is important to remark that the definite census protocol were defined after the validation of the project and included an extensive development of each one of the activities, protocols, annexes, formats and tools to be used as well as the designation of the direct responsible people for the activities and results.

Indigenous People in the Project Area or LMA

As for indigenous groups, according to official information from FUNAI (FUNAI 2012) indigenous lands recognized by FUNAI are not present in the Project's Boundary or Leakage Belt (see Figure 20). Therefore, the project did not involve or affect indigenous people.

Figure 20: Indigenous Lands near the Project's Area and RRD according to official FUNAI database



Based on official information from FUNAI available at http://mapas.funai.gov.br/

The smallest administrative unit at which population information can be found is at sector scale, which is smaller than municipalities but still broad divisions of the territory. Sectors are smaller administrative units known by ID codes designated by IBGE.

Population in the project zone is completely rural (the only urban center is in Portel city, capital of the micro region of Portel). Population in the micro region of Portel is classified as belonging to sectors. Sectors have been defined as registry units by the 2010 census (IBGE 2011).

Figure 21 showing: IBGE as 52,172 family members for the municipality.

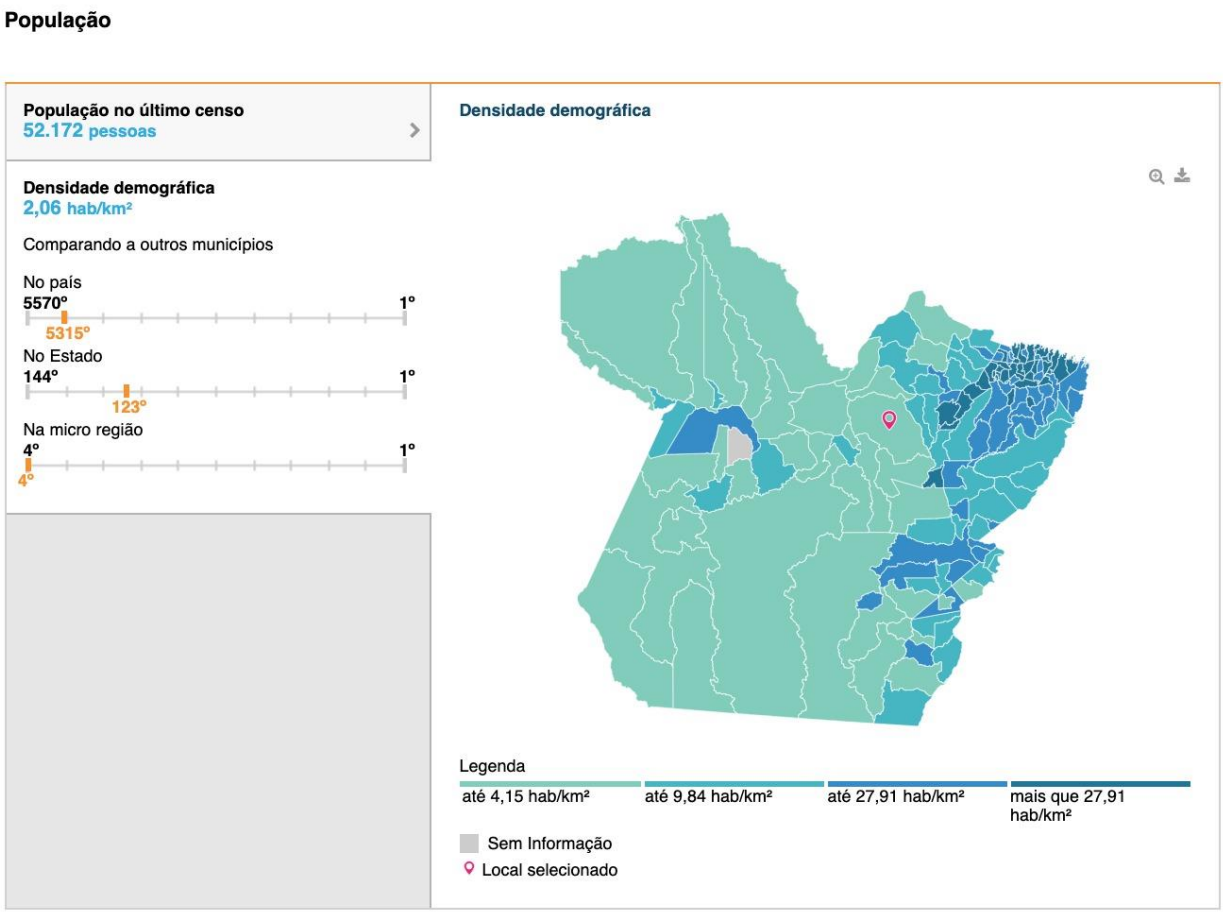
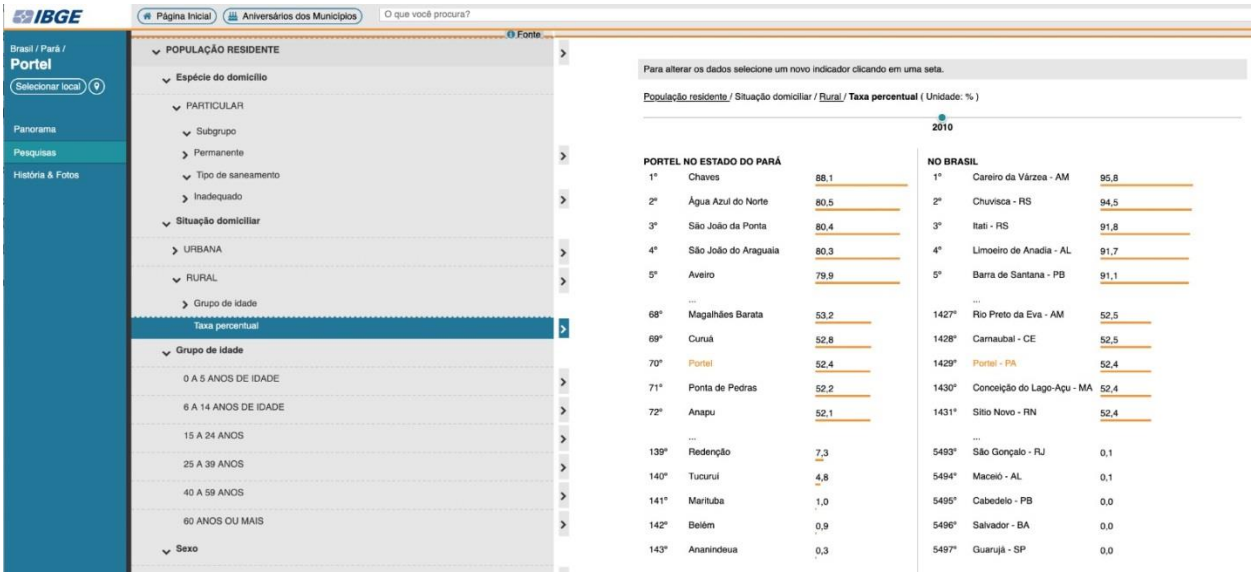


Figure 22: showing 52.5% of the population is rural population.



Population for the municipality is 27,320 for rural areas. The area of the project is further from the city, resulting in a lower average population, with approximate 127 families, resulting about 400 individuals living directly next to the project area,

Impacted population is distributed along Anapu and part of Pacaja rivers.

Figure 23: House Hold Structure of Riverine

Figure 24: Riverine House and family

Figure 25: Riverine House and Large family with 9 children

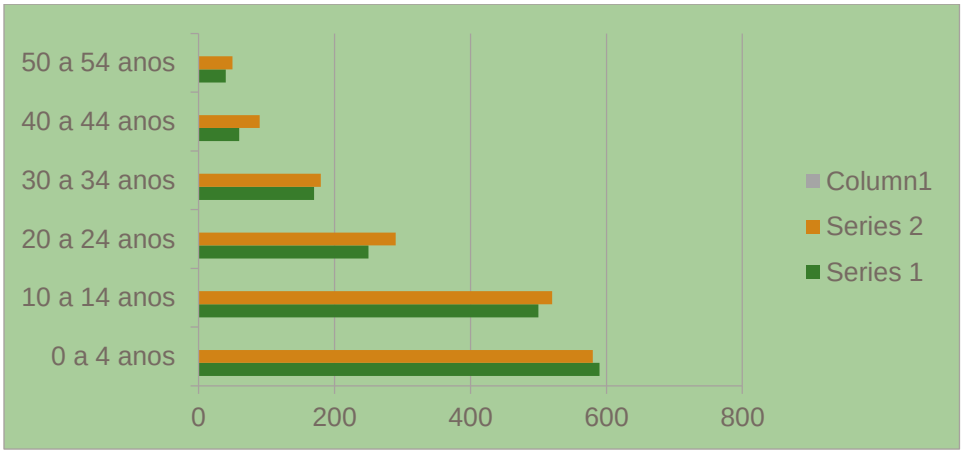
Figure 26: Riverine House

Stakeholders involved by the Project are those living in the LMA which is located around the Project Area, in an area that is between the river shore and the project area, which typically range from 1 to 3 km to the project area boundary. Total population in this area is approximately 400 people having a demographic density of 1.5 person/Km2 according to the latest demographic census at sectors level (IBGE 2011). With 193 people targeted between 2016 and 2020 for initial cook stove and land tenure actives. All houses have been met with for one-on-one meetings.

Population by gender and age group. The gender distribution by sectors in the project area is 52.7% males and 47.3% females.

The population pyramid has a wide base (especially women). This is explained by an absence of young people caused by a migration from rural areas to urban centers to assist to school (mainly to Portel city).

Figure 27: People by age groups

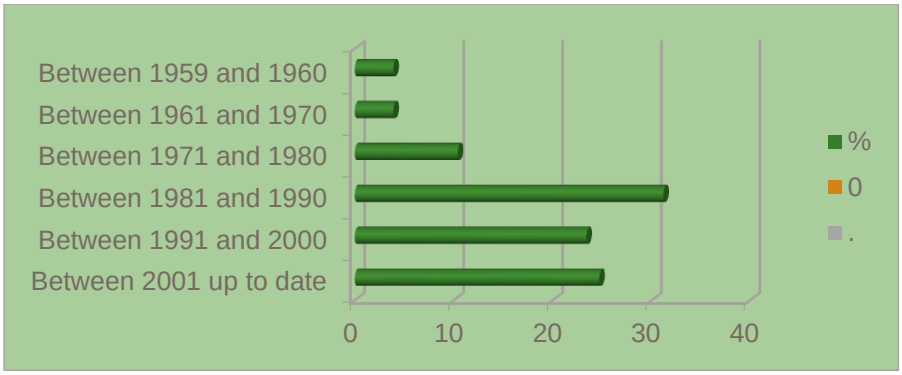


Generally speaking, households are composed by few households (between 1 to 13 agglomerate houses) with an average of 4 people each. With neighboring houses of the same family next door. Rarely is a neighboring house of non-family relations.

From the total population, it was decided to treat each household individually, in order to force the project to have closer relations to the specific family and to allow the project to better understand the needs of specific households instead of generalized activities.

There is an increasing trend towards population growth because of immigration to the project area. Occupation of the project area by riverine date from 1950, showing an increment in population from 1971 to 1980 (10.4%) and then increments in each decade from 1980 to 2010 of 31.2%, 23.4% y 24.7% respectively. When asked about emigrating, 81.2% will not do it and 18.8% will.

Figure 28: Year of migration to the area



Local Economy

In the project area, the main economic activity is cassava growing. Cassava is processed and commercialized as farinha in Portel, the price is 50% to 75% less expensive in Portel, than in Belem for the same product, thus commercialize this crop has not brought increases in living standards for the households.

Households perceive income from the following economic activities according to our PRA:62.1% of households live mainly from agriculture, 18.2% has specialized in farinha production, 4.5% declares to receive money as an a retirement payments from the government and 6.1% receives income from sporadic timber extraction and sale, 9.1% of the population have no income. All females receive some form of welfare income of approximately USD 100 per month.

Now, farinha is produced through a set of steps. These steps are:

a. Cassava growing: Cassava is an annual crop, the first clear cut activities happen in October and planting happens in December, and in some cases where re-planting is necessary, it happens in July. A single plot can be productive for one year or maximum two years, and then is abandoned to let it rest for three to five years. All the members of a household participate in these activities.

Local stakeholders differentiate two main types of Cassava, the one commonly called

Cassava (cultivated and processed to make farinha) and the other called Macaxeira, that is cultivated for direct self-consumption. All farmers surveyed indicate to grow these two species, which are complemented by corn, banana and cane.

Figure 29: Cassava plot processing

Cassava farming requires little investment, inputs and mechanization, which make this activity highly dependent of labor. Operations that require more labor are: planting, weed removal and harvesting. Cassava is a wild and resistant crop that can grow in low fertility soils. In one single plot is common to find Cassava that presents different growing cycles (short, medium and long growing cycles). As Yam, Cassava does not have a defined ripening period thus, after eight months; one can harvest it according to necessity.

Each farmer handles between 2 to 3 fields which are used according to the household labor capacity. Agricultural fields are measured in “brazas” (equivalent to the height of the farmer rising his arm holding a machete; a braza can measure between 2m and 2.5m) and areas are measured in tarefas “tarefas” (1 tarefa = 25 brazas x 25 brazas = 2500 to 3900 m^2).

b. Farinha processing. Farinha processing starts right after harvesting (farinha quality is strongly correlated to this fact). Processing starts by soaking or washing the Cassava (which is done on the river shores), followed by peeling and shredding it to turn it into starch (which is done in a specific place within the house). The next step is to press the starch to dehydrate it. Then, the dry starch is cooked in an open oven where it’s hand-tossed until it reaches the desired point. The final step is packing, for which it’s used an empty oilcan as a measurement unit that contains 30 Kg of farinha (Picture 3).

As for the energy required to prepare farinha, for each work day, 6 feixes are used (feixe is the local name for a package of fuel wood and each feixe contains approx. 8kg of fuel wood) which adds for a total of 48 Kg of fuel wood for one farinhada (the process of making farinha) Each farmer makes two farinhadas per week gathering fuel wood.

Most of the farmers collect fuel wood from their own lands without travelling more than 1 Km (31.6%) while others travel up to 3 Km to gather fuel wood (14%). Others (21%) just cover sort distances (150 meters on average). Fuel wood is collected mainly on forests perceived to be under control of the farmer.

Figure 30: Child processing of farinha in the project leakage management Belt

Figure 31: Riverine person processing farinha

According to Ramos (2001), each 1 kg of farinha produces 0,2 kg are coroeira (farinha process wastes that are fed to chickens and ducks) and requires burning 2Kg of fuel wood. In general, a family (4 members) can produce 40 Kg of farinha in one day (8 hours).

c. Farinha commercialization: Some local people in the project leakage management area sell farinha to traders that travel along the river. Other people bring the farinha to Portel, for sale in the local market.

The project brought anthropologists to the project area. A common belief in scientific papers and publications is that the riverine barter one product for another product they do not produce. This was determined to be false in the region of Portel, Para. All riverine grow cassava and thus no one is going to barter cassava for cassava.

The PRA indicates that the monthly income from farinha sale is about 600 Reais that come from selling 20 fardos (packages) of farinha per month (on average 5 fardos per week). Household sale each fardo of 30 kg for 30 Reais. These amounts are variable and depend on market prices and to family production/consumption of farinha.

The second economic activity in the project area is small scale extraction and sale of wood, where households can either work independently and sale wood to larger companies that visit the area or work directly for such companies. One survey carried out in the influence area reveals that 13% of the households incur in timber extraction as a second economic activity.

In the project area, timber extraction was an important activity that was undertaken in most of the households around 5 years ago. This is because of the presence of large timber extraction companies that would employ local households as workers to extract timber giving the lack of qualified work force in the area.

Past timber extraction can be verified in many households by the presence of unpaved roads (locally known as estradas).

Local households in the project area do not have local businesses such as restaurants, lodging facilities, drugstores, etc. The PRA shows that 70.0% of the households do not have a secondary business and that 27.7% of the households considers farinha sale as a lucrative business.

The PRA shows that average monthly income in the project area from agricultural activities is 269.7 Reais (ranging between 60 and 1000 Reais), the average revenue from farinha production is 434.3 Reais (ranging from 90 to 1,200 Reais), and the average revenue from timber extraction is 862.5 Reais ranging between 150 to 1,800 Reais).

The minimum legal salary in Brazil starting in 2020 is 1045 reais per month, thus local households are below the minimum salary line (except when wood sale happens).

Farming Activities

As mentioned before, households in the project area have agriculture as main economic activity and the main crop is Cassava.

Plots are traditionally prepared by slash and burn technique having as final products Capoeiras (cleared lands ready for sowing). This technique includes making fire barriers to prevent uncontrolled forest fires. In order to sow beans, slashes happen in May and to sow Cassava slashed happen in June or July. Slash and burn happens in August and planting start in September. In the case of corn, planting happens in November and December. Many households associate Cassava with Corn crops.

Figure 32: Slash and burn in two agricultural fields

About agricultural land ownership, only 45.6% of all surveyed farmers indicate they somehow have rights of ownership on their lands. However, after further review the rights are pieces of paper that correspond to no government database that the project could be found. All households requested "updated or correct" documents for their land.

Individual agricultural lands have an average extension of 2,923.1 m2, with a medium of 1,000 m2. Each land has large extensions of forested areas. In these forests, households do not conduct slash and burn. They would rather conduct slash and burn in to open up small plots rather than sow perennial trees, as these lands are used and abandoned for a period of 4 to 5 years and then re-used.

On average each household has 3 plots, each one of approximately a quarter of a hectare; however, in recent years the plots have been growing to be about 1 hectare.

From the total, 79.2% grows Cassava, 1.3 % Corn and 19.5% does not grow anything. This last percentage is related to those who claim to not own land, with a difference of 3.9% corresponding to households that although claiming to own land, do not cultivate anything.

Products to be sold in markets. Primarily Honey, Andiroba oil and Flour from Cassava. Rice is not currently grown in the region and is the main import crop. Thus, the project has long term plans to provide equipment for rice growing to eliminate the need for the region to have a regional trade deficit.

Many of the households complement their diet by growing other products in small fenced in gardens. Such products are cabbage, black pepper, sesame seeds, pepper, chili, eggplant, tomatoes, chicory and basil.

It should be pointed out that not a single household in the project area undertakes cattle ranching activities as shown by the surveys and the PRA. The local rural workers syndicate has imposed a rule upon the local population to not have livestock of any type.

Forestry Activities

The PRA shows that most of the households (82.4%) do not claim to be owners of forested land although not owning such lands it does not mean they do not extract timber from it. Most of those who claimed to be owners of forested land do not have titles or any proofs for that matter to support ownership. However the project has paid for this and be doing much more in this regard.

Households in the project area extract timber mostly for self-consumption (raw materials for construction and one or two trees per household per year for sale). They extract timber in areas they claim are under their control or under communal control.

Even when local households do not extract timber at medium or large scales, they do have knowledge and experience on timber extraction, this because of the extractive history that these communities have. For this matter, only 17.6% of the households state they extract timber, being the most extracted species (in order of importance): Acapu, Macaranduba, Cupiuba, Itauba, Piquiá, Sucupira, Guariquara y Tarú (peca). Timber extraction by riverine and traditional rural villagers is not significant at is happens at a subsistence level.

Those who sell timber state they do so out of necessity and their main selling points are the same household (buyers are illegal loggers who buy for cheap and basically rip off the local riverine and traditional rural villagers' people).

On the other side, although most of the households do not extract and profit from timber, they do extract and profit from other forest resources such as: Acai (66%) and Brazil nuts (57%) as main products followed by Abacaba (7.3%), Copuazú and Cipó (with 5.6% each) and other resources (12.1%) such as oxi, piquiá, bacuri, abacaxi, andiroba, buriti, jamoba, miriti, fruits and medicinal plants.

Most of the households collect Brazil nuts for self-consumption (starts in December and ends in March) and for some sporadic sales in Portel. Despite the fact that this product has a good selling price (1 can has a price between 10 to 12 Reais), it is not very common to sell this product due to the high transportation cost to Portel and the lower production costs of bigger producers.

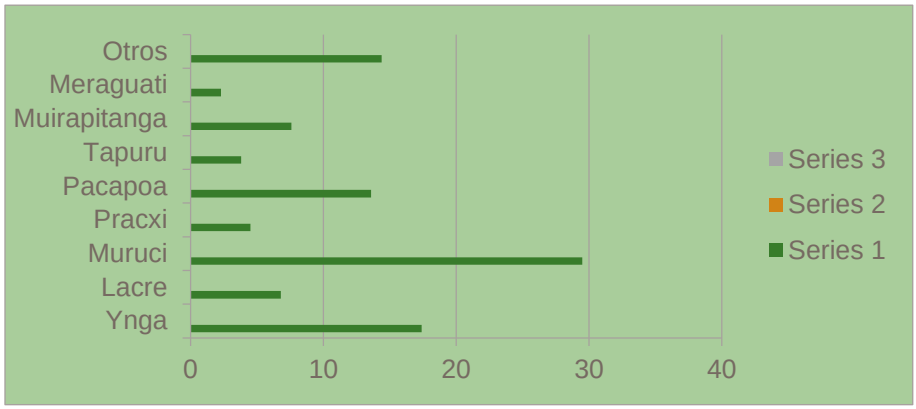
Hunting is an activity that happens intensively and frequently in the forest (on average hunter covers up to 3Km from his household). However, the PRA indicates that nowadays households hunt less because it's harder to find preys because of human intervention such as invasions and logging activities.

The PRA shows that 57% of the households have a high hunting frequency (every day 33.8%; each week 22.1%). About hunting places, those who hunt state that 28.6% hunt in forest of their property, 5.2% hunt in common household areas and 14.3% hunt in other households. All of those who hunt state that they do so only for self-consumption.

Among the hunted species can be found (from the most hunted to the least): tatu (armadillo), the paca (majaz), the venado (deer), the cutia (rodent), the jabuti (turtle) and the porco, catitu, guariba, anta, macaco, námbu, among others. No other species have been identified by the hunters, which may reflect the low availability of fauna in the areas nearby the households.

Firewood comes mainly from residues from the clear cut before applying fire to prepare agricultural plots. Firewood is used exclusively to produce farinha. According to the PRA firewood is collected by most householders in their agricultural plot (76.7%), in the standing forest in their agricultural land 5.8% and in other people's forested agricultural land 5.6%. It should be remarked that households would not collect firewood from a source farther than 3Km from the river shore.

Figure 33: Wood species used for firewood



Social Organization and cultural identity

All households are agglomerations of small families and are organized according to religious beliefs. Thus, some households can be catholic and others evangelic (in the project area there are 6 catholic and 3 evangelic households). According to the PRA 80% of the people in the households are evangelical. A evangelical tidal wave has come over the region in the last 10 years, resulting in multiple evangelical churches/shacks being built in the project area, thus converting the local population by the fact there is a church near to their house.

Churches are the meeting points for each household and it is there where – interest topics for the community are discussed. In the case of each cult, the person that offers the mass acts as a local leader as well.

The church is an important system of support for the towns. From Portel, there are coordinators for rural sectors that support the formation and registry of the communities' affiliates. The leaders go first to the Church of Portel, from where they request support and soon they go to the municipal prefecture. This it is the reason by which, the settlers of the populated centers do not count on a variety of social organizations, to a certain extent because the system of communal organization based on the religion is moderately effective and efficient. In the zone of the project they were only mentioned the Retirees Union, the Fishing Associations and the Association of riverine.

Infrastructure and services

Households in the LMA have the following characteristics: 83.8% of residents own their own house and 16.2% are owned by relatives. Houses are mostly wooden planks constructions processed by chainsaw (not sawn).
Appliances in households: 37.7% of residents have radio, 42.0% of the local population has TV, 62.3% have a gas stove and 16.9% of residents have a refrigerator.

Drinking water. Local population uses water from rivers and streams as well as groundwater. In the project area 47.8% of the families mentioned that draws groundwater (through artesian wells) and 52.2%

from streams and / or rivers. With regard to water quality, 73.9% of respondents mentioned that the water is clean, 15.9% said is muddy and 10.1% said it contains debris.

Drinking water is not treated, and in some towns several illnesses associated with consumption of contaminated water have been identified.

Urban wastewater is eliminated in the backyard and in the local creek or river. The sanitation system is negligible, only 10.1% of households have a silo at home and 89.9% make their hygienic needs in the field or forest.

Energy consumption. None of the families have public electricity service. Families get electricity by using a diesel-powered electric generator.

Food cooking, most families use gas stoves. Very few households use firewood for cooking, wood is used principally and almost exclusively for the preparation of farinha.

Regarding education. Good Educational services are highly demanded by local households. The city does provide a boat to pick up students and bring them to a nearby school, but the quality of teachers is of low quality and commuting is a major issue.

Regarding health. Most households in the project area have no health centers; households have to be assisted in the health center of Villa Monte Horebe and Santo Amaro. The only boat public boat service to the city of Portel from the project region is from Santo Amaro and that is only on Sundays.

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

The Project is located in northwest of Brazil, in the State of Para, micro region of Portel, municipality of Portel. Project area nestles between 51°0’0’’ W 2°0’0’’ S Latitude and 51°0’0’’ W 3°0’0’’ S Longitude. Main transportation means to arrive in Portel is by boat. The trip takes approximately, 12 hours from Belém. It straddles the river basins of the Amazon River in the region.

Figure 34: Boundary of the Project Zone in yellow.

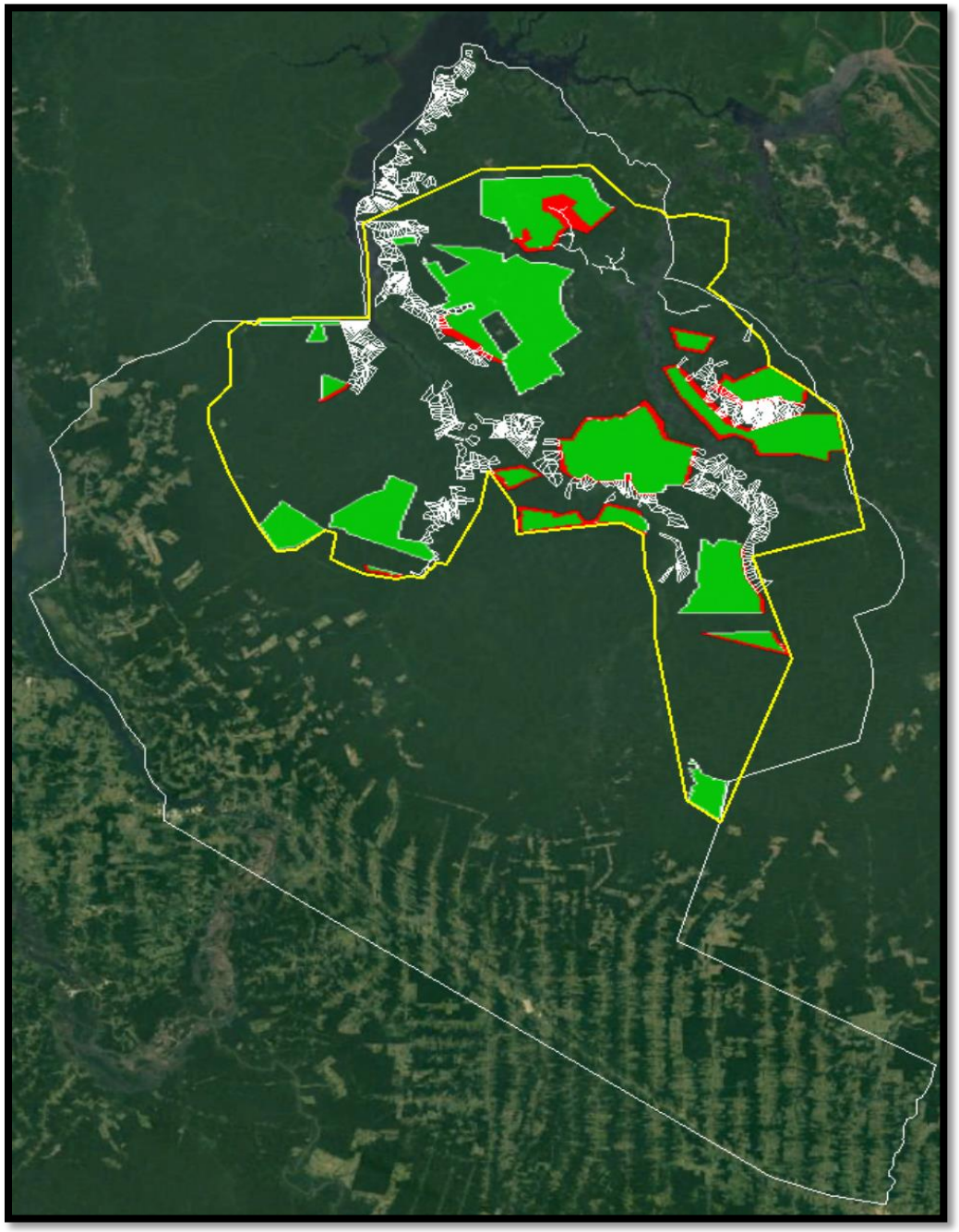
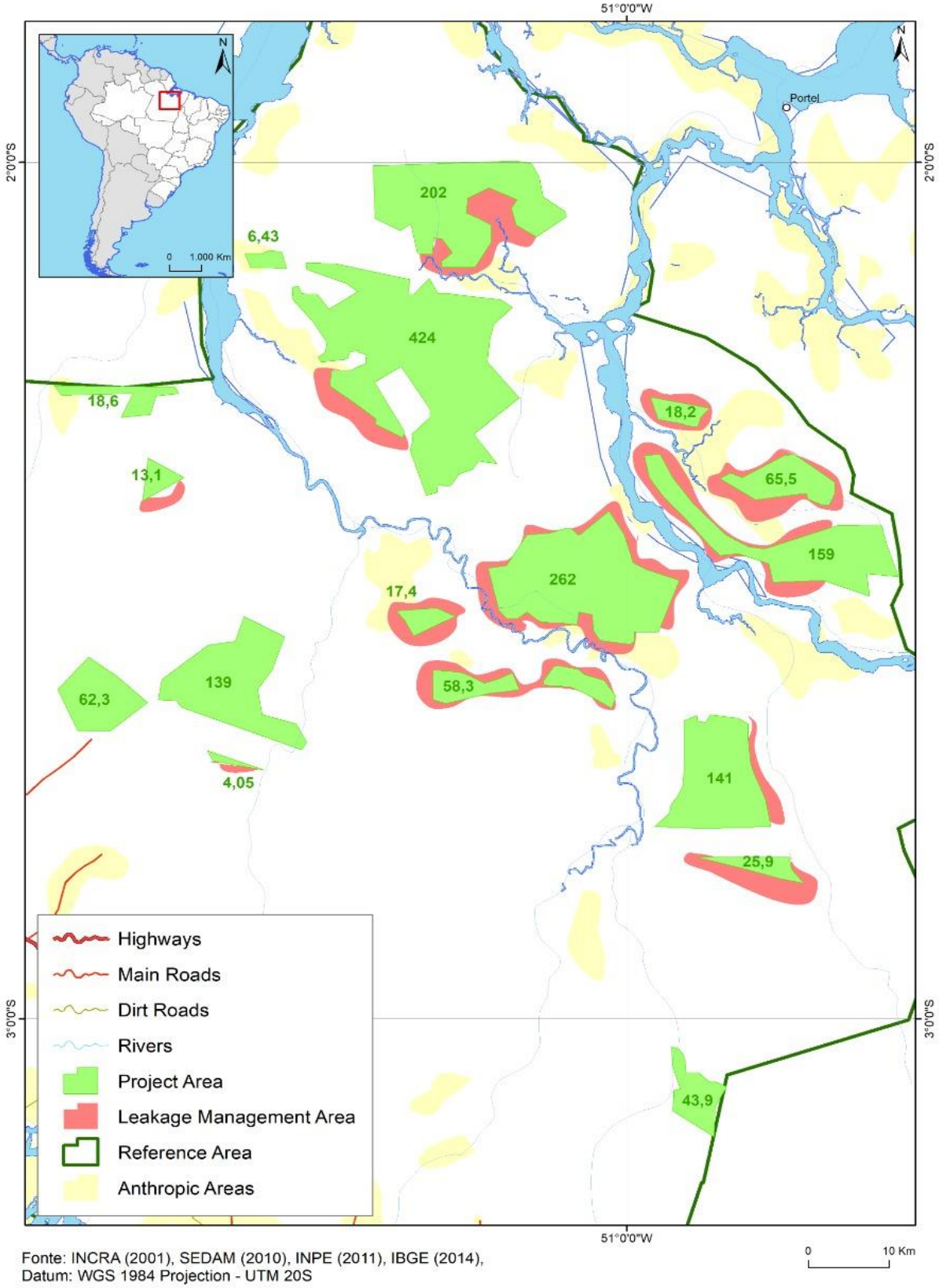


Figure 35: Location of the project area map



Fonte: INCRA (2001), SEDAM (2010), INPE (2011), IBGE (2014),
Datum: WGS 1984 Projection - UTM 20S

Figure 36: Map of Project area showing project boundary, location of communities (identified in Section 2.1.9). High conservation value (HCV) areas (identified in Sections 4.1.3 and 5.1.2).

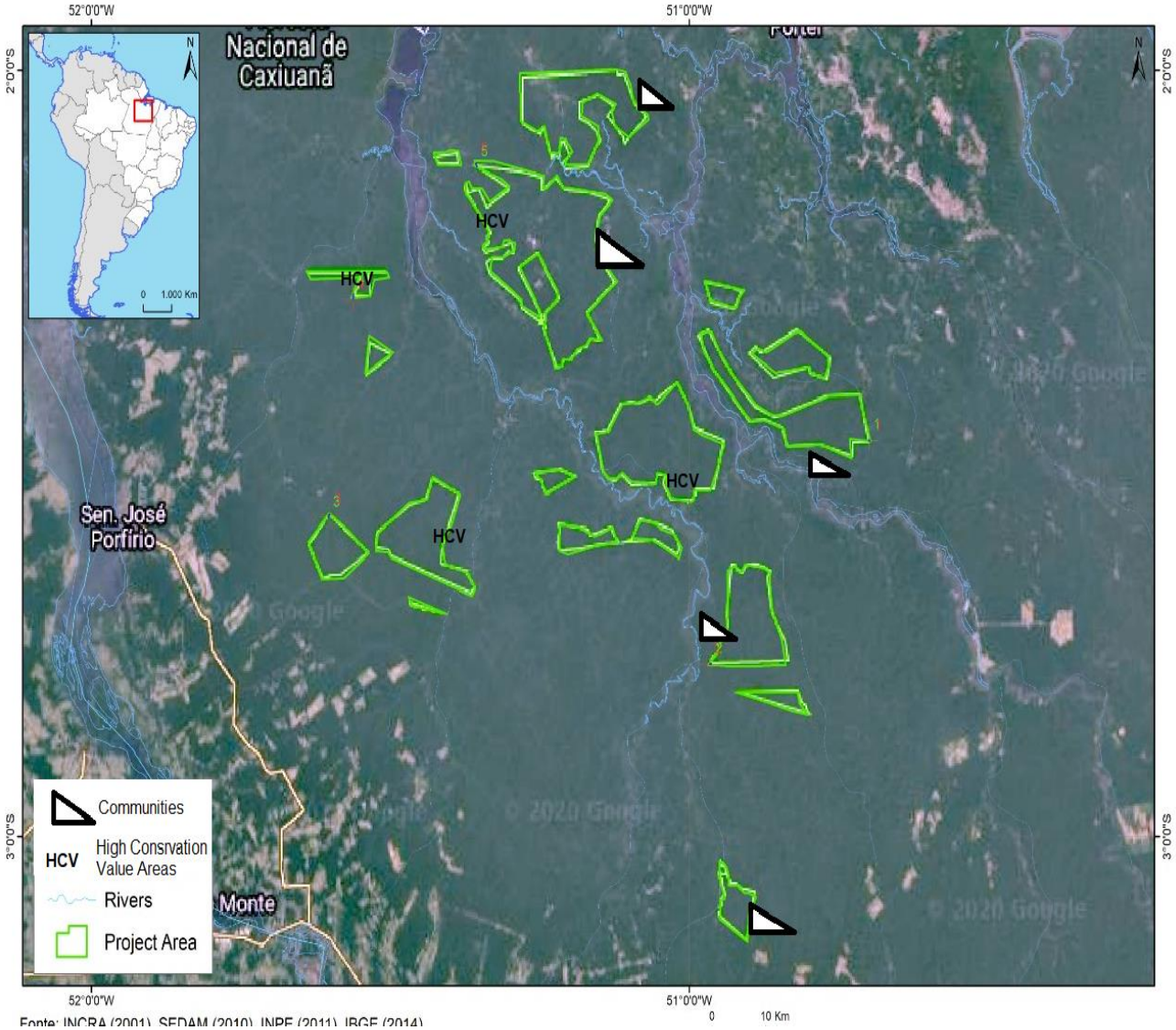
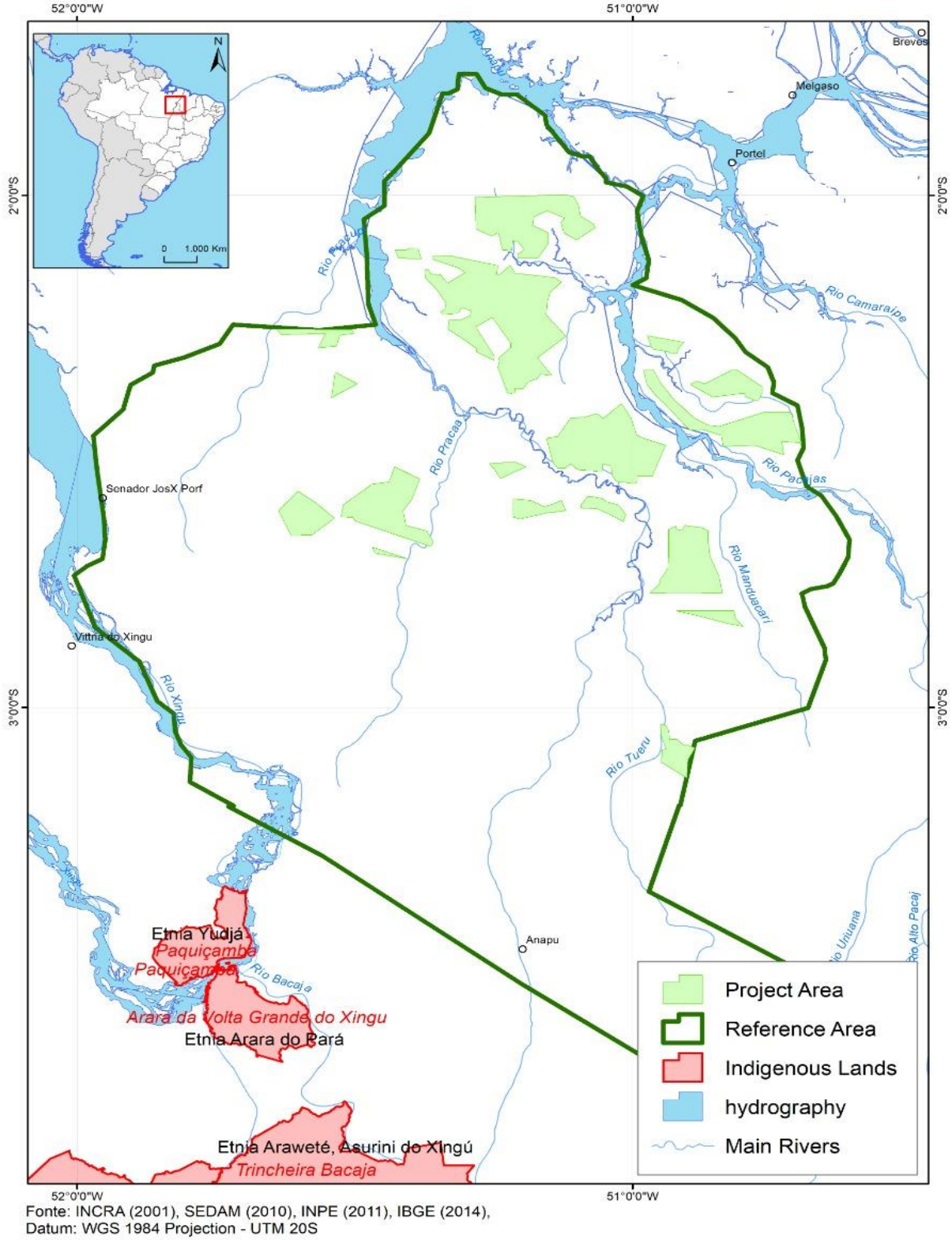


Figure 37: Displaying indigenous communities outside the project area



Fonte: INCRA (2001), SEDAM (2010), INPE (2011), IBGE (2014),
Datum: WGS 1984 Projection - UTM 20S

2.1.8 Stakeholder Identification (G1.5)

The process to identify the stakeholders was completed by identifying everyone who lived within the project area and leakage management area via census work. All people identified can be quantified as Riverine people and traditional rural villagers. The riverine people and traditional rural villagers are two groups, male and female with varying degrees of needs and outcomes from the project.

The riverine people and traditional rural villagers are classified as a traditional people by the government. There are no other types of people within the project boundary, or leakage management area. The community group is all related to each other and is 1st, 2nd, 3rd, 4th cousins. They are, sisters, and brothers, and brother-in-law and sister-in-law's. It is a giant interconnected family in the project area, all classified as one community by the government.

This committee is a proposal that emerged from the initial analysis of the involved stakeholders related to the project, the ones potentially interested and the actors that maintain a recognized influence in the zone. This committee was formed at the beginning of the FPIC process and would be in charge of the participatory and independent surveillance.

Its conformation where defined through a process to raise public awareness, dialogue and negotiation. This committee should also try to incorporate an even number of representatives from the civil society and governmental institutions. The committee must include representatives from:

- The National Environmental Authority, such as the Ministry of Environment and its entities involved in the Project
- Local and Provincial authorities: municipalities, council, government, police, church.
- Population settled within the limits of the project – the Riverine people
- Civil society organizations
- Organizations invited to contribute in the process: public programs and institutions.

The committee was a participative inter-sectorial consultative body that watched over an appropriate implementation of the project and its members and has the capacity to deliberate and decide over the affairs considered in their statutes and regulations.

The members of the committee did not receive any sort of economic retribution or recognition for their participation and assistance. The project did provide logistical support to these councils in order to complete their functions.

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

Below are the listed stakeholders were identified as anyone who lives within the project area or leakage management area of the project or have stake or direct & indirect impact on the project.

1) Riverine People: They are described as traditional people in Brazil and are all characterized as Riverine People. The communities are located in riverside and dry land areas in the region's forests. There are two community groups female and male.

   The females raise the children, cook the food and take care of the household, and are normally the leader of the family. While the men fish and tend to the Cassava patches of approximately 1 hectare per year. Thus, two distinct community groups with mostly separate participatory roles in that group.

   The riverine people are a suppressed community group that is under-educated and thus are open to abuse by both illegal loggers, land grabbers and even leaders of the community that are making agreements to allow illegal loggers to cut, in exchange for sub-par fees. The main abuse that this community group faces is they are being deprived of property rights. The government

has unfolded numerous major initiatives to provide property rights to all, however the representative bodies in the region have told their riverine constituents that these programs are tricks to take their land, and that no one should be trusted.

2) Traditional rural villagers: These primary stakeholders would be considered the impoverished communities, living in rural villages, that are directly adjacent to the project area. These community group stakeholders listed in this section are directly targeted to be directly impacted by the project. Each forest block, of the project area, has focused on 2 or 3 villages directly adjacent or nearest to the project area.

· The village is the group of population in a rural area.

· Within the village is the community

· Within this community are different community groups: (1) male, (2) female (3) children (4) teenagers.

· The male and female are direct beneficiary and impact from the project as they are the adults and interact directly with the project and benefit from this.

· The children and teenagers have an indirect benefit and impact from the project as they are the children or teenagers of the direct beneficiary male community group and female community group. These directly benefited male community group and female community group, as stakeholders, are affected and impacted in different ways from the project:

· Primary relationship between the female community group and the project is that the project has provided an eco-cook stove that was distributed and will improve their cooking conditions.

· The primary relationship for the male community group within the village is jobs working in the property, agroforestry training and adult education if requested as a benefit of working in the project area. The male and female community groups have a direct, and purposeful benefit from the project.

The following villages contain the community groups (male, female, children, teenagers). These are the following 8 villages that have been targeted by the project, to bring direct and purposeful benefits, with the ultimate goal to help the community groups in the villages to move into the rural middle class, have better skill training and be able to provide better future for their children and teenagers:

1. Vila Aru
2. Vila do Bogea
3. Vila Horebe
4. Vila Menino Deus
5. Vila Sao Joao
6. Vila Sao Jose
7. Vila Jerusalem
8. Vila Laguinho

The villages are typically broken into 10 to 30 houses, grouped together on rural dirt roads next to rivers or streams. In some cases, there are no schools, in other cases there is a government run one room school house with no bathroom, no doors, cement floor and a roof. Each village has a village leader. The children are expected to the bathroom in the bushes behind the school.

In each village 1 person from each household was interviewed. In the interview the primary focus of the head of household was to have more money.

The villages are different from the ribeirinho (riverine community group) and traditional rural villagers. They are usually all related to the rural riverine group in one generation. In the case of traditional rural villages in the Amazon, they resemble several separate families more closely, although in some cases it may be a group of several families related by marriage to each other.

Within the villages are the children community group which has a direct impact. This children community group also gains benefit by attending the schools that are set up inside the project area and funded by the project. The schools provide a better education than the government run schools in the area and have proper facilities. Thus, the children that attend the school are stakeholders.

3) Other workers and their families on the property: other workers and families living within the project boundary and leakage management area are stakeholders. These people are not from local villages. They would be considered the working poor from a city. They are not qualified as typical amazon community groups of traditional or indigenous people. They are not: (1) Ribeirinho (Riverine Traditional people) (2) Traditional Rural Amazon villages. Thus, due to this they are not a community group but a stakeholder with a strong benefit from the project.

4) Neighbors: are stakeholders and the neighbors have been consulted and informed of the project. These include the neighboring farms and their workers, technicians. The neighbors would be considered an indirect beneficiary of the project. Upon completion of the current project the validation for a grouped jurisdictional REDD project is to start involving these neighbors. Thus, the neighbors have an indirect benefit by the project's success. However, they are not the direct beneficiaries and not a community group but a stakeholder with a strong potential benefit from the project.

- **Direct stakeholders:** Project owner, Land Owner
- **Institutional Stakeholders:** Mayoral office of the Municipality of Portel and Breves.
- **Commercial Stakeholders:** Brazil Agfor LLC

The project brought cook stoves, did training on other crops besides Casava and did the land tenure certificates known as the Cadastro Ambieintal Rural (environmental certificate) to demarcate their lands. The local population then acts as a human fence between the land invaders and the preserved area. With the local riverine people and traditional amazon villagers having their land rights then they are less likely to be displaced by the drivers of deforestation and illegal logging.

Riverine community and traditional amazon villagers are all interconnected for each river affluent, thus cousins, uncles, aunts, all have houses somewhere along the river. They have intermarried with each other. It was about 1 family per river branch that came to the region. They produced off-spring and that off-spring married the offspring of other riverine families in the same region, thus all the current families can be traced back to 15 original families that arrived to the region in the 1950's as former rubber tappers.

The PRA was developed through a series of field visits, observations, surveys, workshops and interviews to local leaders and experts whom were informed about the project idea, its activities, the potential benefits to the communities and their participation in the project. To complement field information, the team used secondary information from IBGE's 2010 Census.

Figure 39: Surveys and interviews one-on-one applied to leaders of households

Figure 40: Survey Technician in blue shirt with a riverine family, household patron of traditional rural villager

Carrying out meetings and one-one one discussions has been one element of great relevance for the design of the project in PRA. The households were informed about the project idea and the potential benefits for the communities and how their participation was throughout the entire process. Likewise, 'speaking maps' were constructed in a participatory manner in each one of the workshops which has allowed the households to face and describe their current life conditions identifying the main existing problems and the future conditions they would like to have in a situation where the project is being developed.

Figure 41: Workshops with community groups

The tool of elaborating a 'current map' and a 'future desired map' in each locality has allowed the population and Anapu-Pacaja to clarify the needs and expectations of the local community in comparative terms on how they are and how they picture their communities in the future.

The list of stake holders and beneficiaries of both cook stoves and land tenure documents in table - **Heads of Households for 127 families who already received land tenure Certificates (CAR)**

Adeir de Carvalho Bezerra	Janielson Pantoja de Carvelho
Adicilene Cordeiro dos Santos	Jardeane Tenorio Barbosa
Adiel de Carvalho Bezerra	Joabe da Silva Conceicao
Adilson de Michel Santos dos Santos	Joel Andrade Maia
Adim Bezerra	Jose Carlos Alves dos Santos
Adonias da Cruz dos Santos	Jose Nelido Barbosa Soares
Adrielmar Braga Freitas	Joselino Alves Braga
Ailton Melo Barbosa	Julia Braga e Braga
Aldamir de Freitas Braga	Juracy Braga Marinho
Aldici de Michelly Santos dos Santos	Jurandir dos Santos Rodrigues
Alentan Silva Santos	Kelma Silva Santos
Alessando da Costa Texeira	Levi da Silva Gomes
Ameky de Carvalho Bezerra	Lindomar Barbosa Serrao
Ana Ruth Primavera Braga	Lorencio Rodrigues da Silva
Anisia Fonseca Ferreira	Lourenco Rodrigues da Cunha
Antonio Alves Braga	Luciane Flores de Oliveira
Arielson Braga Serrao	Luiza Osmarina Primavera Braga

Beatriz Braga da Cruz	Magno Ribeiro de Jesus
Benedito Brazão de Freitas	Manoel Aguinelo
Benevaldo de Jesus Valadares da Silva	Manoel Carneiro da Cunha
Beneveldo de Jesus da Silva	Marcelino Jardim
Bianca da Cruz Gomes	Marcos Rodrigues Araujo
Brazão de Freitas - communidade	Marcos Rodrigues de Araujo
Carlos Primavera Braga	Maria Brasao de Freitas
Christiane Almeida Braga	Maria de Nazera Alves Braga
Cirilo Alves Valadares	Maria do Carmo Cardoso de Almeida
Cleomar Brandao	Maria Elza
Clodorico Braga da Cruz	Maria Francisca
Davi Valadares da Silva	Maria Jose da Silva Duarte
Deiziane Pinheiro Fonseca	Maria Jose de Lima Barbosa
Diana Marques Pacheco	Maria Leila Lopes Barboza
Diana Miranda da Silva	Maria Lucia Cordeiro dos Santos
Diego da Cruz Gomes	Maria Lucia Serrao de Freitas
Djalma de Freitas Braga	Maria Miguela da Silva Duarte
Edenilson de Freitas Braga	Maria Raimunda Ribeiro de Jesus
Eder Almeida de Freitas	Maria Regina Freitas da Silva
Edileuza Braga Texeira	Mauricio de Almeida Braga
Edimilton Braga Teixeira	Naliel da Silva Souza
Edlene Braga Teixeira	Natanael Mavigno do Carmo
Edson Braga Teixeira	Nazaré Brazão de Freitas
Edvania Goncalves Alves	Neosiane Brazão de Freitas
Elen de Jesus Gomes	Neusinete Rodrigues Brasao
Elias do Carmo Araujo	Odaisa da Silva Rodrigues
Elizangela Sousa de Almeida	Oliveira Santos dos Anjos
Elza Silva Melo	Raimundo Rodrigues dos Santos
Elzo Machado Serrao	Raimundo WAlter Carneiro
Eralda da Silva Costa	Rasangela Maia Reis Macedo
Eraldo Rodrigues Brasao	Ricardo Rodrigues da Cunha
Eraldo Santos dos Anjos	Rosa da Silva Cunha
Erenildo Palheta de Melo	Rosa Moura Braga
Estorgio Rodrigues da Cunha	Roseane de Almeida Sousa
Farnanda Beatriz Aquino da Silva	Roseane Vilarinho da Cruz
Francisca Alves Pimentel	Rubens Brandao
Gabriela Vilarinho da Cruz	Severino Ferreira Pacheco
Gelson Braga Alves	Sidnei Primavera Braga
Geovane Brazão de Freitas	Sinair Vilarinho da Cruz
Geovane da Gama Lopes	Solomao de Sousa Silva
Geovane Fonseca Ferreira	Valdeir Felix Araujo
Hamilton de Freitas Braga	Vanessa Vilarinho da Cruz
Ibette Braga Barbosa	Velton Braga Freitas

Inael Goncalves de Carvalho	Verdilho Valadares da Silva
Izanildo Costa Pinheiro	Vitor Vilarinho da Cruz
Jadison Tenorio Barbosa	Wagner Silva Carvalho
Jaiane Tenorio Barbosa	

Each head of each household participated in Cook stove Receipt, Land Tenure paperwork and survey process of the household property, as well as Agroforestry training.

Each household was surveyed one-on-one to determine the critical issues faced by that specific household.

In additional to this each household signed off with the Free and Prior Conscent to want the carbon credit project. 5 households deemed to be in ideal locations for Fauna Monitoring were trained to be able to monitor the fauna.

To complete the survey the team had to request the ID document of the riverine and traditional rural village person, as this was needed to enter the survey work into the government system for that person.

The information gathered in the field work through the tools mentioned before, especially the needs and problems pointed out by the leaders and local households, has been the basis upon which the proposal for the activities of the project has been developed. The project staff believes that it is better to reach the households with a clear open mind in order to understand local needs and later shape the activities based on the results of the PRA.

For this matter, project activities were conceived right after the social evaluation and not the other way around. Thus, local settlers not only have participated in the design of the project but have indeed provided inputs to Anapu-Pacaja staff for such design.

The following table shows the main problems, priorities and necessities identified by the *population in the workshops and interviews to the local leaders.*

Table 4**:** Main problems, priorities and necessities identified by the population

Main identified problems	**Identified priorities**
• Land Tenure issues and insecurity and instability • Low family income • Limited work opportunities • Increased difficulty to get resources from • hunting and fishing • Low training levels in relation to agricultural activities • Limited knowledge and training on productive activities alternative to farinha. • Low training levels in the organizations for communitarian management	• Funding and coordination to gain Land tenure document • Access to job opportunities • Agricultural production improvement • Access to communitarian transportation • means in order to facilitate access to Portel • New productive alternatives (fisheries • and minor animal breeding) • Access to drinking water • Access to electricity • Access to health services • Access to communication

• Low levels of citizen participation in communitarian management • Unsafe water consumption • Limited access to health services • Limited access to education for children • Limited access to communication	• Access to education • Access to education.

Stake Holder Locations in the Periphery of the Project:

The plots in white, the tiny white polygons around the green project area show the surveys entered into the government system. The project paid for the work to help the riverine and traditional people gain land tenure. A total of 127 families have completed the Environmental Certificate process, with property line survey paid for by the project. The project is in process of completing 121 more. The project will start in June of 2020 a process to do 250 more for an approximate total goal by the end of 2020 of 500 for the Rio Anapu-Pacaja REDD project.
In the map below the outline with polygons represents 250 that are either complete or in process.

Figure 42: Individual Plots surveyed and demarcated by the project in the Jacare Puru River community of the project.

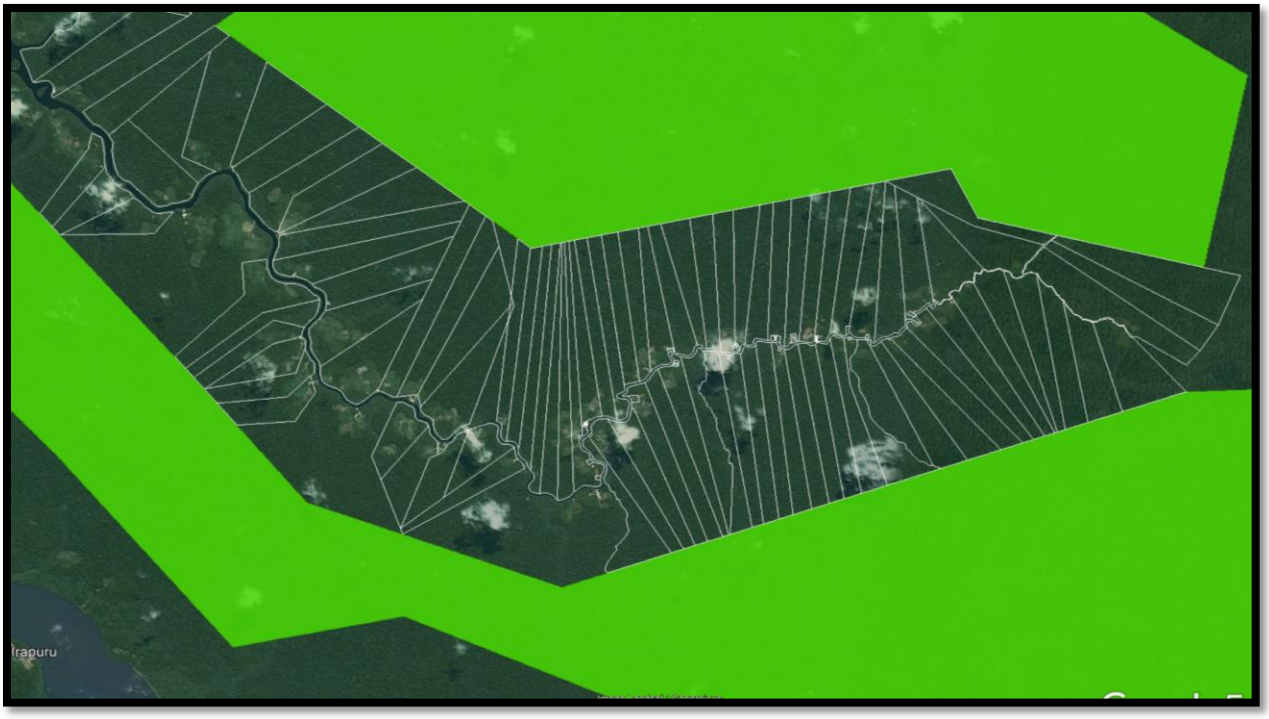


Figure 43: Team transporting cook stoves to the land.

Figure 44: Team loading cement markers placed in the ground during property line surveys. Behind the cement markers 100 cookstoves double packed.

The proposal for the project activities has been designed based upon the problems and priorities identified and pointed out by the households.

The project knows that the activities do make an improvement in the quality of life of the local households in terms of strengthening their capacities and provide opportunities for the economic development of the families. Likewise, being aware that it is not the role of the project to cover and comply with the functions and competencies of the State, the project considers that the proposed activities related to organizational and communitarian managerial capacity building did provide enough skills for the community to manage their public services requirements before the correspondent authorities.

Additionally, the project has determined the creation of an additional fund to the budget to develop and implement project activities. The amount is 5% of the annual income from carbon credits to support the initiatives that arise from the capacities strengthening in the localities.

2.1.10 Sectoral Scope and Project Type

The project corresponds to the VCS Scope 14, VM0015 ver 1.1– Methodology for Avoided Unplanned Deforestation. The project aims to protect rainforest, which are expected to be deforested in the absence of the Project.

- *Sectoral Scope: 14 Agriculture, Forestry and Other Uses of the Land (AFOLU);*
- *Project category: Reducing Emissions from Deforestation and Forest Degradation (REDD);*
- *Project Activity: Avoided Unplanned Deforestation (AUD);*
- *This project is not a grouped project*

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

The Project aims to promote joint actions aimed at reducing greenhouse gas emissions resulting from unplanned deforestation and forest degradation, acting through activities such as intensification of land security and patrimonial surveillance, remote monitoring of changes in land use and cover, the multiple use forest management and monitoring of biodiversity in conjunction with social activities, aiming to promote the incentive to local socioeconomic development on a sustainable basis.

Through the responsible and sustainable use of resources provided by the environment, the project aims to generate net benefits for the climate, communities and biodiversity. Therefore, through these objectives, the activities of the Project were outlined and some of them already implemented. The actions proposed by the Project guarantee the conservation and protection of biodiversity and natural resources, reduction of deforestation and emission of greenhouse gases, local socioeconomic development, social inclusion and the incentive to applied science.

This set of interlinked actions allows the generation of financial resources, mainly through the sale of REDD credits registered in the VCS (Verified Carbon Standard), associated with social development and the conservation of natural resources and, finally, seeking to ensure adequate financing for the accomplishment of the objectives mentioned above, as well as to allow their maintenance throughout the life cycle of the current project.

The project is not located within a jurisdiction covered by a jurisdictional REDD+ program.

Table 10 provides a description of the activities and the principal outcomes and impacts which will contribute to achieving the anticipated benefits of the Project to the Climate, Community and Biodiversity. The activities are divided in themes for better understanding, these are: Initial Studies, Forest Monitoring Intelligence, Technical Assistance and project development from Brazil Agfor, Social Organization, strengthening of Association de Ribeirinhos e Moradores de Portel, Community Infrastructure (Energy and Communication), Efficient management and transparency and Environmental Monitoring and Scientific Research. A brief summary of development of these activities and themes are described below:

Initial Studies:

Activities related to the initial articulation of the Project extend since the signing of the contract, which defined the initial terms of a long-term partnership aimed at environmental conservation and socio-economic development in the region, to meetings with technical partners to present results of the project initial studies. This process involved the elaboration of bids for hiring specialists and meetings between the proponents and the specialists involved to define the scope of the project.

It is understood that the activities related to the initial articulation process are a broad planning agenda for the elaboration of management strategies of this long-term project and, therefore, represent a causal relation of impacts for Climate, Communities and Biodiversity. Among the results identified after the initial articulation there are the reduction of emissions generated by the beginning of the implementation of the project management plan initially designed, the delineation of actions aiming to better deliver the community needs and improve the assistance carried out by Brazil Agfor, and the viability of new environmental studies that provided a better understanding of environmental issues in the region and the generation of long term positive environmental impacts.

The initial studies consist of those related to the production of the technical subsidies necessary for the conception of the project management plan. Among the studies carried out are: the survey of the forest Carbon Stock Estimation and the elaboration of the deforestation Baseline, which result in direct climate impacts; Socioeconomic Diagnosis and Consultation with communities, which deepened studies already done in the area and resulted in direct Social impacts; and the Environmental Diagnoses that, as well as the Socioeconomic Diagnosis, supported the construction of actions to ensure the proper management of agricultural areas, forests and natural resources, giving base to activities proposed in the item "Technical Assistance", specifically activities aimed at strengthening Family Agriculture and Sustainable Extractivism, resulting in direct impacts on Communities and Biodiversity.

Forest Monitoring Intelligence:

The forest monitoring is directly related to climate-related benefits these activities have goals defined as the significant decrease in the occurrence of unplanned deforestation in the Project Area and the consequent reduction of greenhouse gas emissions from these practices. In addition, the objective is the monitoring of forest cover and changes in land use, and support to enable the improvement of land management with respect to land security, patrimonial surveillance and multiple use forest management.

According to the description of the Project, the objective of the Project for the climate component is to avoid the emission of 39,489,204 tons of CO_2, corresponding to the deforestation of 165,707 hectares, which will be avoided through the following activities:

a. Surveillance of the area
b. Monitoring of deforestation and forest degradation by satellite images and
c. Socioenvironmental Activities

Social Organization:

It is necessary to create and strengthen local organizations, so that they have better capacities to seek access to public policies and programs that have been presented as a latent demand of the communities, especially for actions focused on basic structural issues, such as health, education and improvements in access to communities.

The strengthening of organizations is related, in some main lines of action such as training in associativism and cooperativism, to the training of community leaders and the elaboration and implementation of action plan for organizations. In this regard, activities were developed jointly with the Brazil Agfor in order to attend to this theme.

The action in strengthening associativism and cooperativism will aim to contribute directly to mitigation of the main drivers of deforestation as it enhances the organized performance of the communities through the quest to improve the quality of life.

Technical Assistance:

In this aspect, increasing productivity, insertion of new techniques and production technologies, such as implementation of agroforestry systems, and the search for a greater efficiency of current productive systems is very important for a transition from a conventional productive system that is been applied, with cutting and burning, to a low carbon agriculture, with more efficient and profitable production systems and with lower GHG emissions rates.

Ensuring this access will allow an advance in the development of the local productive chains, with gains in scale and quality, resulting in an increase in family income and consequently better living conditions.

The project intends to foster activities that allow the generation of additional income for the communities (community management), as well as improving the management of the territory and the protection of the forest in the long term. Among the proposed actions, the main axis of action is the encouragement of community forest management, which should include the exploitation of timber and non-timber products, depending on the interest and needs raised by the communities. These activities are aimed at the exploitation of low impact of forest resources, associating with the maintenance of the ecological balance, socio-environmental responsibility and economic-financial efficiency.

Community Infrastructure (Energy and Communication):

Communication and energy are central axes for generating socioeconomic well-being in the lives of families in rural communities.

Communication from a social point of view helps to remove communities from the isolation and lack of information from the outside world and favors other issues, such as health and education, which can facilitate the lives of rural people, from the economic point of view, communicating with the external market is fundamental to guarantee access to better marketing conditions.

In the communities involved in the Project only one has better access to the communication networks, and yet they are incipient, in this sense, it is imperative that improvements in community communication systems be implemented, either through actions that articulate with the public power the deployment of public telephony systems or through independent systems from the installation of rural and/or Internet telephony antennas in the communities.

Therefore, efforts will be made to resolve this issue with a view to improving production processes and increasing production capacity in a wide range of areas: improving food, storing food in a refrigerated environment, and facilitating access to information through the use of cellular devices and televisions, which may make it easier to access information and events in the world.

Environmental Monitoring and Scientific Research:

The incentive to reduce deforestation is mainly related to the mitigation of global climate change. However, to provide the generation of consistent positive impacts, conservation initiatives should act comprehensively. Acting not only in relation to the reduction of greenhouse gas emissions and the generation of positive social impacts, but also in the monitoring and mitigation of impacts related to biodiversity, maintenance of gene flow, regulation of water flows and water quality, nutrient cycling, protection of the soil, shelter to the fauna, food supply, fibers and other products to local communities, scenic beauty, maintenance of ecological corridors, among others.

In conjunction with multiple use forest management practices, the Rio Anapu Project aims to monitor and provide for the maintenance of forest cover in the Project Area, ensuring the conservation and protection of habitats and species present on the site and thus generating positive net benefits foreseen to biodiversity for the scenario with the Project.

The detailed and detailed diagnosis in section 5.1 – Without-Project Biodiversity Scenario demonstrated that the Project Area covers a diverse and rich biodiversity, in addition to having species of flora and fauna present in national and international lists of threatened species, which demand great attention. In addition, the area plays an important role as an ecological corridor connecting several Conservation Units in the region.

In general, the project is intended to generate a number of positive impacts on biodiversity, such as conservation of species already diagnosed and conservation of local habitats, conservation of HCVA's, generation and dissemination of scientific knowledge on biodiversity, dissemination of scientific studies in the area and results and indicators related to this theme, maintenance of ecosystem services, mapping of new areas of great relevance for conservation and maintenance of connectivity in the landscape.

Table 5: Summary of the expected changes for climate, communities and biodiversity with the scheduled project activities

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Capacity building via the program Plots for	Secured land tenure Better understanding of	In own land illegal activity is minimized	Forest is protected Illegal activities are	Improved forest management

the Poor – helping the community gain their right to the land.	the importance of protecting the forest and how forest conservation benefits their livelihoods. Opportunity to develop local businesses through an external fund.	and protection is enhanced	minimized	practices with community participation
Improve local livelihoods for households	Diversification of food through agroforestry practices thus an improvement in local nutrition More efficient technologies to produce farinha therefore less time is consume in this activity. Generation of income from monitoring activities.	Improvement in agricultural practices and promotion of income from other activities	Food security is increased Positive impact on average income	Improvement of livelihoods by capacity building
Reduced GHG Emission Reduction and Removal due to the project Activities.	Brazil in general in the short term is seeing a large uptick in both deforestation, fires and illegal logging, as the president of Brazil is focused on destruction and degradation due to possible economic benefits. The project is reducing the GHG emissions in the project boundary in the short term, while regional fires rage to the south.	The project under the next president should expect a general improvement in GHG emissions. The Rio Anapu-Pacaja REDD project will have a current immense stresses taken off its shoulders of the project proponent as the threats are currently extremely high.	Long term, the project will greatly reduce GHG emissions. Once the project is completely done with the plots for the poor, which is hoped for 18 months from now, and 2000 families in the region will gain this. It is believed that this will greatly reduce GHG emissions, as 2000 families will have access to better agro-forestry techniques and will have their own land to invest into higher yield, lower negative impact crops such as black pepper.	This will have a positive effect on reducing GHG emissions.
Participatory Rural Appraisal	Survey conducted in area constituted by the Project's Boundary and a 15km buffer to gather socio-economic information	Identification of deforestation drivers and agents by means of survey	Implementation of mitigation measures to reduce impact by drivers of deforestation	Positive effect on maintenance of carbon stocks
Improvement of health	Distribution of improve cook stoves to households	Better air quality is ensured in households	Longer life expectancy	Improvement of livelihoods
Maintain forest cover and reduce habitat fragmentation	Protect existing high-quality wildlife greenspace	Improve the permeability of land use between sites	Manage and improve degraded greenspace	Conservation of forest cover
Reduce human activities that do not comply with the conservation of biodiversity	Identify locations of critical wildlife habitat for species at risk and the threats to these areas	Monitoring of destruction, degradation and fragmentation of habitats	Conducting trainings and workshops on Biodiversity Conservation	Healthy ecosystems clean our water, purify our air, maintain our soil, regulate the climate, recycle nutrients and provide us with food

2.1.12 Sustainable Development

Forests of the project area have become important areas for conservation. Although these are strategic ecosystems in the provision of environmental services, they are surrounded by a mosaic of pasturelands on the south and west and are at risk to become fragmented and are actively threatened with the expansion of the agricultural frontier. To continue supporting both production and conservation on these lands, adaptation strategies and alternatives to current regional production systems must be sought to both integrate the sustainable use of natural resources and allow for the connectivity of strategic ecosystems. Proper care is taken for man-made forest fires by deploying patrolling activities.

In keeping with the REDD+ approach of examining the direct relationship between human activities, deforestation, and forest degradation, a series of project activities has been proposed to reduce the aforementioned threats on the forests in the project zone and mitigate the associated GHG emissions.

The overarching aim of the project is to support the enactment of the project area Plots for the Poor program. The Project Proponent is focused on bringing stability. Plots for the Poor does three things: (i) promote sustainable economic activities that positively impact the local community while reducing the impact of production on forests, (ii) integrate land management into the socioeconomic and political climate, and (iii) fortify management, governance, and technical capacities to ensure the efficient implementation of the REDD+ project.

With title deeds the local population will invest back into their land. Currently the personal management plans of the local population is not focused on high yield crops due to risk of displacement once that investment is made.

The project is not located within a jurisdiction covered by a jurisdictional REDD+ program. If a jurisdictional REDD program was to be planned for the region, the project would Opt-Out of it due to its private property rights.

The development of the following series of project activities has been proposed after having carefully accounted for the ideas and the wealth of accumulated knowledge particular to the project zone. Among the considered information: a socioeconomic evaluation of the study area such as a scheme for black pepper to replace Cassava, as well as a plan to help the riverine and traditional rural villager's population gain bank loans for projects and wisely use that money on economic plans that have positive impact.

In addition:

The Project Activity promotes proper handling of the land in the Amazon Biome, contributing to the mitigation of climate change by reducing GHG emissions, by generating e sustainable development through the activities such as capacity building and trainings, reforestation activities, education for younger generation which will support and generate social, climatic and environmental co-benefits.

Currently the Presidential Directive for the Amazon is to focus on a rapid development with the hopes to improve the economy in the Amazon.

Total of 5 sustainable development goals will be addressed as per the project. Social co-benefits:

Project activities have stimulated an increase in the local workforce employed in the Project Zone. The project is focusing on better types of agroforestry that can create the need for the riverine and traditional rural villagers to employee others.

Climate co-benefits:

The Project has a positive impact on the microclimate of the region: in fact it contributes, less soil reflectivity, and a reduction in temperatures. This could, as it is done on a large scale, have significant effects on the climate of the micro-region. The project aims to reduce nearly 40 million tCO2eof GHG

emissions in the next 30 years of the crediting period. The start date being January 1, 2016 and the end date being December 31, 2045.

Environmental co-benefits:

Soil: the Project has a positive impact on the soil, which improves the characteristics, mainly organic matter: this increasing follows the planting and the subsequent cuts because during the harvesting and the selection of the timber abundant vegetable matter (branches and leaves) remains in the location. This wood litter, with natural decomposition, integrates with the soil in the form of organic
matter.

Biodiversity:

As for biodiversity in the specific case of the property, there will be an increase in different species (including black jaguar (onca preta), spotted cat, hawks, woodpeckers, snakes-hunter birds and various species of birds) and (including Anteaters, Tapirs, Deer, Foxes, Wild Boars, Ocelots and numerous species of rodents) can be frequently found in the Project Zone

The project works to meeting the nationally stated sustainable development priorities by helping all of the community members gain land title or land tenure documents, if they request it. The projects goal is to provide these to everyone in the region.

Based on this support and in accordance with expected impacts, the project will contribute to the following UN sustainable development goals:

Sustainable Development Goals	**Application in Project**
	The project helps in the fight hunger through the implementation of sustainable food production systems and resilient agricultural practices through strengthening family agriculture low carbon in the area, increasing productivity in family production units, recovering areas degraded previously by implantation of Agroforestry Systems, diversifying the agricultural production with the implantation of nurseries to supply seedlings of varied species and generating guarantee of food security for the families
	The project provides access and encourages education through technical and professional courses enabling better employment conditions and income, especially for women and youth. In addition, activities related to education and incentives to sustainable management practices of forest resources, reduce the spread of illegal activities, promote the appreciation of cultural diversity and contribute to the sustainable development culture. In order to achieve these objectives, the project is focused on intensifying technical assistance and rural extension services, as well as offering training aimed at production bias, social organization, corporativism, leadership and financial management, developing technical and professional skills.

	All project activities are open and stimulated for the participation of all the residents of the acting communities, especially women, youth and marginalized people.
	Through actions that encourage the responsible exploitation of natural resources, low carbon agriculture and the recovery of degraded areas, the project promotes the conservation of natural resources, coupled with socioeconomic development for this, some of the main components of the Project are related to the promotion of scientific research focused on the efficient use of natural resources, seeking greater integration among the parties involved in the project and focusing on sustainable business chains, generating income and well-being for local communities and making the use of natural resources available more responsible and conscious
	All activities undertaken by the project aim to take action to combat climate change and its impacts through the reduction of deforestation in the project area and consequently reducing the emission of greenhouse gases, contributing directly to the Brazilian goal of reducing emissions, the project has the potential to reduce 39,489,204 tCO2e of GHG emissions in 30 years.

2.1.13 Implementation Schedule (G1.9)

Date	Milestone(s) in the project's development and implementation
June 2, 2012	The project signed the contract with the landowners.
September 2015	Free, Prior and Informed Consent (FPIC) process
2016	The community groups were contacted and one-on-one meetings took place to gain support for the project signature goal of inserting into the government database the necessary documentation to allow each family to gain land tenure documents.
January 1, 2016	Start date of GHG accounting Period (First Verification).
January 15th 2016	Initial Participatory Rural Appraisal (PRA)
March 2nd 2016	Stakeholder's meeting on carbon credits
January 1, 2017 to July 30 2017	Eco-Stoves were delivered for 17 families Some land survey work was completed for each family.
2nd September 2017	Implementation of biodiversity monitoring plan

January 1, 2018 to July 30 2018	Eco-Stoves were delivered to 17 families in the project area
January 1, 2019 to July 30 2019	Eco-Stoves were delivered to 17 families. The first land tenure documents were inserted into the government database
10th May 2019	Resource Management Plan completed and signed
January 1, 2020 to April 20, 2020	Additional land survey work for each family parcel is being completed so that the data can be submitted to the government for the final step in a long process to gain land title deeds for each Riverine and traditional rural villagers' family.
20th August 2020	Completion of PD and MR
Year 2020 to 2045	• Development and monitoring of environmental and social management activities • Monitoring of deforestation and emissions • Monitoring of biodiversity (Fauna and Flora) and High Conservation Value Areas • Development of scientific research • Verification of credits (Selection and contracting of verification body; Production of follow-up bulletins for Verification Project; Monitoring of field audit; Registration of credits) • Conducting of credit marketing processes

2.1.14 Project Start Date

January 1, 2016

The project contracts were signed in 2012 with the landowners. The original project name was known as "Greenwall". In 2016 when the project was started there was another project in Africa named Greenwall, thus the name "Rio Anapu-Pacaja REDD project" was adopted, reflecting the two main rivers that pass through the project area.

Prior to 2016, the carbon market was not strong at the time, and thus the landowners determined to wait for launcing the project when the market picked up and that was in 2016. Until this date nothing was done with substantial impact had been completed.

The main aspect in 2016 was that a great deal of social work started in the project area, from census work to visits to the Riverine and traditional rural village people.

Although, forest protection initiatives and activities were developed prior to 2016, setting a 2016 project start date was a conservative approach to make sure the project had enough monitoring and enforcement experience to start producing conservation results.

2.1.15 Benefits Assessment and Crediting Period (G1.9)

January 1, 2016 to December 31, 2045 a total of 30 years

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

No difference

2.1.17 Estimated GHG Emission Reductions or Removals

Year	Estimated net GHG emission reduction or removals (tCO_2e)
1	1,058,555
2	1,422,367
3	1,649,462
4	1,607,271
5	1,508,898
6	1,320,248
7	1,363,523
8	1,242,472
9	1,173,757
10	1,109,919
11	1,064,801
12	1,065,411
13	1,039,113
14	974,934
15	1,043,380
16	1,070,035
17	1,065,431
18	1,079,065
19	1,089,469
20	1,115,156
21	1,175,781
22	1,172,653
23	1,362,991
24	1,441,838
25	1,445,889
26	1,544,149
27	1,571,984
28	1,662,138
29	1,921,502
30	2,127,014
Total number of credit years	30
Average annual	1,316,307

ERs	
Total estimated ERs	39,489,204

2.1.18 Risks to the Project (G1.10)

1. Communities lack of effectiveness to control the Conservation Forest area

The Project did provide permanent land use rights against results for conservation to those families living within the Project Boundary. Families were trained to monitor the area and to protect the forest.

With the completed census, and knowing who individually owns what, if a family breaks the Conservation Forest Area plan, it is easy to identify who this is and future benefits from the project will be curtailed if the behavior continues. The project will have no way to revoke title that has been provided the riverine and traditional rural village people.

The project has done a financial feasibility assessment on how much it costs to visit a house and it is between 30 and 50 dollars (depending on the months total productivity) between team on the boat, staff salaries and overhead just to visit the house. The project is adding technicians to the boat, so more families can be visited in less team, which the project hopes will reduce the high visitation expense.

The future process related to the land tenure is to request from the government to issue the final title deed. As much as the goal is to give title in exchange for preserving, it is also a human rights factor where we cannot skip even one household no matter if the person is bad or deforested, the stability brings preservation. The environmental certificate has helped monitor the persons activities and based on national statistics has had significant impact in stopping deforestation.

2. Population growth forces agricultural expansion in project area.

Although population is growing in the area, it is clear from the PRA and the LULC change analysis that small-scale agriculture is not a significant driver of deforestation in the area. Nevertheless, the Project includes capacity building on agroforestry techniques to help riverine and traditional rural villagers to develop more efficient crop systems that require less area and longer rotation times, thus reducing the need of clearing forest patches under regeneration.

3. Loss of carbon stocks through fire, illegal felling, and land clearing

The Project has reduced the risk of leakage, illegal logging and fire by building strong partnerships with households in the Project Boundaries and it its vicinity thus preventing deforestation activities to start. This includes by giving out cook stoves and also paying for the riverine and traditional rural villagers in these locations to gain title. Also, capacity building workshops were held with cattle ranchers that get in the vicinity of the project to show them the benefits of intensified pasture management, thus preventing further LULC change in the area.

Illegal logging risks were mitigated through a number of measures including demarcating boundaries and posting signage, blocking machinery access through trenching and other methods, regular patrolling, and improved communications with local authorities in Portel through two-way radios and cell phones (where available).

Land grabbing were addressed in two ways. First Anapu-Pacaja 's local team have met with new migrants and neighboring households and leaders, as well as the municipal authorities to make sure the Project Boundaries are known and resolve any existing conflicts. Communities were encouraged to inform prospective migrants that the forests are protected and that there are no opportunities for new migrants to the area. Second, Anapu-Pacaja did demarcate boundaries with pillars and signage, maintain regular patrols, and call in the support of the local authorities and police.

Table 6. Risks and measures to the project benefits

Risk	**Measure**
Non continuity of the project activities	The project is backed by conservation agreements signed by the owners voluntarily under prior and informed referring to the benefits and commitments to engage in REDD strategy (see folder Land owners Agreements). Likewise, the strategy of permanent communication with the owners and the community and the good results of the project will allow continued ownership of the project by the owners. Any policy changes will not affect our project area since this is being implemented on a private land. The contract has been designed in such a way with the Land owner that even policy changes should not affect the conservation program of the project area. • According to the conservation agreements the land owner is committed to conserve the productive systems implemented in their properties. Also, if a beneficiary want/must sell the land, he/she may transfer the commitments and
	benefits to the new land owner; it will favor the permanence of project benefits regardless the changes in ownership. • Active participation of the community in the project management and the effective communication to show the multiple benefits related to the project in every phase.
Invasion of project land by outsiders	Regular patrols, signage, purchasing of more vehicles to conduct patrols, increasing awareness of community members about conservation and the rules of the resource plan, strengthening and authenticating land rights
Climate change /drought	Reducing deforestation – reduces carbon emissions and creates a better local ecosystem. Diversification of livelihood sources to reduce reliability on livestock.
Weak leadership /governance	Leadership training and capacity building

	activities for the community leadership and village leadership teams, measures to increase transparency around income and expenditure of funds
Limited allocation of income	Most of the project activities are designed to reduce the maintenance costs and/or increase the profitability of the productive systems. Also, the land owners are trained along with the implementation of the activities, in order to enable that subsequently, the activities can be developed by themselves.
Lack of budget for implementation of activities and / or project monitoring	Most of the project activities are designed to reduce the maintenance costs and/or increase the profitability of the productive systems. Also, the land owners are trained along with the implementation of the activities, in order to enable that subsequently, the activities can be developed by themselves. Amazon Reforestation Consortium has an extensive trajectory in implementing projects with rural communities (especially in the project region) related to forest conservation and productive alternative systems. Therefore, this risk is mitigated based on its certified experience and management and mobilizing resources capacities at the country and international level.
Forest fires and other threats	The land owners are trained by ARC in order to perform the technical tasks in an appropriate manner. Besides, ARC conducts regular visits to the properties which allow them to monitor as well as identify potential risks.
Policy change by local governments	REDD+ may undermine the decentralization of forest management systems in developing countries. Governments could be inclined to recentralize their forest management systems, because REDD+ requires governments to establish national carbon-oriented forest management plans, reliable baseline data, MRV mechanisms, and national institutions for the trading and payment of carbon stocks in the forests. If any change happens also will be inclined towards the project development positively.

The project is working rapidly to help all the families in this region to gain their land tenure documents. Once this is present, a great deal of issues related to land conflict and the results of land conflict such as fire, illegal felling and land clearing will be resolved.

2.1.19 Benefit Permanence (G1.11)

Community activities are designed to transform local economies over the life of the Project. In this regard, the focus of the Anapu-Pacaja developed local business and income-generating activities that are critical components of a long-term low carbon economy. Project activities that met this overarching objective focus on education, sustainable agriculture, community-based ecotourism and sustainable management

of natural resources. These activities reduced the necessity of community members to deforest and degrade the Project Area. During the Project Lifetime, this will be achieved, for example, facilitating better education, through training farmers in sustainable agriculture.

The project focuses on three principal strategies to ensure the maintenance and enhancement of the project benefits beyond the project lifetime. For this monitoring period also the focus is the same.

1. Skill and capacity development.
2. Goal of permanent Land ownership
3. Health benefits

1. The skills are learnt by the communities throughout the projects lifetime. These relate to better land resource management. The project has initiated several awareness programmes for efficient use of land for agricultural practices and has also provided cook stoves which have the benefit of lessening the time for Farinha production and the overall cooking time. The protection of the forests itself ensure that due to lesser degradation there is greater potential to provide timber and non-timber forest products on a sustainable basis. The community has been made aware and trained in alternative crops of agroforestry such as black pepper, honey or andiroba oil. Around 200 community members have received training during this monitoring period.

2. The goal of permanent land ownership to the communities is one of the main initiatives of the project and this provides permanent ownership even beyond the project lifetime. This provides the community to implement the skills and learnings on their own land which is self-sustainable and provides benefits beyond the projects lifetime. Around 220 CARs have been distributed during this monitoring period.

3. The health benefits to the women and to the overall community is expected to continue beyond the projects lifetime. In a 2002 report, WHO listed indoor smoke from solid fuels among the top 10 risks to human health [12]. "Day in and day out, and for hours at a time, women and their small children breathe in amounts of smoke equivalent to consuming two packs of cigarettes per day," WHO reported in the 2006 report Fuel for Life [(12)] : Household Energy and Health. As greenhouse gas emissions have increased, the smoke from kitchens in the developing world has escalated from a local to a worldwide threat. The average cooking fire produces about as much carbon dioxide as a car, and produces more soot, also known as black carbon [(12)]. Reducing these emissions may be among the fastest, cheapest ways to fight global climate change. 50 women have received cook stoves which translates to improved livelihood during this monitoring period.

The permanence of the benefits associated with the project are captured during the feedback from the community during the periodic community meetings in which around 78% of them prefer to continue the good practices.

Improvement in patrimonial surveillance procedures: through the provision of additional tools such as remote monitoring of high-resolution satellite images, acquisition of support equipment, and provision of training to the patrimonial surveillance team, the Project aims to increase efficiency and reduce costs of patrimonial surveillance operations. In this way the surveillance operations will have a great increase in the intelligence process related to territorial monitoring and management, which should directly reflect the maintenance of long-term climatic benefits;

Greater scientific knowledge on Biodiversity and Maintenance of High Conservation Value Attributes: in addition to providing for the maintenance of native forest cover, supporting the activities of responsible forest exploitation and providing tools to provide sustainable socioeconomic development, the Project has as its axis of action the incentive for scientific research. In this way, the Project will implement

[12] Fuel for Life – World Health Organization (2006)
(https://www.who.int/airpollution/publications/fuelforlife.pdf)

a long-term monitoring plan for Biodiversity and HCVAs. These monitoring will aim to evaluate impacts, to implement mitigation actions and to increase the scientific understanding of Biodiversity in the region.

2.1.20 Financial Sustainability (G1.12)

Funding for Project's activities is secured by funds committed by the Project Proponent from 2016 to the present. After 2020 the project is expected to generate enough revenues from carbon credit sale to cover Project costs. The Project financial analysis makes clear how important is the revenue generated through carbon credits to protect the Project Area and to implement the Project's activities.

The project proponent has made a financial statement to demonstrate their commitment to cover future costs until the project receives credits for the emissions achieved since the Project start date until validation date.

Considering current carbon market assumptions and the potential for generation of GHG Emissions Reductions, the financial flow of the Project presents quite attractive results. The Internal Rate of Return (IRR) of the project in its 30-year duration, according to the estimates, should represent about 50%. The Net Present Value of the project (NPV), when considered a discount rate of 25%, is about 3.6 million reais. In this model, the proponents expect to recover the investment in the fifth year of the project, when the commercialization of GHG Emissions Reductions will be started.

Other information related to the financial analysis of the Project, and financial health statements of the proponent institutions are considered commercially sensitive information and were shared with the audit team on a confidentiality basis.

2.1.21 Grouped Projects

This is not a grouped Project.

2.2 Without-project Land Use Scenario and Additionality

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

For the determination of the land use scenario in the absence of the Project (baseline scenario) the approved methodology VCS VM0015 version 1.1 was used.

The analysis of deforestation, vector agents and hidden causes, as well as the probable scenarios of land use in the absence of the Project were performed based on the baseline scenario and are detailed in section 3.1.4 of the PD.

The range of potential land use scenarios and the associated drivers of land use changes most likely to occur within the project zone in the absence of the project, are:

• Deforestation for the expansion of livestock activities

• Deforestation for the expansion of the agricultural frontier and crops

In order to mitigate these risks, the project has several proposals for training activities directed to the population with aims at Improving local livelihoods for villagers, Capacity building and training with appropriate and adaptive forestry practices contributing to guarantee security in the intervention area. Improvement in their health and education systems. As well as a clear definition of land ownership for the rural riverine and traditional rural village people, who act as a buffer for these agents.

Moreover, it is foreseen to maintain a better water table level and the precipitations patterns in a microclimate environment by maintaining a forest cover, which at the same time provides protection to extreme events such as reducing the impact during heavy rains, soil erosion and maintenance of the air temperature

As seen on Map 19, the deforestation scenario in the southern part of the project Reference Region. Without the private the land would immediately face a bombardment of land grabbers. Current the project is facing a bombardment of land grabbers. The threat in this region is extremely high.

2.2.2 Most-Likely Scenario Justification (G2.1)

In the absence of the project, the most likely activities are livestock development which leads for grazing and expansion of the agricultural frontier; all these activities are practiced traditionally for their survival which gives continuity to management practices that generally they are detrimental to natural resources. This in turn affects gradually the loss of soil fertility, increase erosion and decrease topsoil, and as a result, a decrease in productivity is achieved with unprofitable products. It has also got direct impacts on flora and fauna. Due to native forest loss, we may have to lose many endemic species in the area which leads to ecological imbalance. Illegal logging, deforestation due to the expansion of township and for grazing is going to be continued in the project area without the project activity.

However, these activities continue to perform as traditional methods also involve low capital investment and implementation of known techniques. The age old methods of cultivation, livestock breeding and other old traditional methods of cooking, all these characteristics are most important when taking into account that much of the rural population in the prioritized area corresponds to adult age groups, culturally most established to the knowledge acquired from their parents and less willingness to change their traditional systems production. Without the implementation of this project, the surrounding population will continue the same old traditional methods which leads in deforestation of native forests.

2.2.3 Community and Biodiversity Additionality (G2.2)

The current scenario in the absence of the Project would be limited in generating benefits to climate, community and biodiversity. The scenario without the Project tends to progress to the increase of illegal extractive activities, conversion of forest areas into unplanned irregular occupations, expansion of the area of agriculture and livestock with low productivity and environmental degradation due to the lack of basic knowledge on environment and forests, increasing the deforestation pressure in the project's area of expansion and gradually advancing towards the boundaries of the Project area.

The present scenario with the development of the REDD+ Project is socially, environmentally and economically positive. Sustainable development activities are an important path for the conservation of forests and for the improvement of the local economy of communities. The Project seeks to improve lifestyle management of locals, revenue generation and control of the forest loss by conducting proper training programs annually. In the area of agriculture and livestock, agroecological production techniques, increased productivity in smaller areas and the strengthening of production networks can contribute to reductions in environmental impacts, as well as enhancing socioeconomic improvements for the region's population.

The role of education in the project scenario is extremely important, and access to schools, vocational and technical courses should provide better conditions of employment and income. In addition, incentives to develop sustainable forest management practices reduce forest stress.

The project, together with its mechanisms, guarantees the permanence of the forest and the consequent conservation of biodiversity, maintenance of ecosystem services, water quality and climate regulation. In the scenario without Project, the forest environment is being replaced by areas that are more and more

anthropized through deforestation[13] (FEARNSIDE, 2006) As explained about the scenarios, which is presented with and without REDD, through secondary data, the importance of the implementation of the project and development of the Project is reiterated.

The scenarios outlined above are in consistent with enforced mandatory applicable laws and regulations of the country. Project area is a private land which is in line with the approval of the district governments of Paragominas. Project would not have been implemented due to financial constrain, ARC has taken initiative and have invested significant VCS and CCB expenses prior to project registration under VERRA considering the future VCS revenue to implemented the planned activities under REDD+. Even though the old and new version of the Brazilian Forestry Code indicates that 80% of the forest within a privately owned area should be preserved, it is well know from the literature and re-affirmed by our historical analysis with Landsat TM imagery and interviews with local experts that such regulations is weakly enforced.

However, no national or district government funds are made available for the management of the project, nor are there any finance requirements imposed on the management of native forest lands.

For further details on Project additionality for community and biodiversity can be found in sections 4.1.4 – Without-Project Scenario: Community and 5.1.3 – Without-Project Scenario: Biodiversity.

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

Not applicable. The besides GHG emission reductions and CCB certification, the project intends to offer no other benefits of the project as offsets directly or indirectly. Thus due to this there are no costs related to these benefits and there is no risk related to these benefits.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

The Project has determined three methods of communication with the parties involved, aiming to guarantee access to documents and all other information of the Project through oral, written and virtual form, as described below.

Writing: a printed version of each document related to the Project, such as the summary of Project design document in local language. Full reports are at the office in Portel, Para. This includes the PD, MR as well as all other documents. In addition, numerous pamphlets are provided to the community related to our goals for the plots for the poor program.

Virtual: documents related to the Project are available through virtual means on website ribeirinho.org.

Oral: information and news about the Project will also be conveyed orally during one-on-one meetings. This will be conveyed via community leaders as well.

2.3.2 Dissemination of Summary Project Documents (G3.1)

All the documents/results are published in the project website and communicated in Portuguese in a simple language to the council of stakeholders for their awareness and free participation.

[13] *(Fearnside, Philip. (2006). Dams in the Amazon: Belo Monte and Brazil's Hydroelectric Development of the Xingu River Basin. Environmental management. 38. 16-27. 10.1007/s00267-005-0113-6.).*

Apart from the survey teams the main form of communication followed was one-to-one meetings with the community in which the feedback on the benefits provided were communicated which are set for 3 times per year per family Further during this period, the benefits were mainly related to Skill and capacity development, Goal of permanent Land ownership and improved land management practices which were categorised as both long term and short term benefits in the relevant sections of the MR. sample of the survey forms and attendance records of one to one meetings have been submitted to the VVB.

2.3.3 Informational Meetings with Stakeholders (G3.1)

During all consultation aspects of the climate change and carbon markets were addressed by providing information and general concepts in simple and local language (Portuguese) that could be understood by all participants. The documentation and information regarding the Project was made available to the community through the following mechanisms:

• At the beginning of each meeting, participants received a summary sheet of the Project for them to understand the Project

• During the meetings aspects related to forest carbon project, specific project activities and participants were explained.

• There were question and answer sessions after the talks. The questions of the participants were resolved and all observations were heard and taken into consideration.

• The information provided, included contacts (phone number and email) of the people in charge of the Project documentation (project developers), in order to give the attendants, the possibility to permanently communicate their concerns or comments.

• Once the project document is ready, it will be published on the website of the CCB for public Comments.

In addition to the topics mentioned above, during the local consultation were analysed the possible impacts that the project might have on individual or collective actors in terms of economic, social and biodiversity aspects. This analysis was performed through the use questions, comments and opinions regarding to the exposed topics. The result of the evaluation, assigned to each impact a rating of positive, negative or neutral according to the effect on the quality of life of each participant.

During the local consultation, all participants were informed about the validation and registry process while pointing out that an external auditor (a validation and verification body) who visits the area of influence executes this process, interacts with stakeholders, evaluates the project information and issues a report of the evaluation.

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

Through carbon benefits workshop all participants were explained the benefits of the project and the potential costs and risks that they could perceive due to the implementation of the project. However, the project activities have been designed in conjunction with the owners in order to minimize possible negative impacts.

In addition, in every consultation workshop each participant interested in being involved in the project received a one-on-one interview with a questionnaire on it. The technician asked each head of household if they wanted to be involved in the project. If the household stated yes the interview question was filled out. If they stated, no then the house where they lived with GPS marked on the questionnaire.

In very few cases people wanted to think about it. Other cases people were not home to be interviewed. The technician leader makes it an effort to send a boat back to the houses that were missed in order to encounter the community members that were not home.

All interviews that have taken place focused on how the proposed project would affect the communities, what the communities would have to put in place to qualify for carbon benefits and how project activities relate to existing land use plans and user-rights conferred to the villages through the creation of the Wildlife Management Area the communities identified 4 areas of risk involved with participation in the project;

Area	Risk	Mitigation
Grazing	Better quality grazing could attract others to the area and lead to increased pressure	The resource management plan plays out the rules for incursions by non-natives into the community grazing lands
Finance	Increased revenue could lead to corruption and theft	Project structure includes checks and financial transparency will be a linchpin of all project dealings and activities
Culture	Project could threaten the ancient culture in the area due to exposure	The project is based on the resource management plan which was designed by the communities specifically to protect their culture and traditional natural resource uses
Land use	The project could affect the way land is used in the community and restrict access	The project is based on the resource management plan which was designed by the communities specifically to protect traditional land uses

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

The Project's executive summary, including project information and project benefits has been translated into Portuguese and is posted in public places in communities throughout the Project Zone.

During community meetings held by project staff as part of the project outreach process the monitoring and verification process was described.

A poster/notice in Portuguese advertising the Project's public comment period and the validation /verification field visit was posted in communities throughout the Project Zone.

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

The project Proponent actively has 6 technicians working in the field in constant contact with the local households. In the rare event that someone from the team is not in the field, there are two people in the city of Portel that are able to communicate with the riverine and traditional rural villager people.

The Project Proponent has actively communicated to community members and stakeholders about the start of the Public Comment Period and the methods with which they can submit comments on the Project as well as how to view full project documentation. This was accomplished by communicating the Project - Public Comment Period and Verification field visit dates to previously identified stakeholders, community leaders, leaders of the faith communities and public officials. They were then requested to pass that information onto their communities.

Six weeks prior to the site visit in March 2020, verbal communication was done, and it was requested that up to 1 person from all 50 families be prepared to answer questions of the auditor. One-on-one interviews were arranged.

2.3.7 Stakeholder Consultations (G3.4)

The Project designed its activities based on the results of the PRA. It was intended since the beginning to develop activities that were tuned with local livelihoods and the best way to do so was by first consulting with local stakeholders.

All Project activities are based fundamentally on local customs and needs. Such activities do not constitute dramatic changes on local ways of life or customs but only provide knowledge and finance to improve and make more efficient what is already happening on the ground.

The team was able to consult with the community originally prior to July 2016.

The technicians who go to the land stay in the houses of the riverine people and traditional rural villagers while doing survey work, eat at their table and greatly support the project, this has greatly help build trust with the stakeholders. 50 households are involved.

Apart from the survey teams the main form of communication followed was one-to-one meetings with the community. This is necessary for the project to do plots for the poor, we must gain mothers name, the ID number known as RG, and the tax ID number known as the CPF in these consultations. If this data is not gained, or not gained correctly in the one-on-one meeting then the team has to go back to that house at a great expense to the project. Thus clean and clear communication is the utmost to prevent- two trips to the same house, in a short period of time.

2.3.8 Continued Consultation and Adaptive Management (G3.4)

Two of the project team Sergio and Camerao live in Portel and have been with the project since the beginning. They were hired as they know each family in the project area their local knowledge facilitated the warm reception for the project. They are both the project guides and pilots for the technicians and team. They know first-hand everyone in the community and this knowledge allows there to be seamless communication between the project team and the local communities. It may require a cell phone call to Camerao, who calls on the radio to the specific river to reach the family.

Throughout the lifetime of the project, we maintain a direct line of communication with community members, and relevant stakeholders. This establishes a commitment to communication and consultation to keep stakeholders informed of project activities including restoration, maintenance, monitoring and the CCB validation and verification process.

With-project scenario there is an increase to the socio-ecological resilience, reduce the vulnerability and improve the adaptation capacity through a better management of the natural resources, including adaptive management. In addition to this, forest protection in the project area does provide a healthy ecosystem with much greater adaptation potential to climate change, with a higher resistance and

recovery capability to extreme meteorological phenomena and a wide range of benefits to the neighboring people.

Hence there is no change in the consultative and adaptive management system during this monitoring period.

2.3.9 Stakeholder Consultation Channels (G3.5)

The technicians who go to the land stay in the houses of the riverine people and traditional rural villagers while doing survey work, eat at their table and greatly support the project, this has greatly help build trust with the stakeholders.

Apart from the survey teams the main form of communication followed was one-to-one meetings with the community.

The project has Sergio and 6 local technicians that live in Portel, who are reachable at all times by the local population. In addition to this the local community population has the project email, and most families have 1 working cell phone to be able to reach the team.

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

Consultations have ensured to engage with both men and women, and more marginal stakeholder groups in culturally appropriate ways to ensure that the project can hear a wide range of perspectives. Apart from the survey teams the main form of communication followed was one-to-one meetings with the community.

In the decision making process, the main aspect that always came to mind was land rights, eviction and stability, as well as “threats from people who are there to steal their land”. The main decision 95% of the one-on-one meeting is land rights and solutions to resolve the instability and threats.

2.3.11 Anti-Discrimination Assurance (G3.7)

Anapu-Pacaja has company policies to prevent discrimination and outline a course of action, should it occur, the human resource (HR) policy provides a clear statement on discrimination relating to gender, religion or sexual discrimination. Discrimination is considered a level A misconduct under the HR policy. Where discrimination occurs within the company, partner organizations or within project areas (project participants), actions are outlined in the grievance policy to ensure that any discrimination is dealt with by the senior management. All company employees and field partners sign a code of conduct when they sign on to work for the project. No such related incidents have been reported for this monitoring period.

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

There have been no grievances. The riverine and traditional rural villagers are grateful to all help the project provides.

For the Land Tenure program, when the Land Tenure certificates are delivered with a team of 1 technician and 1 local support staff and meet one-on-one and explain about the document and the land tenure boundaries. During the delivery process, the team will request for any issues with the documents and will assure to change the documents if necessary.

The conflict resolution approach has been sequentially adopted and responds to the conformity or inconformity of the complainer to the proposed solution. The evaluator may also propose a specific approach for the resolution depending on the complexity of the case and the assessment of the same.

The present mechanism does not exclude the right of local people to present the case to any public entities estimated to be convenient. Actually, during the census, the Project's management team had informed local people of the creation of such committee and were informed of their right to present grievances directly to public entities, making a clear point that all claims and/or complaints were addressed equally *notwithstanding the line of grievance.* No such related incidents have been reported for this monitoring period.

The legal system in Brazil is takes 5 to 10 years, if not longer to resolve issues, so this is only used in cases of land grabbers invading the project area. The court case for land grabbers takes years, but at least during these years the land grabber is unable to actually deforest and utilize the land until the judge makes a decision. Thus the goal of the project is to use the courts to stall land grabbers until Brazil takes climate change and preservation seriously, thus if a land grabber in 2020 can be stalled until 2030, in 2030, even if a decision as not favorable for the project, in 2030 the laws and regulations in Brazil should be more considerate to preservation, versus the current system of mass deforestation promoted by nearly all levels of government.

PP has a clear grievance redress mechanism which is outlined in the company grievance policy. The grievance policy is also part of the files kept at the PP's office. The policy defines a grievance and its scope and outlines both an informal and formal procedure for managing grievances. Under the informal procedure, affected person first discuss with a director or another member of the management team. The director will attempt to resolve the grievance on an informal basis, taking advice if necessary from other parties. The director and affected person will work together to resolve the problem. If a grievance cannot be resolved via informal discussions, the formal procedure may then be used. The formal procedure requests the grievance to be in written form (or if not possible, by telephone to the director). An investigation is arranged within 1 week (7 days) to gather additional information, followed by a grievance hearing. The hearing should occur within 10 working days of the investigation being completed. Additional details, including the contact numbers of the directors, are included in the grievance policy, available in both English and Portuguese.

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

Accessibility of the feedback and grievance procedure is ensured as grievances can be reported at multiple levels. Individual community members have direct communication access to technicians and social-worker staff, which is almost always in the project area, the community has bi-annual meetings designed for this specific purpose, and the leadership have direct formal channel to air grievances and general feedback. Furthermore, the concept of feedback and grievance and the channels of using the mechanism have been explained to the community at all these levels.

The person in charge of the feedback and grievance redress procedure (for both channels mentioned in section 2.3.12) must be available during the days and times previously agreed with the community, to receive and / or make calls. In addition, the project is planning to set up several offices in each river to be able to provide video-conference technology to a centralized office in Portel town, bearing that the project is able to generate sufficient carbon sales. This video conference technology will allow individuals to voice grievances when they live in remote areas of the project, and have a proper redress on a live video feed, thus they will not need to look for the technicians in the field.

Besides, the contact information was provided during the local stakeholder's consultation. This should allow direct communication with property owner representatives and answering questions that will arise during the project implementation.

2.3.14 Worker Training (G3.9)

Project's activity #1 is designed to provide training to local community groups that will generate the required capabilities to undertake forest monitoring as well as monitoring for social and biodiversity variables.

The Project ensures that all members of the community groups have the same opportunity to attend capacity building workshops and participate in demonstrational activities, regardless of race, religion, sexual orientation, or gender. Although the opportunity to actively participate in all the activities of the Project, it is finally a decision of each stakeholder to participate with no pressure.

The team was added with 7 new staff who were hired by the project owner and did not bring back old 4 staff due to the distance they lived from the project area. The existing staff trained the newly appointed staff and handed over the responsibilities prior to the new staff starting to work independently.

Special attention was given to under-represented groups (elder people, woman and children) are aware of the on-going training workshops and activities. The content and language of capacity training and demonstrational activities were adopted accordingly to each participating group. The Project considers developing and implementing workshops specifically designed for age classes groups to better transmit the information.

Capacity building is a relevant aspect in the implementation and operation of the project. In order to achieve the goals successfully the member of the community must be trained to have the skills and knowledge to effectively carry out the work.

50 community people have benefited from the training programs during this monitoring period.

2.3.15 Community Employment Opportunities (G3.10)

The Project has design employment opportunities to make sure underrepresented groups of local community have equal opportunities of finding employment in within the Project management and demonstrative activities.

Employment positions that require demanding physical work and a higher risk (i.e. on the ground monitoring of former logging trails, sampling biomass in forest plots, monitoring of Project Boundaries by boat to detect illegal logging activities, setting and revisiting biodiversity camera traps) were filled by persons between the age of 18 and 60 years and/or according to the experience and physical strength of a person, assessed on and individual basis.

Other employment opportunities that require less physical effort and by their nature are less risky set aside for elderly people or less physically apt people. Such activities can be but not limited to: social assessment surveying and monitoring, running demonstrative activities to other members of the local communities and to neighbor communities, actively participating in setting up demonstrative activities (i.e. home gardens, forest gardens, improved fallows, energy efficient cook stoves, etc.).

Around 14 people have been employed of which 4 are women for this monitoring period.

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

The local community has received clear and adequate information about the requirements of national and international regulations on workers" rights before entering in a contract agreement with Rio Anapu-Pacaja REDD project .

Rio Anapu-Pacaja REDD project makes sure to comply with the applicable national regulations on worker's rights. This is assured by yearly audits held by a third party that are identified in the census that was done. Such audits announced to the community and community leaders and they are encouraged to meet with audit entity. This way, local people can rest assure that all their complaints about worker's rights are known in a straightforward and clear way.

The following is a list of Brazil's all relevant laws and regulations covering worker's rights:

- The Brazilian Constitution, Chapter II-Social Rights, Articles 7- 11 which addressed: o Minimum wage o Normal working hours on Guidance on vacation and weekly leave on Guidance on maternity and paternity leave o Recognition of collective bargaining o Prohibition of discrimination.

- In addition to the Constitution, there are two additional decrees related to Brazilian labor laws. Consolidação das Leis do Trabalho (CLT): DECRETO-LEI N.o 5.452, DE 1o DE MAIO DE 1943 (Consolidate of Working Laws)35. This decree gives more clarification on: the Hourly, daily, weekly and monthly work hours of Employment of minors and women o Establishes a minimum wage of Worker safety and safe working environments of Defines penalties for non-compliance by employers establishes a judicial work-related process for addressing all worker related issues.

- Estatui normas reguladoras do trabalho rural: LEI No 5.889, DE 8 DE JUNHO DE 1973 (Establishes Regular Norms for Rural Workers)36. This is a complimentary law to the aforementioned 1943 decree because prior to 1973, rural workers did not have the same rights as urban workers. In 1973, this law was established to specify the equality between urban and rural workers, along with compensation for overtime.

Hence it is stated that the project complies with relevant horst country rules for this monitoring period as there have been no reported incidents to the contrary.

Brazil has more labor law legal cases than the rest of the world combined. Due to this the project has been focused to hire most of the staff as "autonomous contractors" to prevent a devastating lawsuit that is common:

- *Law 605/1949 - Repouso Semanal Remunerado (Paid Weekly Rest);*
- *Law 2.959/1956 - Contrato por Obra ou Serviço Certo (Contract for Work or Right Service);*
- *Law 3.030/1956 - Desconto por Fornecimento de Alimentação (Discount for Food Supply);*
- *Law 4.090/1962 - Gratificação de Natal;*
- *Law 4.749/1965 - 13º Salário*
- *Law 4.886/1965 - Representantes Comerciais Autônomos (Autonomous Business Representatives);*
- *Law 4.950-A/1966 - Remuneração de Profissionais (Engenharia, Química, Agron. e Veter.) (Remuneration of Professionals (Engineering, Chemistry, Agron. And Veter.);*
- *Law 5.859/1972 - Empregado Doméstico (Housekeeper);*
- *Law 5.889/1973 - Trabalho Rural (Rural Work);*
- *Law 6.019/1974 - Trabalho Temporário Urbano (Temporary Urban Work);*
- *Law 6.494/1977 - Estagiários (Trainees);*
- *Law 6.919/1981 - FGTS de Diretores (FGTS of Directors);*
- *Law 6.932/1981 - Médicos Residentes (Resident Doctors);*
- *Law 7.418/1985 - Vale-Transporte (Transportation vouchers);*
- *Law 8.036/1990 - Lei do FGTS (FGTS Law);*
- *Law 8.906/1994 - Advogados (Lawyers);*

- *Law 9.601/1998 - Banco de Horas e Contrato por Prazo Determinado (Bank of Hours and Contract for Term Determined);*
- *Law 10.101/2000 - Participação dos Trabalhadores nos Lucros ou Resultados (Workers' Participation in Profits or Results);*
- *Law 10.607/2002 - Declara Feriados Nacionais (National Holidays);*
- *Law 10.748/2003 - Programa Primeiro Emprego – PNPE (First Job Program);*
- *Law 10.820/2003 - Desconto de Prestações em Folha de Pagamento (Discount on Payroll Benefits);*

2.3.17 Occupational Safety Assessment (G3.12)

Project's activities do not hold risk besides those inherent to the day-to-day life in the forest. Project's activities do not require the use of heavy machinery or dangerous substances. Nevertheless, the Project management team has provided adequate protection equipment to employees working in forest monitoring activities. Also, monitoring staff are equipped with first aid kits. Protection equipment does include but is not be limited to:

Hard hat
Cap with the company's logo
Reflective/fluorescent security vest with the company's logo
Rubber boots
Gloves
Two-way radios
GPS
Camera
Field backpack
Camel pack
LED Flashlight
Whistle
Machete
First aid kid

Risks for each type of work are assessed and safety guidelines are developed help identifying and reducing such risks. Guidelines are written in clear and adequate language and distributed among workers. Additionally, workers receive safety instructions to make sure any doubts and suggestions are taken care of. During this period such training was provided to 11 people who have been employed of which 3 are women.

Figure 45: Survey Equipment

2.4 Management Capacity

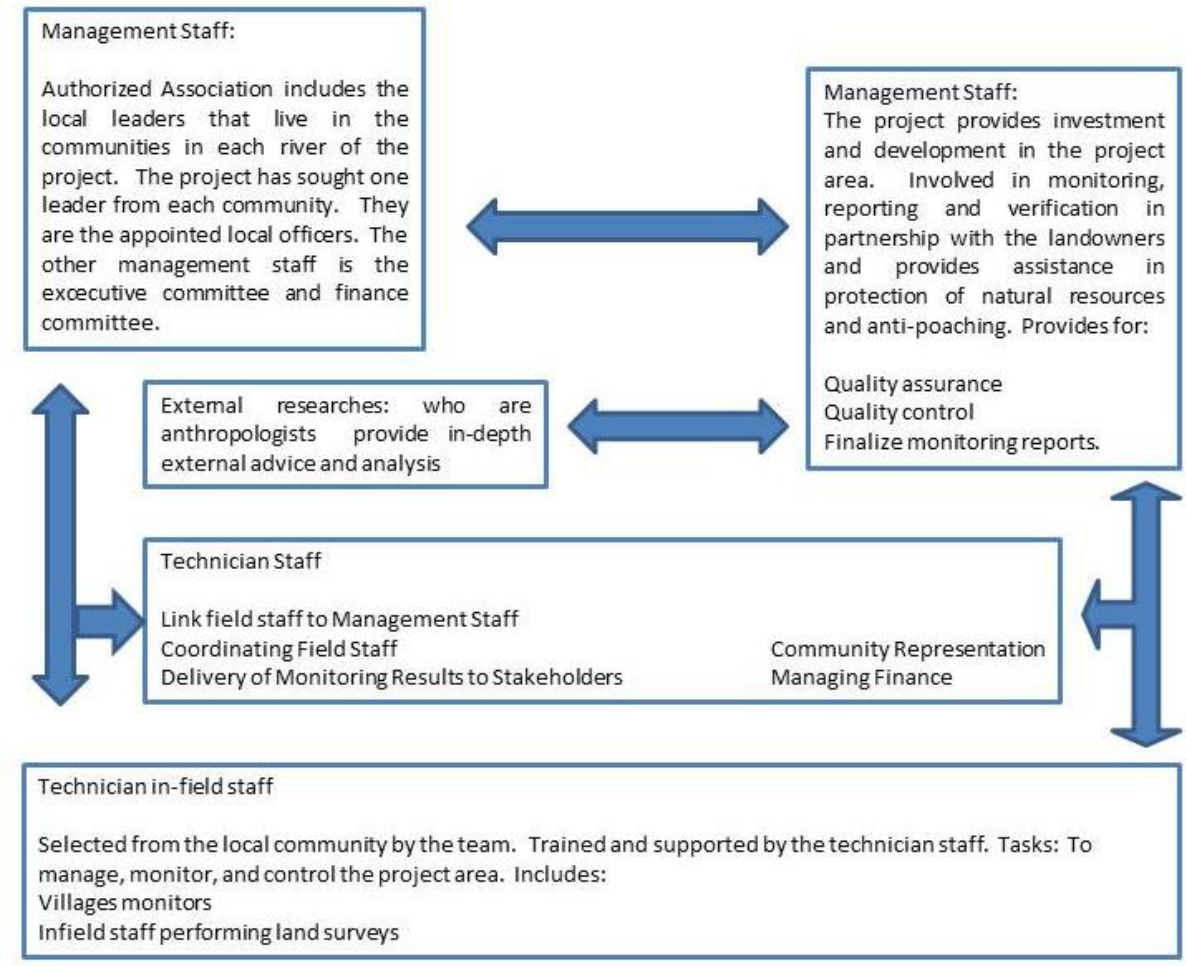
2.4.1 Project Governance Structures (G4.1)

The current governance structure of the project is composed of the project proponent and landowners:

Project Proponent: Brazil Agfor LLC

- Coordinate's owners of the land around the project.
- Represents landowners
- Sets conservation agreements with the owners
- Manages resources for implementation
- Hires / implements project activities
- Hires / implements the monitoring Project

Landowners
The land owners are linked to the project by the conservation agreements signed between each of them and the Project Proponent. Their participation in the project is completely voluntary, through free, prior and informed consent and through free commitments and the benefits expected. Management capacity is explained below;



2.4.2 Required Technical Skills (G4.2)

Project participants and their activities are summarized below; All project participants have consulted for, worked on or have been involved in a REDD market. All team members have experience of more than 10 years working in rural land. All team managers are trained to be able to handle the current situations. Each specialty field such as geography or law, the professionals have licenses for this work. The attorneys for the project are licensed with the property government law entities to be able to practice law.

• Knowledge of the region and social science / local community related skills like handcrafts.

• Experience in sustainable practices for local / rural development, conservation and management of biodiversity and ecosystem services.

• Knowledge in planning, execution and control of administrative and financial resources. Extensive experience and skills in managing resources from donors and co-operators.

• Experience in carbon markets, VCS and CCB standards.

• Experience in biodiversity monitoring, sampling methods of wildlife and ecosystem assessment using quality indicators.

• Extensive experience in working with the community and environmental education.

• Knowledge of the area and experience in field implementation of restoration activities, crop improvement, woodlots, silvo-pastoral systems, efficient stoves and solar power panels.

• Abilities to manage the geographical information system and databases of property owners, as well as to generate all required cartographic analysis.

2.4.3 Management Team Experience (G4.2)

Michael Greene – Project Coordinator and landowner. Michael is currently responsible for the general coordination of the project activities. He has a Bachelor's degree in Industrial Engineering from Kettering University in Michigan. He has lived in Brazil for 10 years, consulting related to complex real estate situations. Michael's specialty is the coordination of the program plots for the poor. This is a program to help each family gain title. He oversees an engineer and geomancer team of 4 people in the field and 2 people in front of computers, categorizing each family a and there their plots of land are located. He also directs the security boat patrols and is taking quotations from companies to build 30 security houses within the project area.

Professor David Vale - **Technical Director,** is currently responsible for coordinating, managing and implementing the social aspects of the project. David is professor of Geography at the Federal University in the state of Para. He has worked over the last 20 years in numerous projects involving land survey work, making him suitable for helping the Riverine people and traditional rural villagers gain survey and land tenure documents. While this work is taking place, a huge amount of face-time occurs between the riverine people and the technicians, allowing for strong relationships to be built and making these moments ideal for agroforestry lessons and eco-cook stove distribution.

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

Dr. Evelise da Cruz Pires Greene – Project Coordinator and is responsible for assisting in coordinating social activities. (Association de Ribeirinhos e Moradores de Portel, Para Ltda.)

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

The project is funded by the landowners. No outside investors are involved in the The Rio Anapu-Pacaja REDD Project.

The supporting documents of the financial health of both companies are classified as Commercially Sensitive Information and were shared with the audit team on a confidential basis.

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

As a collaborative effort, the Rio Anapu-Pacaja REDD project team is committed to upholding a high level of integrity and professionalism throughout all aspects of project design and implementation. We have a zero-tolerance attitude towards corruption and unethical behavior, and are not involved in, or complicit in, any form of corruption such as bribery, embezzlement, fraud, extortion, and collusion.

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

There is no commercially sensitive information in this Project document, itself. Supporting documents which include commercially sensitive information are not made publicly available include: the MOU; Contracts with Buyers and Service Providers; and documents related to project financials.

2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

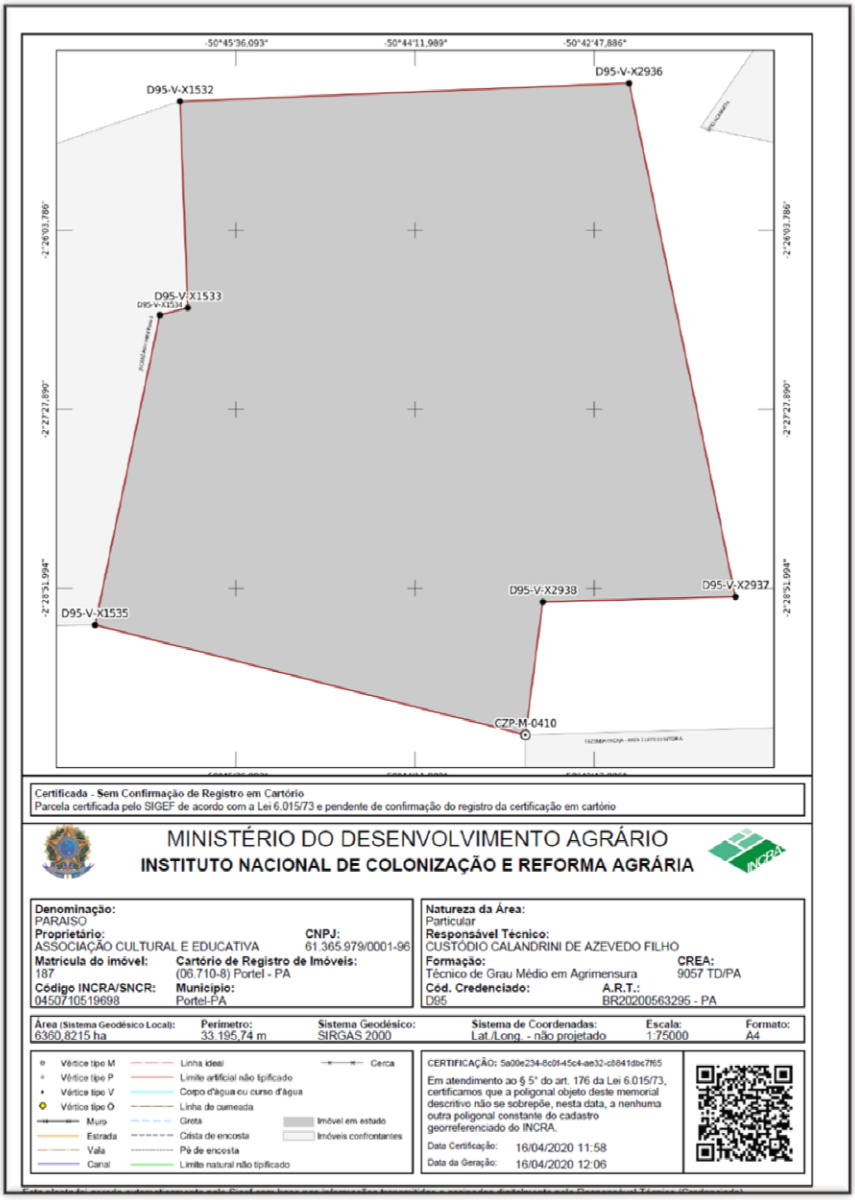
In Brazil over 3 million properties have no title, no registry. The basis of ownership is only the property tax receipt registered with the city where the property is located.

The Rio Anapu-Pacaja REDD Project has all possible documentation that is required for ownership, is mentioned below as follows;

1.) Freehold Title Deeds registered in the registry office (cartorio) of Portel, Para, Brazil.
2.) There are 36 different properties each with title deed in the registry office of Portel, Para
3.) Each property has taxes paid and an individual Tax ID number
4.) Each property has tax receipts available from 1990 to the present
5.) Each property has an INCRA Federal Land Agency related to land: Rural Code ID number
6.) Each property has the INCRA CCIR certificate
7.) Each property has the a INCRA Location Description map (called in Portuguese Memorial Discritiva – issued by INCRA the Federal land agency)
9.) Each property has the INCRA Survey registered with INCRA that was updated in 2019
10.) Each property has the Cadastro Ambiental Rural (Environmental Certificate)
11.) Each property has the name and date and index (indice) number for origination from the state.

The PROPERTIES in the project area have Certified Geo-Reference map with the FEDERAL Land Agency of INCRA. Only two properties don't have it, as listed below in section 2.5.6 explaining why they are not certified with the federal government.

Certificate 1: INCRA Certified Survey



2.5.2 Recognition of Property Rights (G5.1)

Name of the Law	Description	Project Compliance
Law number 4771, September 15th 1965 (D.0.U of September 16th 1965)	The Brazilian Forest code of 1965 – Brazilian Forest Code – provides for example: II – area of permanent preservation: protected area in the terms of article 20 and 30 of this law, covered or not by native vegetation, with the role of	All properties have legal reserve areas and APPs defined. In accordance with the CARs (Environment Rural Registry) at SEMA (Environment *State Institute)*

	protecting the water resources, landscape, geological stability, biodiversity, flux of genes of plants and animals, protect de soil and secure a good environment for the human population; III – Legal Reserve Areas: Area located in the property or "posse rural" excluding the areas of permanent preservation, for the sustainable use of the natural resources, conservation and restoration of the ecological process, biodiversity conservation and refugee and protection of native animals and plants; Art. 150 – It is prohibited under empirical form the exploration of primitive forest of the Amazon watershed, but only can be explored in accordance of technical management plans approved by act of Public authorities, to be issued in one year *term.*	
Normative Instruction number 003 of May 23th 2007 – Executive office of environment , science and technology - *SECTAM*	Regulatory of the Environmental Rural Registry -CAR in the state of Pará and providence of other requirements. Art 1 – establish criteria and procedures for implementation of the CAR – PA as an instrument for identification of the rural properties in the state of Pará that must be issued by SECTAM-PA in accordance with this Normative Instruction. Art 2 – It is necessary for all rural properties in the state of Pará to be registered in the CAR-PA, even the properties that have no production activity. Art 3 – The issuance of the CAR-PA, as toll for identification of the property was done only once for each property. It has a registry number with a sequential number. This number is in all licenses, authorizations, and other documents issued for the environmental regularization of the rural property. This registry number is linked to the land,	Development of CAR in all lands in the Project Area

	independent if the land is sold, transferred or taken possession by other person. Single paragraph – There are no concession of any license for the land that has no registry at CAR-PA. Art 4 – In the CAR-PA it is mentioned all the basic data of the rural property, Total area- AT, Area of permanent preservation – APP, legal reserve areas – ARL, and area of alternative use of the soil – AUAS , in addition the name and profession of the land owner, geographic coordinates and other information required by complementary laws	
Federal Decree number 5.975/2006	Art. 10 – Forest exploration and succession formations that require shallow harvest of the forest only are permitted under specific authorization for alternative land uses issued by SISNAMA. # 1o By alternative land use is understood any conversion of the forest to other land cover, such as settlements, agriculture, pasture, industry, energy generation, mining and transportation.	All properties have legal reserve areas and APPs defined. In accordance with the CARs (Environment Rural Registry) at SEMA (Environment State Institute)

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

Free prior and informed consent (FPIC) is the principle that a community has the right to give or withhold its consent to proposed projects that may affect the lands they customarily own, occupy or otherwise use.

The project proposes conduct a process of FPIC to continue the informative process initiated with the PRA in order to promote a reasonable understanding about the project is and their activities, an equitable participation in decision-making processes and the involvement of the population in the implementation of the proposed project.

In this regard, we consider the following elements conductors for this process
Avoiding the exercise of coercion, intimidation or manipulation (FREE);

- *Consent is required in advance to any authorization or beginning of the activities (PRIOR);*

- *Providing information that covers the following information:*

a. The nature, importance, rhythm, reversibility and approach of the project and the proposed activities;

b. The purpose of the project and its activities;

c. The duration of the project;

d. The area where the project and its activities were developed, as well as the localities involved;

e. The results of the initial diagnosis of the economic, social, cultural and environmental situation, including possible risks and benefits;

f. The institutions and staff that intervene in the implementation project, and

g. The procedures the project may include (claims resolution mechanism);

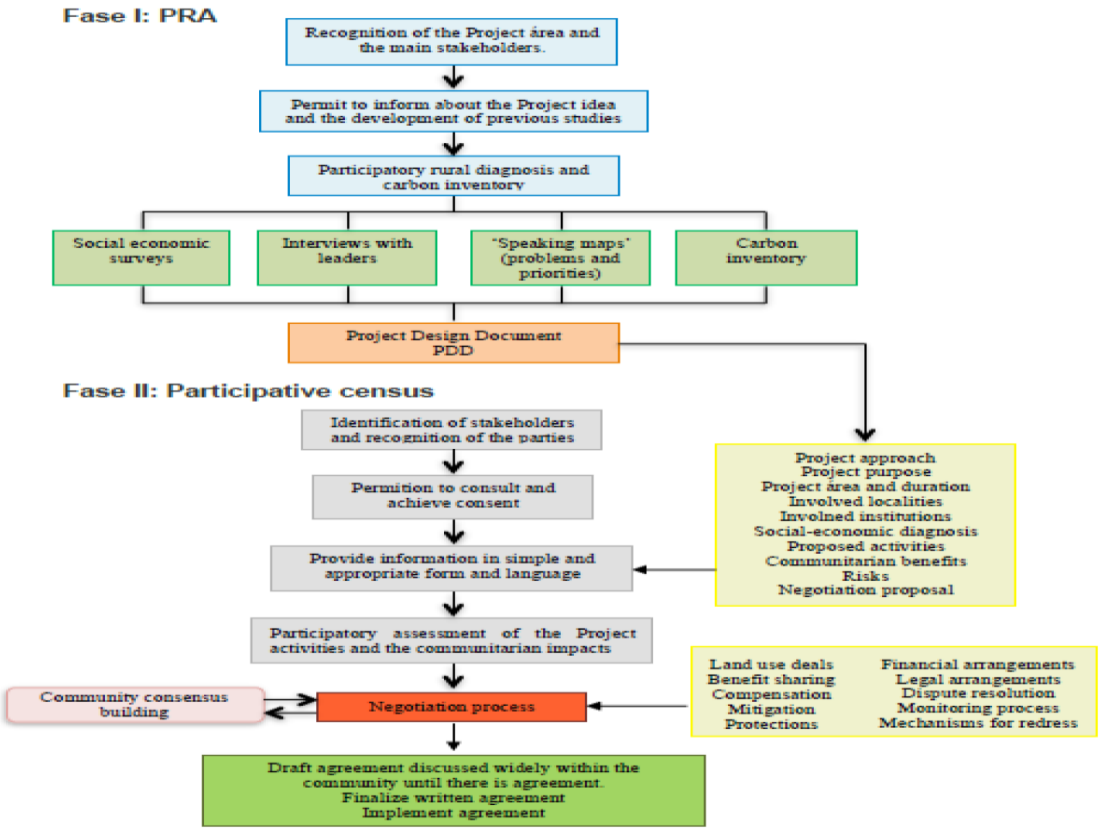
- *The consultation must be carried out through the establishment of a frank dialogue within an atmosphere of mutual respect, good faith and full and equitable participation (CONSENT);*

- *The process must include genre perspective. Women participation is essential, as well as the involvement of children, young people and vulnerable groups.*

It is important to mention that the definite protocol for FPIC was produced and developed after experience from working on other REDD projects in the region. This experience allowed a duplication of the way that interviews were conducted with the local population.

The following flowchart intends to represent the protocol to be followed in order to comply and ensure the FPIC standards and criteria are implemented.

Figure 46: Flowchart for FPIC



2.5.4 Property Rights Protection (G5.3)

Our project activities do not lead to involuntary removal or relocation of property rights holders from their lands or territories and does not force rights holders to relocate activities important to their culture or livelihood. If in the future any relocation of activities needs to be undertaken, it will take place with a written agreement that demonstrates that the agreement was made with the free, prior, and informed consent of those concerned and includes provisions for just and fair compensation. However technically under Brazilian law the only way to remove a property owner is by buying their property from that person in an agreement – in a real estate transaction.

All residents even land grabbers are permitted to keep the land they have taken up to 100 hectares.

However land grabbing or other agro-business driven sources of deforestation, will not and have not been tolerated. These cases are aggressively pursued within the legal system of Brazil by the projects landowners.

2.5.5 Illegal Activity Identification (G5.4)

Illegal activities in the area are constituted by unplanned timber extraction. Such logging operations are evidenced by the proliferation of pioneer roads as presented in Map 12. It is known from literature that extractive operations will take advantage from the fact that local farmers don't have land titles to displace them or to gain access to the forest resources nearby villages (Araujo, Bonjean et al. 2009). At the same time, illegal logging operations thrive whenever there are forested areas that seem to be under no-use and where the presence of the landowner is not made evident (Margulis 2004).

The Project has trained local community members to work as monitoring staff in the Project Area and the LMA. This is the main activity to identify, prevent and avoid illegal activities from taking place in the Project Area.

As support measures against illegal activities, the Project did provide land titles against conservation results to households living within the Project LMA Boundaries and did provide support to neighboring communities to achieve land tenure on unused public lands.

Stakeholders in neighboring communities were encouraged to report encroachers and illegal loggers trying to get into nearby forests. The Project did proceed to make the respective denounce to local authorities as just like the situation is occurring in the Project Area. Through this mechanism the project were generating positive leakage.

2.5.6 Ongoing Disputes (G5.5)

There is an ongoing dispute in the project area.

Dispute:

The project area has a dispute with the government. The government re-zoned part of the area from private property, to private property deemed in need of settling. In Portuguese this is known as: "assentamentos" or "settlement areas. The project has 15,936 hectares which is affected by a settlement area, but it is not invaded by any individual or group.

The government of President Bolsanaro has canceled the settlement area, however the settlement area still shows up in the system. Upon the moment that the settlement area is removed from the government system the following lands surveys will be registered and will be certirfied with INCRA: s cn

The titles that are affected are: Title Matricula 278 and INCRA CCIR Rural Code number 045.071.051.829-2 as well as Matricula 166 a total of 4,356 hectares for this property is affected by this dispute. The other land affected is Title Matricula 166 which has Rural Code Number: 045.071.051-900-00 a total of 11,580 hectares is affected from these titles which have a total of 21,780 hectares.

The project does not foresee a control issue of these lands due to the project having possession of the area.

2.5.7 National and Local Laws (G5.6)

Brazil is one of the signatories of Kyoto protocol. The project is in compliance with this regulatory framework, because in the AFOLU scope, conservation is one of several mechanisms by which GHG emissions are expected to be reduced.

Compliance with Laws, Statutes and other significant regulatory instances for the Rio Anapu REDD+ Project is related to the forest management activity. In the State of Pará, the activities of the enterprise are being licensed by the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA), thus having to apply federal legislation. Subordinated to the federal legislation, the legislation at the state level applies.

Regarding REDD+ activities, there is nothing establishing or regulating officially any legislation related to this subject up to the present moment. One can note a history of initiatives despite the construction and negotiation of this concept through agreements and meetings in the United Nations Framework Convention on Climate Change (UNFCCC).

Nationally, the most significant effort to date was the submission of Bill No. 195/2011, which "establishes the national system to reduce emissions from deforestation and degradation, conservation, sustainable forest management, maintenance and increase of carbon stocks (REDD+), and other provisions", which are still in progress.

In addition, in December 2015, the National Strategy for REDD+ of Brazil (ENREDD+) was instituted by MMA Ordinance No. 370, a document that formalizes to Brazilian society and the UNFCCC signatory countries how the Brazilian government has structured its efforts and aims to improve them by 2020, contributing to climate change mitigation by controlling deforestation and forest degradation, promoting forest recovery and promoting sustainable development.

Below are the main relevant laws and regulations at the federal and state levels listed and detailed. In addition, a brief review of international climate agreements has been conducted that has led to the creation and development of REDD+ initiatives around the world.

• Law 12,651 of 05/25/2012: It provides for the protection of native vegetation; amending Laws No. 6938, of August 31, 1981, Law No. 9393, of December 19, 1996, and Law No.11428 of December 22, 2006; revoking Laws No. 4771, of September 15, 1965, and No. 7754 of April 14 1989, and Provisional Measure No. 2166-67, of August 24, 2001; and other measures.

• Law No. 12187 of 12/29/2009: It established the National Policy on Climate Change (PNMC) and provides other measures.

• Provisional Measure No. 571, of 05/25/2012: It amends Law 12651 of May 25, 2012, which provides for protection of native vegetation; amending Laws No. 6938, of August 31, 1981, Law No. 9393, of December 19, 1996, and Law No.11428 of December 22, 2006; revoking Laws No. 4771, of September 15, 1965, and No. 7754 of April 14 1989, and Provisional Measure No. 2166-67, of August 24, 2001.

• Law No. 58,054 of 3/23/1966: It promulgates the Convention for the protection of flora, fauna and scenic beauties of the American countries.

• Decree No. 96944 of 10/12/1988: It created the Program in Défense of the Ecosystem Complex of the Legal Amazon, and other measures.
• Decree No. 2661 of 7/8/1998: It regulates the sole paragraph of art. 27 of Law 4.771 of September 15, 1965 (Forest Code), by establishing precautionary standards for activities involving fire in agropastoral and forestry practices, and other measures.

• Decree No. 2959 of 2/10/1999: It provides for measures to be implemented in the Legal Amazon, for monitoring, prevention, environmental education, and forest fire fighting.

• Decree No. 5975 of 11/30/2006: It regulates art. 12, final part, 15, 16, 19, 20 and 21 of Law 4771 of September 15, 1965, art. 4, item III, of Law 6938 of August 31, 1981, art. 2 of Law No. 10650, of April 16, 2003, amends and adds provisions to Decrees 6514/08 and 3420/00, and other provisions.

• Decree No. 7390 of 12/9/2010: Regulates articles 6, 11 and 12 of Law 12187 of December 29, 2009, establishing the National Policy on Climate Change (PNMC), and other measures.

• Decree-Law No. 5452 of 05/01/1943: Approves Labor Laws Consolidation. CONAMA Resolution No. 16 of 12/07/1989: It establishes the Integrated Program for Assessment and Environmental Control of the Legal Amazon.

• CONAMA Resolution No. 378 of 10/19/2006: It defines undertakings potentially responsible for national or regional environmental impact for purposes of item III, paragraph 1, art. 19 of Law 4771 of September 15, 1965, and other measures.

• CONAMA Resolution No. 379 of 10/19/2006: It creates and regulates the data system and on forest management under the National Environmental System - SISNAMA.

• CONAMA Administrative Rule No. 218 of 5/4/1989: It provides for felling and exploration of native forests and successors forest formations of the Atlantic Forest, and other measures.

• IBAMA Administrative Rule No. 37 of 4/3/1992: Recognizes as Official List of Brazilian Endangered Flora Species the list found in the Administrative Rule.

• Ministry of Environment Administrative Rule No. 103 of 4/5/2006: It provides for the implementation of the Document of Forest Origin - DOF, and other measures.

• Ministry of Environment Administrative Rule No. 253 of 8/18/2006: It establishes, from 1 September 2006 on, under the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), the Document of Forest Origin (DOF), replacing the Authorization for Transportation of Forest Products (ATPFs).

• Administrative Rule 1896 of 09/12/2013: It amends Regulatory Norm No. 31. Ministry of Environment Administrative Rule No. 1 of 9/5/1996: It provides for Obligatory Reforestation and Forest Integrated Plan.

• Ministry of Environment Administrative Rule No. 07 of 4/27/1999: It provides for the authorization for deforestation in the Legal Amazon States.

• Ministry of Environment Administrative Rule No. 02 of 5/10/2001: It provides for the economic exploration of forests in rural properties located in the Legal Amazon, including Legal Reserve areas and with exception of permanent preservation established in current legislation, which will be carried out through multiple use sustainable forest management practices.

• IBAMA Normative Instruction No. 30 of 12/31/2002: It informs the geometric volume calculation of standing trees, applying the volume equation that specifies it, and other measures.

• IBAMA Normative Instruction No. 112 of 08/21/2006: It regulates the Document of Forest Origin - DOF, established by Ordinance Ministry of Environment Administrative Rule .253 of August 18, 2006. (Amended by IBAMA Normative Instruction No. 134 of November 22, 2006)

• Ministry of Environment Administrative Rule No. 06 of 12/15/2006: It provides for the reforestation and consumption of forest raw materials, and other measures.

• IBAMA Normative Instruction No. 178 of 6/23/2008: It defines guidelines and procedures, provided by IBAMA, for consideration and approval on the issue of forest suppression authorizations and other forms of native vegetation in an area greater than two thousand hectares in rural properties located in the Legal Amazon, and a thousand hectares in rural properties located in the remaining regions of the country.

• Regulatory Norm No. 31 of 03/03/2005: Approves the Regulatory Norm for Safety and Health at Work in Agriculture, Cattle Raising, Forestry, Forest Exploration, and Aquafarming.

2.5.8 Approvals (G5.7)

The Project is developed on privately owned land and complies with all the required laws and regulations regarding forest protection in private lands. Given the fact that in Brazil there are not regulations regarding REDD projects and the fact that the Project will not undertake extractive activities but will preserve 100% of its Project Area, permits are not required from municipal, state or federal authorities.

There are no current approval processes in Brazil for REDD carbon credit projects.

However the project is 100% on private property, has no indigenous or traditional people overlapping the project area, thus as Brazil permits, Brazilians are allowed to do any project on their land.

2.5.9 Project Ownership (G5.8)

The project is set up by the project land owners. As listed in the title deeds, the owners of the land have the right to set up the project.

The owners of the land have signed with the Project Proponent various contracts allowing and giving permission to complete the project.

2.5.10 Management of Double Counting Risk (G5.9)

To date, the State of Pará, Brazil does not have a defined State REDD+ Strategy or any Forum for Climate Change registry, that would be the main organization to lead discussions on the subject, is currently inactive. In addition, the State Government does not provide formal procedures for registering or recognizing private voluntary projects under any jurisdiction REDD+ project. Also, the project does not intend to get the project registered any other carbon market registry. Hence, it is concluded that there will be no issues of double counting of carbon credits generated from the project.

If there is a jurisdictional program on a national scale, the project will make appropriate arrangements so that the carbon credits are not sold twice.

2.5.11 Emissions Trading Programs and Other Binding Limits

The project will not sign up to other emissions trading programs and is not restricted by other binding limits. Brazil does not have any emissions trading programs.

2.5.12 Other Forms of Environmental Credit

The project is not involved in any other form of environmental credit.

2.5.13 Participation under Other GHG Programs

The project is not involved in other GHG programs.

2.5.14 Projects Rejected by Other GHG Programs

The project has not submitted to any other GHG program

2.5.15 Double Counting (G5.9)

The carbon credits generated from the project will be registered under the Verified Carbon Standard and sold under that mechanism. Credits from the project will not be registered or sold under any current regulatory scheme, as these schemes currently do not allow REDD credits to be sold. If and when the credits become eligible under a regulatory scheme, the proper procedures will be taken to ensure that credits are not sold twice

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

The project has been developed using the guidelines in VCS VM0015 REDD Methodology: Methodology for unplanned deforestation V1.1.
As part of the first validation of the project has followed the following documents and tools:

- VCS Tool VT001 Version 3.0 – Tool for demonstration and Assessment of Additionality in AFOLU Project Activities.
- *VCS AFOLU Non-Permanence Risk Tool Version 3.1*

3.1.2 Applicability of Methodology

Table 7 indicates the applicability conditions to the VM0015 methodology and explains how the Project meets each criterion.

Applicability Conditions	Project Compliance to the methodology
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 activities in the baseline are unplanned timber logging and grazing activities.
Project activities may include one or a combination of the eligible categories defined in the description of the scope of the methodology	The main Project activity is to protect the forest. As a secondary activity it is envisioned controlled logging activities to provide timber resources to local settlers.

The Project Area can include different types of forest, such as, but not limited to, old- growth forest, degraded forest, secondary forests, planted forests and agro-forestry systems meeting the definition of "forest".	The Project Area is more than 90% Dense Ombrofile Forest. Forests in the Project Area are primary, secondary and degraded forests all of them in compliance with Brazil's definition of forest14.
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.	Landsat TM images from the year 2004 to 2014 before the Project start date have been analyzed to identify only forested areas according to Brazil's definition of forest.
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 doesn't include forested wetlands.

3.1.3 Project Boundary

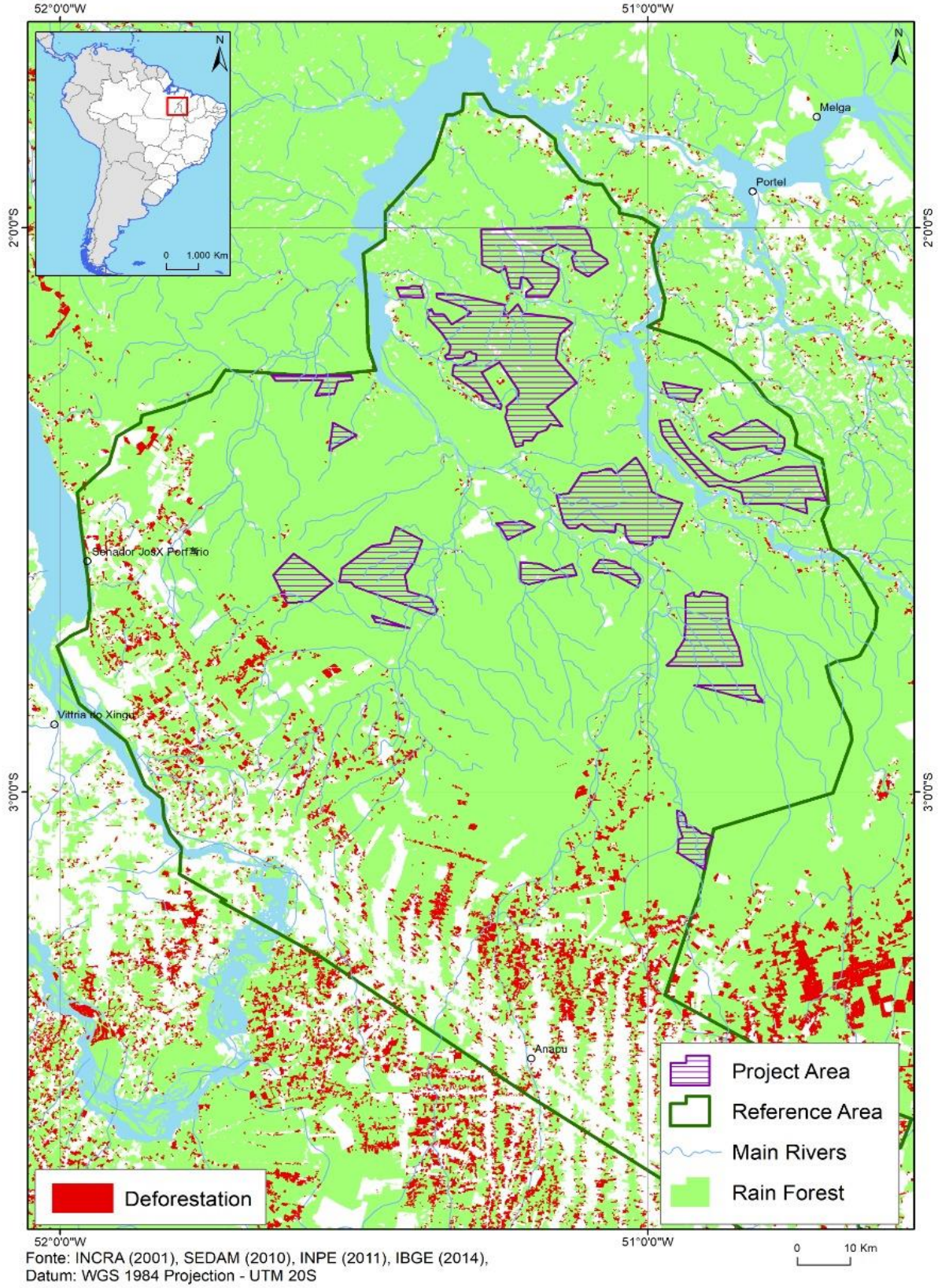
The physical locations where project activities take place are presented in the below figures: project boundary and leakage management areas.

Step 1.1 of VM0015 Project Spatial Boundaries

1.1.1 - Region of Reference

Region of Reference: The reference region is the spatial boundary where rates, agents, vectors, and patterns of land use and land cover are analyzed, projected for the future, and monitored. The Project area, leakage belt and leak management area are contained in the reference region.

Figure 47. Location of the Reference Region, Project Area, Leakage belt, and Leak Management Area



Fonte: INCRA (2001), SEDAM (2010), INPE (2011), IBGE (2014),
Datum: WGS 1984 Projection - UTM 20S

Reference Region:

Area: 1,991,227 Ha
Historical deforestation rate: 1.91%
Vegetation: Dense Ombrofile Forest
Elevation range: 0-100m
Average slope: 6
Annual average precipitation: 2181mm
Agents and drivers of deforestation: main agents of deforestation are cattle ranchers (preceded by illegal loggers and squatters) followed by small-scale farmers (Riverine and traditional rural villagers).
Land Tenure: both public and private lands
Law enforcement on land tenure rights: weak.

In defining the spatial boundary of the reference region, environmental characteristics (river basin boundaries), deforestation direction vector and land tenure situation were considered. The boundary of the reference region followed the guidelines described on page 17 of the VM0015 methodology, with the final area within the range suggested by footnote 05 (page 18 of methodology VM0015). The reference region may include one or several discrete areas. It must be larger than the project area and include the project area.

The characteristics of the reference region meet the similarity requirements with the Project area determined by the methodology VM0015 (presented on pages 22 and 23 of VM0015), presenting the following characteristics:

1. Deforestation agents and vectors - improved infrastructure (such as roads, railroads, bridges, hydroelectric reservoirs, etc.) is expected to develop near the project area, new industries have been planned already in and around the project area where impact on forest cover was similar to the one expected from the old improved infrastructure in the project area.

2. Landscape configuration and ecological conditions - these are uniform throughout the RRD. Although some areas may present slight variations in slope, elevation and precipitation fall within the same range in all the areas of the RRD. Vegetation is mostly Ombrophilous Forest with evidence of agricultural plots no further than 3Km from navigable rivers due to cassava crops implemented by local population. The RRD complies with the requirements of the VM0015 methodology in terms of representativeness of the characteristics found in the PA by satisfying all the four-landscape configuration and ecological conditions.

3. Socioeconomic and cultural conditions - The legal status of the land (private) is a unique patch of land present in the most deforested and degraded lands as compared in the baseline case within the project area of the reference region. The legal status of the private land is not biasing with the baseline of the project area. Table 8 presents the carbon pools used to account for carbon stocks for the Project.

Below mentioned figure shows the Forest typologies identified in the Reference Region. The classes of vegetation type found in the project area occupied 100% of the Reference Region. Based on these results, it is believed that the requirement that at least 90% of the project area have forest classes found in at least 90% of the reference region is met.

Figure 48. Map of the forest types in the reference region

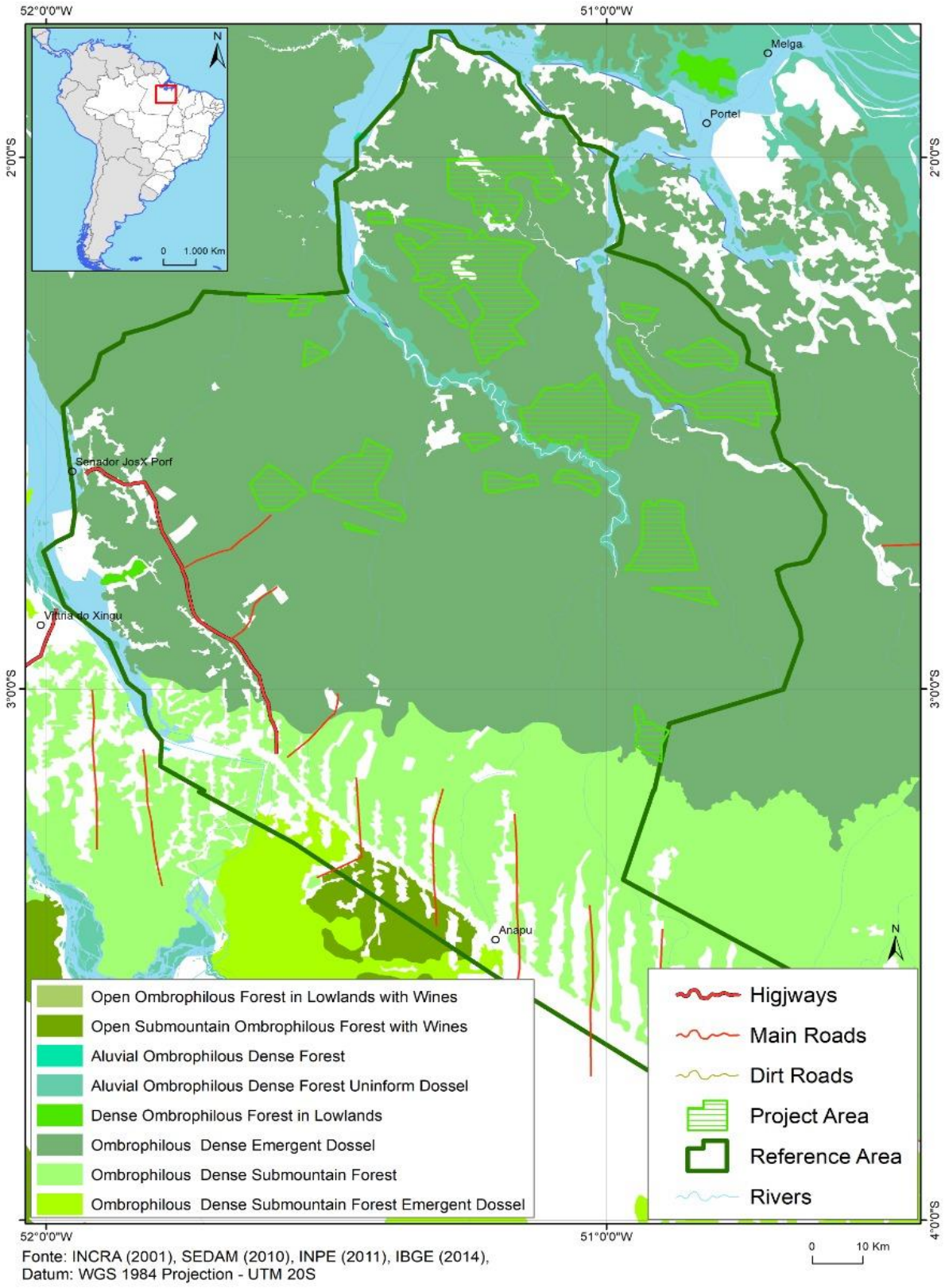


Table 8: Main forest typologies identified in the Reference Region of the Project

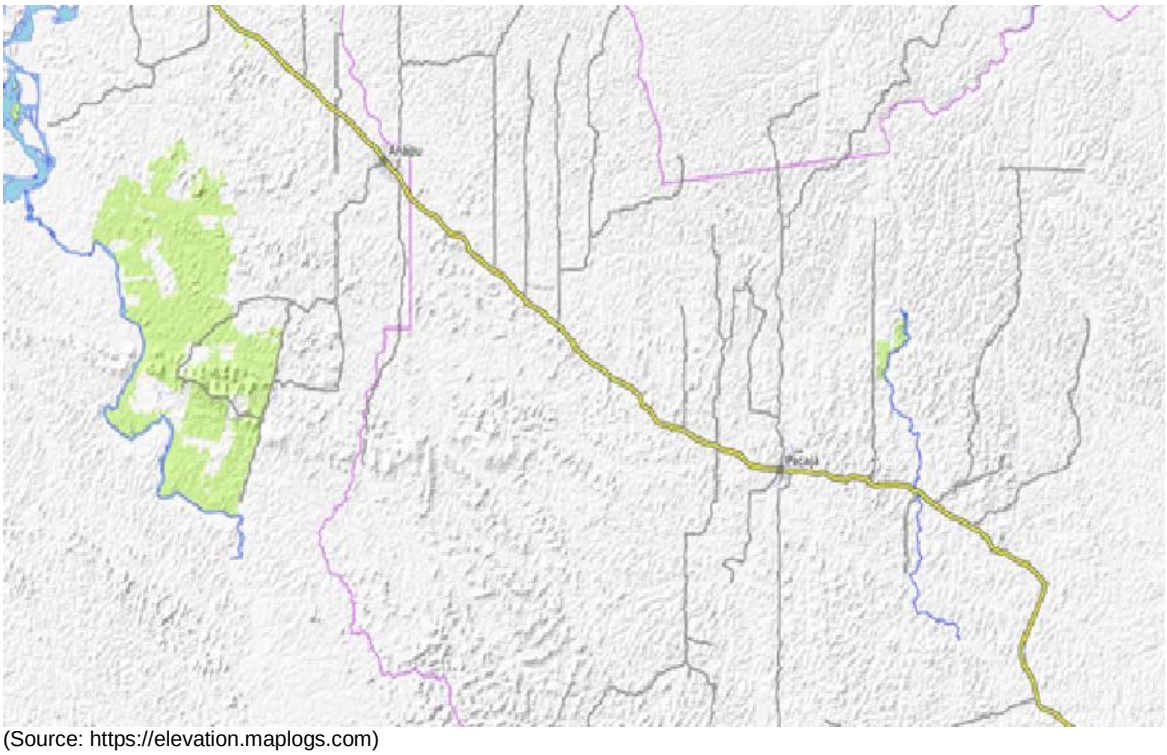
Class of vegetation	**Reference region**			
	Area (Ha)	**% of Total**	**% Cumulative**	**Rank**
Emergent Canopy Lowland Dense Ombrophilous Forest	577,832	29	29	1
Non-forest classes	378974	19	48	2
Submontane Open Ombrophilous Forest with Vines	261742	13	61	3
Emergent Canopy Submontane Dense Ombrophilous Forest	225659	11	72	4
Uniform Canopy Submontane Dense Ombrophilous Forest	189031	10	82	5
Pioneering Formations with fluvial and / or lacustrine influence - herbaceous without palms	121927	6	88	6
Lowland Dense Ombrophilous Forest	119271	6	94	7
Submontane Dense Ombrophilous Forest	62841	3	97	8
Uniforme Canopy Alluvial Dense Ombrophilous Forest	53018	3	100	9
Alluvial Dense Ombrophilous Forest	932	0	100	10
Total	19,91,227	100%		

Table 9: Main Forest typologies identified in the Project Area of the Project

Class of vegetation	**Project Area**			
	Area (Ha)	**% of Total**	**% Cumulative**	**Rank**
Emergent Canopy Lowland Dense Ombrophilous Forest	60827	37	37	1
Non-forest classes	49536	30	67	2
Submontane Open Ombrophilous Forest with Vines	27927	17	84	3
Emergent Canopy Submontane Dense Ombrophilous Forest	13071	8	92	4
Uniform Canopy Submontane Dense Ombrophilous Forest	7494	5	97	5
Pioneering Formations with fluvial and / or lacustrine influence - herbaceous without palms	4279	2	99	6
Lowland Dense Ombrophilous Forest	1424	1	100	7
Submontane Dense Ombrophilous Forest	906	0	100	8
Uniforme Canopy Alluvial Dense Ombrophilous Forest	174	0	100	9
Alluvial Dense Ombrophilous Forest	69	0	100	10
Total	165,707	100%		

Elevation: The dimensions below 350 m cover 90% of the Reference Region. About 89% of the Project Area is with dimensions lower than 350 m which is shown in the below mentioned figure 24.

Figure 49. Map of the elevation in the reference region



(Source: https://elevation.maplogs.com)

Table 10: Elevation (class of 50 meters) in the Reference Region and Project Area of the Project

Elevation (class in meters)		**Reference Region**			**Project Area**		
Min	**Max**	**AREA (ha)**	**% of Total (ha)**	**% Cumulative**	**AREA (ha)**	**% of Total (ha)**	**% Cumulative**
0	0	8320	0	0	0	0	0
1	50	635932	32	32	22201	13	13
51	100	494892	25	57	45104	28	41
101	150	305672	15	72	30987	19	60
151	200	278452	14	86	15605	9	69
201	250	110969	6	92	10593	6	75
251	300	63028	3	95	8269	5	80

301	350	32105	2	97	6984	4	84
351	400	21942	1	98	6960	4	88
401	450	18042	1	99	7170	4	92
451	500	10428	1	100	4896	3	95
501	550	9320	0	100	2934	2	97
551	600	1904	0	100	1430	1	98
601	650	132	0	100	2490	2	100
651	700	89	0	100	84	0	100
Total (ha)		1,991,227	100%		165,707	100%	

Project Boundary:

Area: 182,210
Includes both the Leakage Management Area (LMA) and the Project Area (PA) and Social Outreach Area where the team goes to do social work. It is a much larger area, as the project's goal is to bring stability to the region.

1.1.2 Project Area

Area: 165,707 hectares
Vegetation: 100% forested Dense Ombrofile Forest
Human Density: No humans
Land Tenure: The Private Property placed into the project
Land tenure rights and law enforcement: Titled property recognized on the Federal level, but weak local enforcement of private property land rights.

1.1.3 Leakage belt

The leakage belt was defined using the mobility approach (option II available in VCS Methodology VM0015). This option was selected because there are no data or studies in the Reference Region that prove that "economic gains" is a vector that represents more than 80% of deforestation observed in the historical reference period. Analyses carried out with data from the Terraclass Project (INPE and EMBRAPA, 2012) have demonstrated that more than 40% of the deforested area in the Reference Region is not converted to productive uses, remaining as capoeiras or secondary vegetation. According to the socioeconomic study carried out in this project, deforestation is the result of a chain of actions related mainly to land insecurity and lack of command-and-control actions of state and municipal institutions (Ecoporé, 2015).

1.1.4 Leakage Management area

Area: 16,503 hectares
Vegetation: Mix between dense ombrofile forest, and riverine cassava plantations
Land Tenure: Small land grabber claims of less than 1000 hectares ontop of public land and riverine and traditional rural village plots which the project has already provided the Cadastrol Ambiental Rural for 50 of these plots. With the program to provide the Cadastrol Ambiental for the remaining area.
Law enforcement on land tenure rights: weak.
Project Goal: In the LMA bring stability here by helping the riverine clarify land rights will greatly bring stability to the area around the project.

Table 11: Carbon pools included/excluded (Refer to Table 3 - VM0015)

Carbon pools	**Included / TBD/ Excluded**	**Justification / Explanation of choice**
Above-ground	Included	Carbon stock change in this pool is always significant
Below-ground	Included	Included to account for all the trees biomass.
Dead wood	Excluded	This pool is less present in the baseline scenario than in the Project scenario, thus is conservatively excluded.
Harvested wood products	Excluded	This pool didn't pass the 5% significance test.
Litter	Included	According to the VM0015 methodology (version 1.1) it can be included.
Soil organic carbon	Excluded	Not to be measure when forest is converted to pastures in the baseline scenario according to VCS VM0015 methodology.

Table 12: Gas inclusion or exclusion

Gas		Included?	Justification/Explanation
Baseline	CO_2	Excluded	Registered as changes in carbon stocks
	CH_4	Excluded	Considered insignificant, according to VCS Program updates, on May 24, 2010
	N_2O	Excluded	Considered insignificant, according to VCS Program updates, on May 24, 2010
Livestock Activities	CO_2	Excluded	Not a significant source
	CH_4	Excluded	The project does not include livestock activities, so it is conservative to exclude such emissions once they are present in the baseline scenario
	N_2O	Excluded	The project does not include livestock activities, so it is conservative to exclude such emissions once they are present in the baseline scenario

Step 1.2 of VM0015 – Temporal Boundaries

1.2.1: Starting date and end date of historical reference period

The historical period of this REDD+ Project is limited to the years 2000 to 2014. These dates were defined mainly considering the data availability of PRODES Project, used to generate land cover maps and meet the requirements of methodology VM0015 (Figure 25) Land-use and Land-cover change map from 2000 to 2014;

1.2.2: starting date of the project crediting period of the AUD project activity

The start date of the crediting period is 01/01/2016 to 31/12/2045 and deforestation of the baseline scenario was modelled until the year 2045 (+30 years);

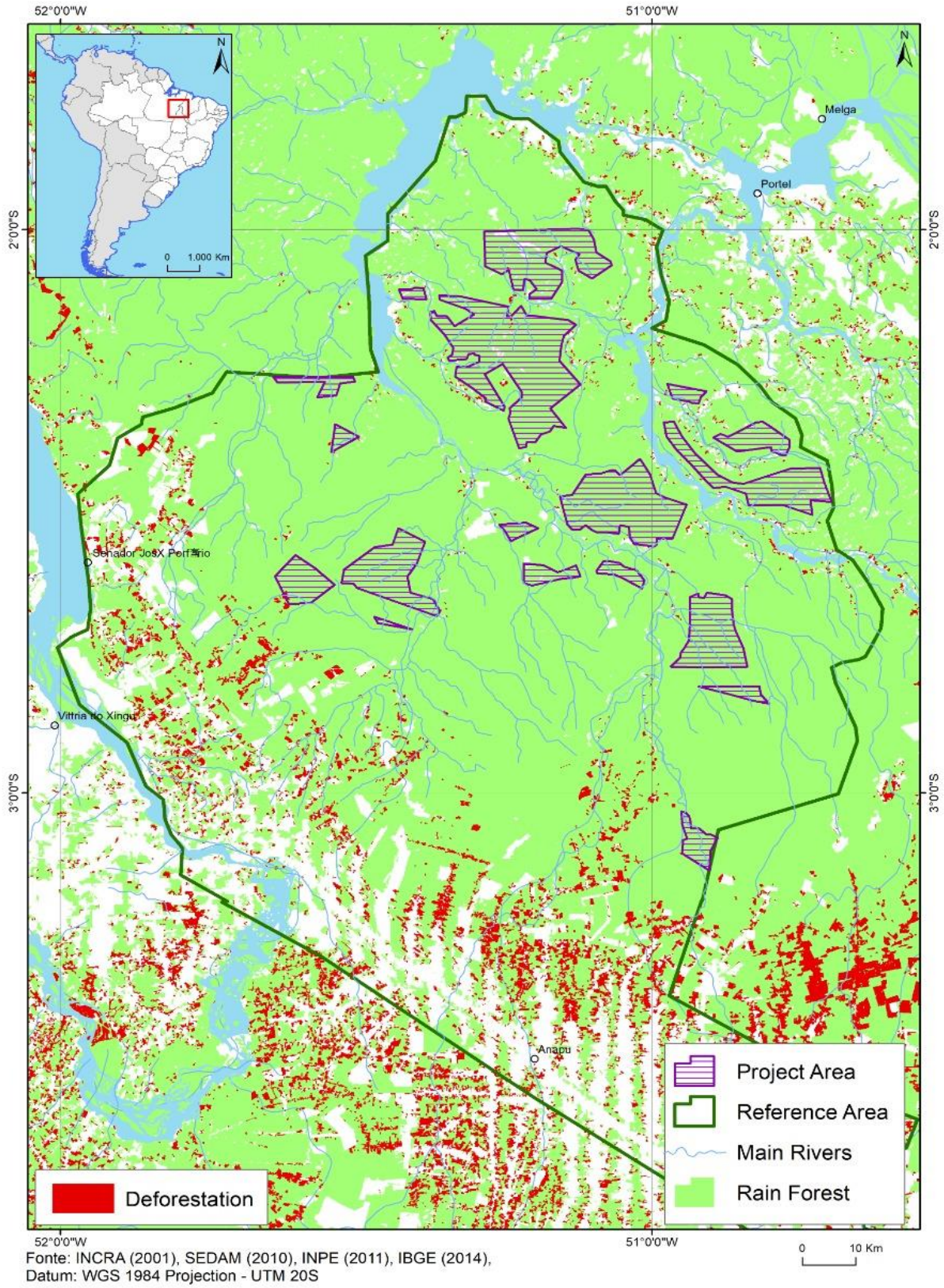
1.2.3: starting date and the end date of the first fixed baseline period

The fixed baseline period is 10 years, as determined by methodology VM0015 (page 30). The baseline scenario will be reassessed in the year 2026;

1.2.4: Monitoring period

The monitoring period for land use and change is one year, starting from the year 2015

Figure 50: Land-use and Land-cover change map from 2000 to 2014



Fonte: INCRA (2001), SEDAM (2010), INPE (2011), IBGE (2014),
Datum: WGS 1984 Projection - UTM 20S

3.1.4 Baseline Scenario

The baseline scenario identifies two deforestation processes happening simultaneously in the RRD, related by a common but non-exclusive chain of events. Regardless of the process, eventually the most profitable final land-use is the one that will prevail.

Therefore, in the RRD there are two well-defined fronts of deforestation that are linked by a common dynamic, a Pioneer and a Consolidated Frontiers.

On one side, there is a Pioneer Frontier where Riverines and traditional rural villagers live alongside the shores of primary and secondary rivers within the LMA. At the same time, squatters and illegal loggers encroach unprotected dense forests building pioneer roads from secondary rivers, away from primary rivers and out of sight of law enforcers and legal landowners. On the other side, there is a Consolidated Frontier, close to main roads like the Transamazonica highway (BR-230) and where deforestation is already wide spread. Here small and medium size cattle ranchers expand secondary and tertiary roads, extract valuable timber species17 and then deforest through slash and burn. In this region the non-taken lands have been exhausted, making the 7 large forest landowners just to the north of this region as prime target by these small and medium size cattle farmers.

Pioneer Frontier

From our Social Assessment we know that riverine and traditional rural villagers have as main economic activity small-scale cassava agriculture to produce and sale farinha. Riverine and traditional rural villagers slash young trees in abandoned fallows, take the cut timber and then apply fire to clear the land and have it ready to plant cassava. Should be remarked that from our study we know riverine won't set cassava fields any further than 3Km from the river shores. At the same time, riverine extract timber as a secondary economic activity. Although it is a secondary economic activity, timber extraction provides higher revenues that are used to pay for education and health care. From our Social Assessment study, we know a household extracts between one or two tress per year.

Simultaneously, there are invaders (Squatters/ land grabbers), illegal selective loggers and cattle ranchers. These three agents form part of a single deforestation process. Squatters/land grabbers and illegal selective loggers conduct their activities in what is known as the "pioneer frontier" which is the area far from developed roads, deep into the forest. They have a low opportunity cost and they clear forested areas not only for the timber but also for the expectation of selling such land in the future (after getting some sort of land possession right, the same type of right the project pays for the riverine and traditional rural villagers to gain). Usually illegal selective loggers share the land with small and medium scale cattle ranchers, who start growing pasture underneath the degraded forest. After a couple of years of logging, ranchers will buy the lands from loggers/ and land grabbers and perform slash and burn on the remaining trees. Under this approach, deforestation can appear from one year to the other.

The squatters / land grabbers from our study number in the thousands of potential violators. These potential land grabbers use the ambiguous ownership rights of the riverine and traditional rural villagers to "claim" the region is a conflict region, thus their actions are acceptable due to the words they use as their justification for their actions. The region in reality is only a conflict region due to the existence of these land grabbers and the world conflict region is their justification.

Two other large landowners released security in 2010 due to the world financial crisis as their businesses broke and were 100% invaded in a matter of months. In some cases, land grabber claims and squatter claims layered as many as 10 people claiming the same location. There was so much leakage due to these two landowners, that other large landowners had to multiply security on their land due to the "free-for-all" invasion. After nine years both of these properties have had all wood of value stripped and have hundreds of claims. The motivation of these land grabbers is simple: 1000 hectares claimed is worth 1 million dollars in a sale with a possession document. The motivation for the land grabbing is 100% based on financial incentive.

Consolidated Frontier

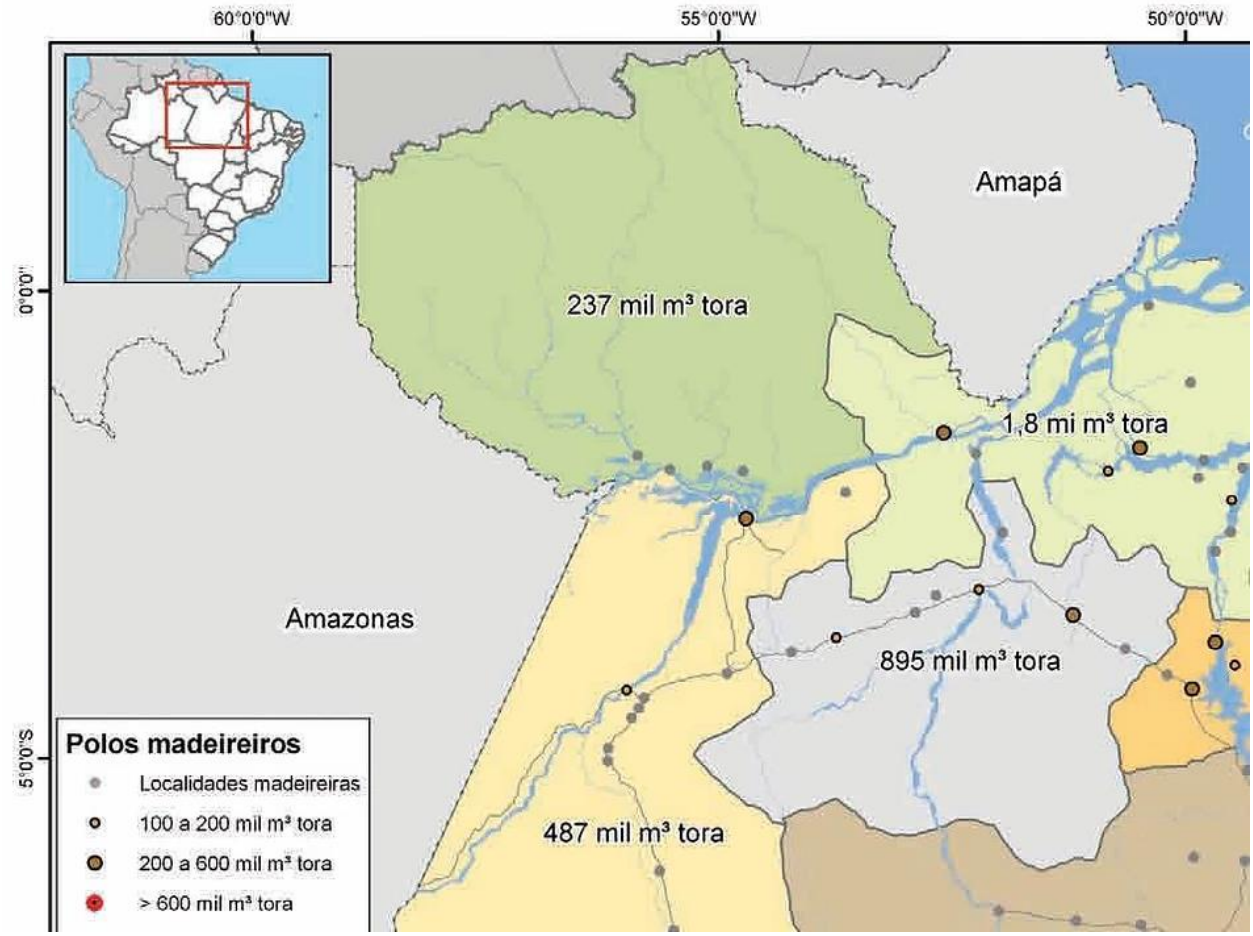
In the case of large-scale cattle ranchers, they operate in what is known as the "consolidated frontier" which is the area closer to the Transamazonica federal highway (BR-230) and the Senador Jose Porfirio state highway (PA-167). In this area, deforestation agents have developed over the years a complex network of secondary and tertiary roads from where deforestation expands. This road-expansion process was already in place at the start of the historical deforestation period and has increased over the years.

As with the Pioneer Frontier, this area started to be colonized by logging companies and other opportunistic agents that set the infrastructure for final land users (cattle ranchers) to buy the lands with degraded forest, apply slash and burn and develop pastures. This process was the norm at the beginning as cattle ranchers establishing in the area were colonizing the area taking advantage of the economic incentives generated by the government, and at the time they wouldn't have enough capital to cover the costs of timber extraction and transportation.

Nowadays the situation has changed. Thanks to subsidies, tax breaks and high demand for meat, cattle ranchers in this area have become well-capitalized agents that can undertake timber extraction and posterior deforestation if they need more areas to develop pastures. Therefore, these agents clean the forest directly, keeping valuable timber species for sale and applying fire to what is left thus pushing northwards the deforestation frontier (Fearnside 2001; Margulis 2004; May 2011)[16].

[16]Carrero, G. C., and P. M. Fearnside. 2011. Forest clearing dynamics and the expansion of landholdings in Apuí, a deforestation hotspot on Brazil's Transamazon Highway. Ecology and Society 16(2): 26).

Figure 51: Map of the forest biomass of the project area (https://abibbrasil.wixsite.com/brazilbiomass/potencial_biomassa_para)



Modeling based approach was used for selection of baseline. With this approach, the rate of baseline deforestation was estimated using a model that expresses deforestation as a function of driver variables selected by the project proponents. Such driver variables may be spatial and consistency with the analysis of step 3 must exist. Several remote sensing technologies are being developed . Assessing Forest Biomass and Exploration in the Brazilian Amazon with Airborne InSAR: an Alternative for REDD. The Open Remote Sensing Journal. 5. 10.2174/1875413901205010021.) to provide accurate estimates of forest biomass to guarantee that REDD can effectively reduce carbon emissions from deforestation and forest degradation. X/P-band InSAR combines the potential for wall-to-wall data acquisition in very large areas and estimation of forest biomass in conditions - such as with the presence of cloud cover, and dense vegetation – that other remote sensing technologies face difficulties to deliver. We confirmed the results of the studies demonstrating that, when Hint is available, forest biomass estimation is improved substantially. This can overcome the known limitation of using P-band backscatter alone for biomass estimation, i.e., signal saturation above a certain biomass threshold. It was evident from the study that cattle ranching and timber logging are the main drivers of deforestation in and around the project area.

The pioneer frontier is the area of the project boundaries and its immediate vicinity. In this southern part of the RRD, landless people or communities colonize river shores and develop small villages; illegal

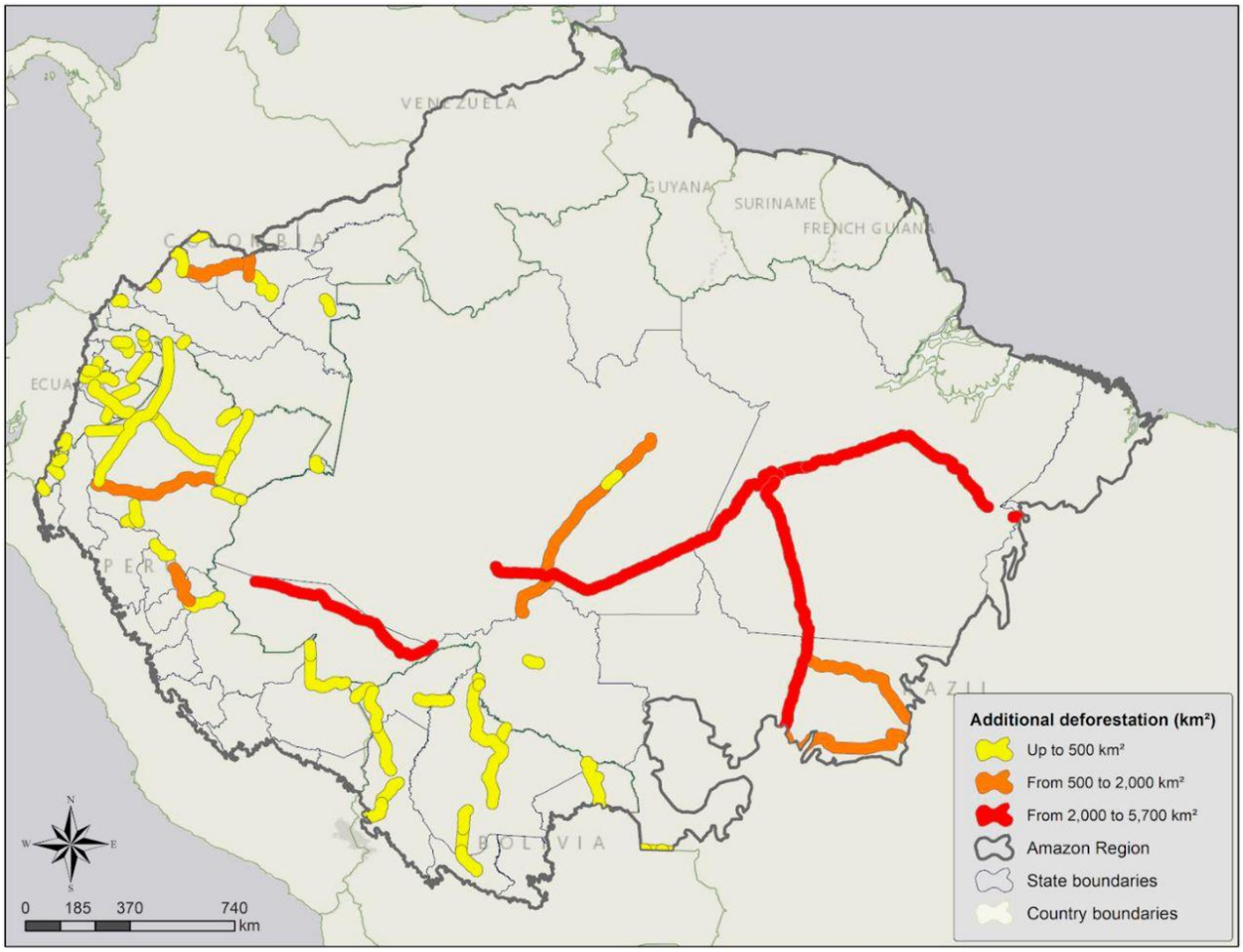
loggers open penetration roads to access valuable timber resources; squatters (invaders) clear-cut patches of forest through slash and burn to prove land ownership and attempt a future land re-sale.

[7]Sambatti, 2012) (Sambatti, Julianno & Leduc, Raphael & Lübeck, Dieter & Moreira, João & Santos, João. (2012).

The rapidly expanding network of roads into the Amazon is permanently altering the world's largest tropical forest. Most proposed road projects lack rigorous impact assessments or even basic economic justification. Vilela et.al, 2020, analyzes the expected environmental, social and economic impacts of 75 road projects, totaling 12 thousand kilometers of planned roads, in the region. Their find that all projects, although in different magnitudes, will negatively impact the environment. Forty-five percent will also generate economic losses, even without accounting for social and environmental externalities. Canceling economically unjustified projects would avoid 1.1 million hectares of deforestation and US$ 7.6 billion in wasted funding for development projects. For projects that exceed a basic economic viability threshold, we identify the ones that are comparatively better not only in terms of economic return but also have lower social and environmental impacts. We find that a smaller set of carefully chosen projects could deliver 77% of the economic benefit at 10% of the environmental and social damage, showing that it is possible to have efficient tradeoff decisions informed by legitimately determined national priorities.

[8]Thais Vilela, Alfonso Malky Harb, Aaron Bruner, Vera Laísada Silva Arruda, Vivian Ribeiro, Ane Auxiliadora Costa Alencar, Annie Julissa Escobedo Grandez, Adriana Rojas, Alejandra Laina, and Rodrigo Botero. 2020. A better Amazon road network for people and the environment. PNAS.vol(117)13:7095–7102.

Figure 52. Primary, secondary and tertiary road network in and around the project area



Squatters thrive on land speculation and use the network of tertiary roads to encroach the Project Area and clear it to claim ownership. Squatters will implement small-scale grazing to prevent the forest from regenerating and to prove that the land is under productive use, aiming at obtaining land ownership titles. Once ownership is granted, they sale they land to larger-scale ranchers.

Ranchers will expand pastures and grazing activities not only because it is a profitable activity but also to keep proving land ownership. The use of the network of tertiary roads allows ranchers to speed-up the consolidation process of the pioneer frontier.

Given the fact that pioneer roads are becoming tertiary roads by connecting with the network of the internal highway networking, it is expected that the Project Area will suffer the same pressures and average deforestation rates that affected the consolidated frontier during the historical deforestation period.

Due to its massive size, deforestation in Brazil beginning in the 1970s and 1980s led to international attention to protect rainforest habitat. Deforestation in Brazil is largely driven by large scale forest conversion to cattle and later to soy cultivation. In the Brazilian Amazon, about 80% of the deforested areas are within 30 km of official road. Much of this forest loss is located along the Trans Amazonian highway running east-west from the dry northeast coast into Para in the central Amazon, and along the soy highway running south-north from Mato Grosso into the interior Para.

In a without project scenario it is likely that deforestation in the area will continue at a conservative rate of 1.7 % per year which can be used for baseline projections. Deforestation in the Brazilian Amazon surpassed 10,000 square kilometers in 2019, the first time forest clearing in Earth's largest rainforest has topped that mark since 2008, according to revised data from Brazil's national space research institute INPE.

Deforestation mostly occurred close to rivers, in sandy plains and valleys. Historically, the main proximate cause of deforestation in the territory has been to extend pasture for extensive cattle ranching. Cattle ranching requires good access to surface waters (rivers and small streams), which are concentrated in the plains and valleys. Moreover, the low fertility of sandy soils does not have a negative effect on pasture productivity in these extensive systems.

Figure 53. Deforestation rate of Amazon area in Brazil from 1988 to 2019

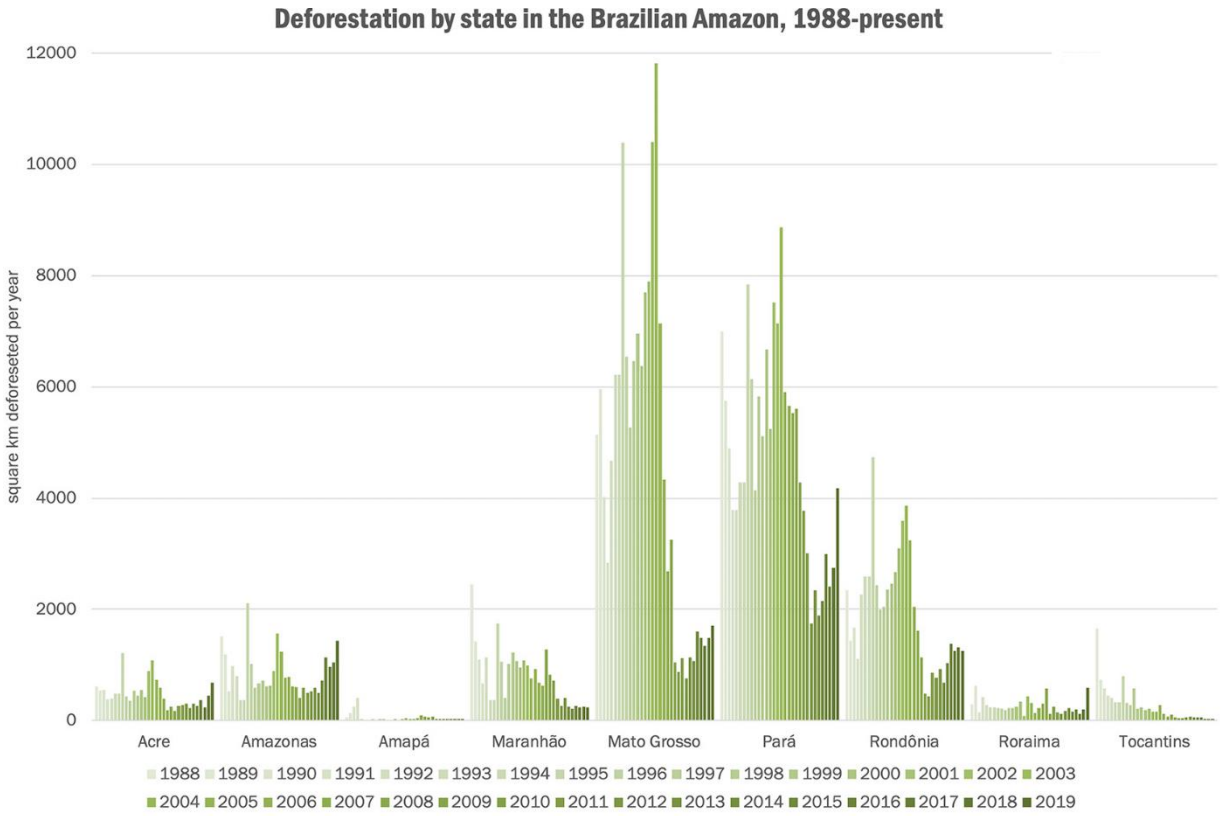
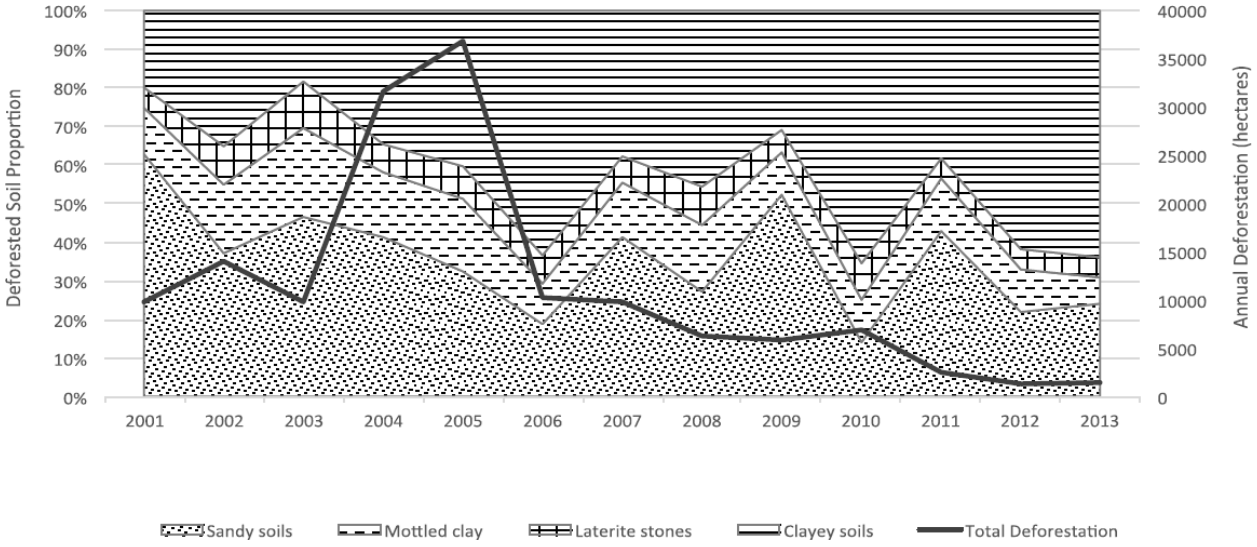


Figure 53, explains the deforestation rate in the Amazon states of Brazil from the year 1988 to 2019. It is clearly evident from INPE studies that the State of Para is one of the most deforested areas in the amazon part of Brazil.

Land use and land cover data in Brazil are organized according to the country's six major terrestrial biomes Amazônia (mainly tropical rain forest), Cerrado (tropical savanna), Caatinga (semi-arid deciduous shrubland and semi-deciduous dry forests), Mata Atlântica (tropical and subtropical forest, much depleted), Pantanal (extensive wetlands) and Pampa (mainly natural grassland). Each of these biomes has unique inter-annual and seasonal variability, presenting unique challenges for mapping land cover and land use.

Soils in the Project Area and its surroundings are showed in the figure below. Latossolo Amarelos contain clay B-horizon with a range from 15% to over 60%. It is possible to define a sort of intermediate texture of the soil (15% to 35% of clay), clay (35% to 60% of clay) and other clay (more than 60% of clay). With reference to land use possibilities, Rodrigues et al. (2003) mentions that Oxisols, due to their chemical characteristics unfavorable for agricultural activities, requires correction, especially in relation to high acidity and high aluminum content. The application of lime and chemical and organic fertilizers easily correct these limiting characteristics in order to increase concentration and retention capacity of soil nutrients. Soils in the Project Area are showed below in Figure 54.

Figure 54. Distribution of annual deforested areas as a function of soils type



Step 2 of VM0015 - Analysis of Historical Land-Use and Land-Cover Change

2.1 Collection of appropriate data sources

For the mapping of the changes in the classes of use and soil cover, data from the PRODES Digital program (INPE, 2014) were used in vector format (shapefile) with spatial resolution of 30 meters. A total of 83 Landsat satellite images were used to map forest, non-forest vegetation, hydrography and anthropogenic vegetation (deforestation) (Table 13). According to the methodology of PRODES Câmara et al. (2006) (Câmara G, Valeriano D, Soares JV (2006) Metodologia para o Cálculo da Taxa Anual de Desmatamento na Amazônia Legal. INPE, Sao Jose dos Campos), these images underwent geometric correction with displacement error less than 1 pixel (30 x 30 m). These images cover the historical reference period (2000 to 2014) and can be located through four Orbits/ Point in the Landsat scene.

Table 13. Data used to identify and map historical LU/LC change analysis in the project (Table 5 of methodology VM0015, page 30)

Vector (Satellite or Airplane)	Sensor	Number of Images	Mean Spatial Resolution (m)	Acquisition Date/Year	Mean Coverage of Study Area (%)
Satellite	Aster	12	15	2010	23
Satellite	CBERS	7	20	2006	81

Satellite	ISS	1	27.31	2014	24
Satellite	Landsat 1	8	70	1972	85
Satellite	Landsat 2	10	76	1974	93
Satellite	Landsat 3	4	80	1978	90
Satellite	Landsat 4	2	45	1982	100
Satellite	Landsat 5	69	30	1990	99
Satellite	Landsat 7	15	30	2012	93
Satellite	Landsat 8	6	30	2014	99
Satellite	Sentinel 1	1	5	2015	100
Satellite	Sentinel 2	3	20	2016	54
Satellite	STS	1	541	2002	78

2.2 Definition of classes of Land-Use and Land-Cover

The soil cover classes used in this Project are represented in Table 14 and Figure 55. The following are the description the classes used in the Project and its area at the beginning of the historical period (2000):

- Forest (1,293,784 ha): area of forest remnant belonging to different Phyto-physiognomies of the ombrophilous forest;

- Non-forest vegetation (339,536 ha): area consisting of vegetation with physiognomy diverse from forest such as Arboreal-Shrub Savannah (Savanna), Gramineous-Woody Savannah (Clear Field of Savanna), Campinarana, among others;

- Hydrography (60,732 ha): water bodies (rivers, lakes, streams, among others);

- Anthropogenic Vegetation (Deforestation – 297,175 ha): area where there was forest, but that was removed through the shallow cutting process (removal of forest cover). These areas are converted to other uses of land, different from forest areas (mosaic of different types of vegetation that includes pastures, plantations and secondary vegetation, according to Fearnside, 1996).

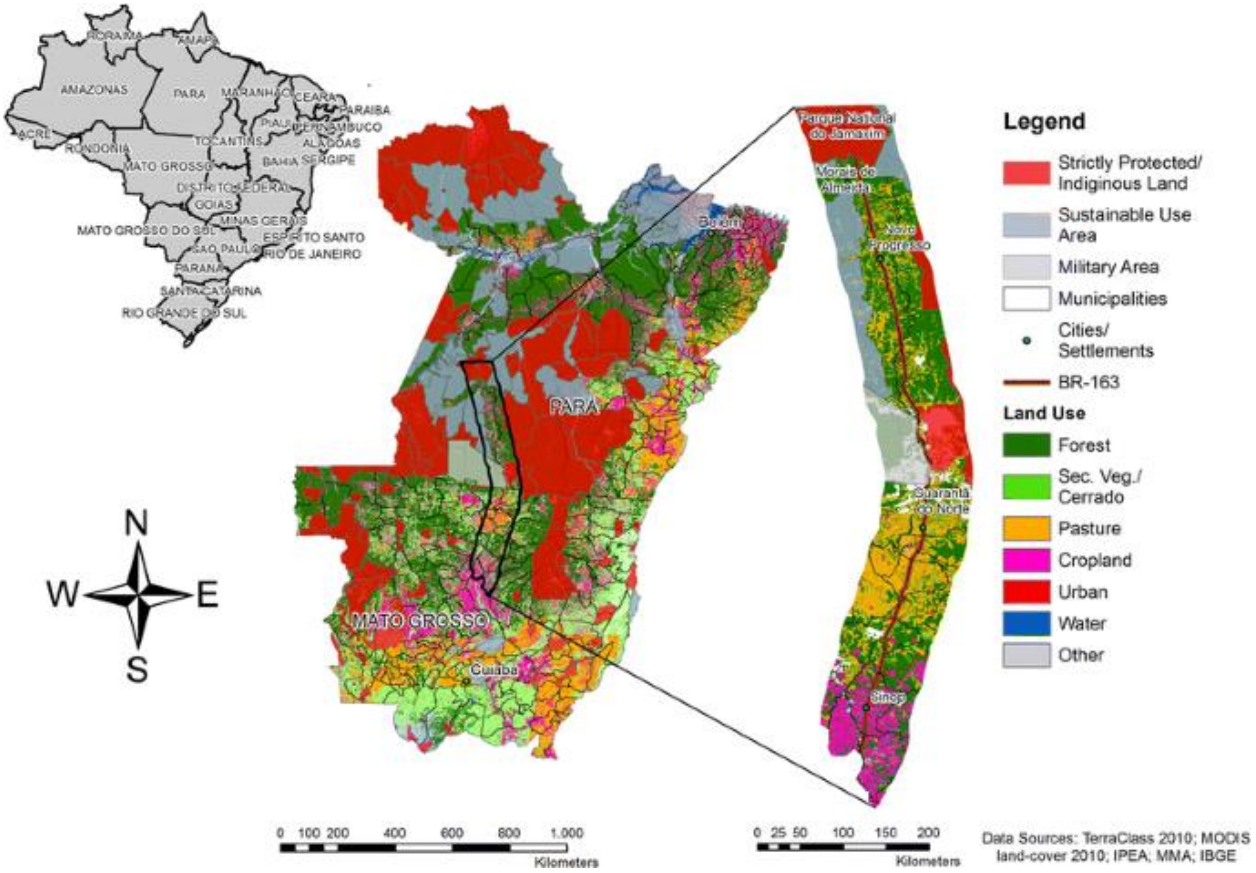
Table 14. List of all land use and land cover classes existing at the Rio Anapu REDD+ Project start date within the Reference Region (Table 6 of methodology VM0015, page 32)

Class identifier		**Trend in Carbon Stock**	**Presence in[1]**	**Baseline activity[2]**			**Description (including criteria for unambiguous boundary definition)**
ID_{cl}	**Name**			**LG**	**FW**	**CP**	
1	Anthropized Vegetation in Balance	Constant	RR, LK, LM, PA	Yes	Yes	No	Area that has undergone deforestation by shallow cut and has vegetation

							different from Ombrophilous Forest
2	Forest	Descending	RR, LK, LM, PA	Yes	Yes	No	Remaining forest area
3	Hydrography	Constant	RR	No	No	No	Area with water bodies
4	Non-forest vegetation	Constant	RR, PA	No	No	No	Non-forest formation area

Note: [1]RR: Reference Region; LK: Leakage Belt; LM: Leakage Management Area; PA: Project Area.
[2]LG: Logging; FW: Fuel-Wood Collection; CP: Charcoal Production.

Figure 55. Land Use and Land Cover Map and Deforestation for the sub-period analyzed



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

For the Project, the transition between two categories of land use was projected, with the change of areas with forest cover to areas of anthropized vegetation (deforestation) (Table 15).

Table 15. List of land-use and land-cover change categories (Table 7b of methodology VM0015, page 33)

ID_{cl}	**Name**	**Trend in Carbon Stock**	**Presence in**	**Activity in the Baseline case[1]**	**Name**	**Trend in Carbon Stock**	**Presence in**	**Activity in the Project case[1]**

				LG	FW	CP				LG	FW	CP
I1/F1	Forest	Decreasing	PA	Yes	Yes	No	Deforestation	Constant	LM	Yes	Yes	No
I2/F1	Forest	Decreasing	LK	Yes	Yes	No	Deforestation	Constant	LM	Yes	Yes	No

Note: [1]LK: Leakage Belt; PA: Project Area; [2]LG: Logging; FW: Fuel-Wood Collection; CP: Charcoal Production.

2.4 Analysis of the historical Land-Use and Land-Cover change

Mapping and deforestation data provided by PRODES were used to analyze the history of changes in land use. The main activities carried out by the PRODES Project to monitor the forest cover of the Brazilian Amazon will be detailed below.

2.4.1 Pre-processing

The procedures of imagery preprocessing performed by the PRODES Project are constituted in the following steps (CÂMARA et al., 2006):

- Selection of images with lower cloud cover and acquisition date closer to dry season in the Amazon and with adequate radiometric quality;

- Georeferencing of 30-meter spatial resolution images in 1:100,000 scale maps and NASA Orthorectified MrSID format images.

2.4.2 Interpretation and classification

The method of classification of satellite images used by PRODES follows four main steps. First a spectral mixing model is generated identifying the components of vegetation, soil and shade. This technique is known as a linear spectral mixture model (MLME) that aims to estimate the percentage of vegetation, soil and shade components for each cell (pixel) of the satellite image. The second step is the application of the segmentation technique, which identifies in the satellite image spatially adjacent regions (segments) with similar spectral characteristics. After segmentation, the segments are categorized individually to identify the forest, non-forest vegetation, hydrography and deforestation classes (anthropic vegetation). Finally, the result of classified segmentation is submitted to the process of editing or auditing the classification, performed by a specialist and ending with the creation of state mosaics.

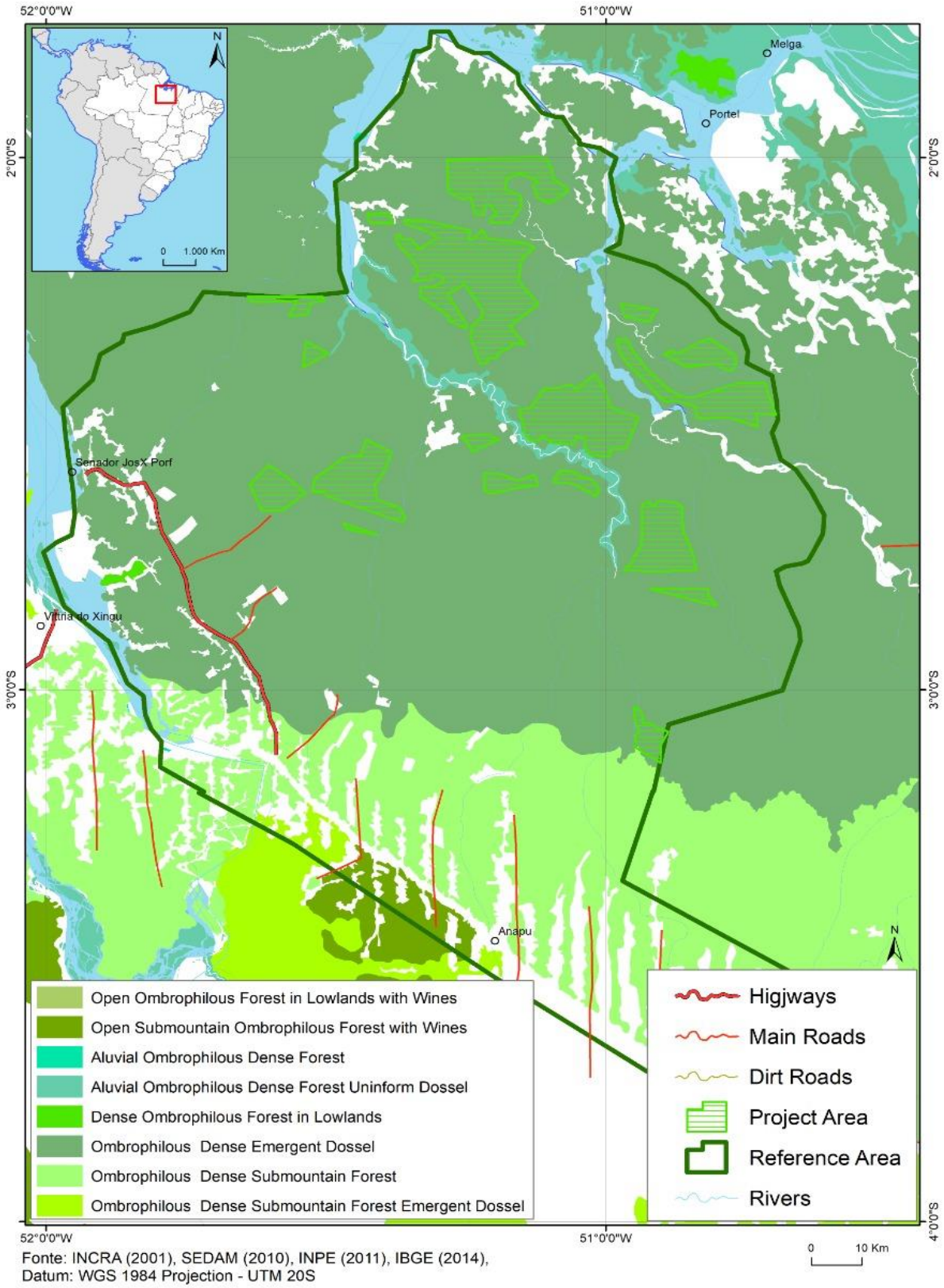
2.4.3 Post-processing

According to VM0015, the post-processing step includes the use of non-spectral information for the stratification of the carbon density of the land cover classes. This information was generated implicitly during the next steps.

2.4.4 Results

The results of the post-processing step are shown in the below represented Figure 56 and table 16 below.

Figure 56: Land Usage and forest cover in the Reference Region based on date from 2000 to 2014.



Fonte: INCRA (2001), SEDAM (2010), INPE (2011), IBGE (2014),
Datum: WGS 1984 Projection - UTM 20S

Table 16. Matrix of the soil cover map (PRODES, 2014) of the Reference Region generated from satellite images of Google Earth

		Reference				Total	User	Commission
		Water	Deforestation	Forest	Non-Forest		Accuracy	Error
Classified	Water	**7**				7	100%	0%
	Deforestation		**56**	17		73	93%	7%
	Forest	3	13	**132**	7	155	92%	8%
	Non-Forest		2	3	**24**	29	91%	9%
Total		10	71	152	31	**264**		
Producer Accuracy		80%	84%	97%	84%			
Omission Error		20%	16%	3%	16%			
Map Accuracy								92%

Results are interpreted in section 2.5-Map accuracy assessment.

2.5 Map accuracy assessment

PRODES data were validated from a comparison of Landsat images collected in the year 2014, as well as high spatial resolution images available in Google Earth and the soil cover map generated by INPE for the year 2014. About 264 points were randomly distributed in the reference region. For each point a visual interpretation was made in the 1:50,000 scale of the predominant class at the point (classes: Forest, Non-Forest, Water and Deforestation). Then the classification through visual interpretation was compared with the classification generated by INPE through the confusion matrix (Congalton, 1999) (Congalton, R.G. and Green, K. (1999) Assessing the Accuracy of Remotely Sensed Data Principles and Practices. Lewis Publishers, Boca Raton). The overall accuracy of the 170 points evaluated was 91%.

2.6 Results in change history analysis in Land-Use and Land-Cover

Based on the data obtained in the previous steps, the analysis of the historical change in land cover between 2000 and 2014 was carried out in the Reference Region of the Rio Anapu-Pacaja REDD project Area. The subtraction map analysis resulted in a deforested area between 2000 and 2014 of approximately 102,923 ha (6% of forest remnant in 2000).

Below mentioned table shows the changes occurring from the Forest class to the Deforestation class, with a decrease in the carbon stock. (annual deforestation that occurred between 2000 and 2014 in the Reference Region).

Initial class (2000)							
ID_{cl}		Name	Forest	Non-forest vegetation	Hydrography	Anthropized vegetation	Total (ha)
			I1	I2	I3	I4	
Class LU/LC final (2014)	F1	Forest	1,190,861	0	0	0	1,190,861
	F2	Non-forest	0	339,536	0	0	339,536
	F3	Hydrography	0	0	60,732	0	60,732
	F4	Deforestation	102,923	0	0	297,175	400,098
Total (ha)			1,293,784	339,536	60,732	297,175	1,991,227

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

3.1 Identification of agents of deforestation

a) Name of the agents of deforestation in the Reference Region: the main agents of deforestation are squatters for grazing, agriculture and other activities such as timber extraction.

b) Relative importance of the amount of historical deforestation assigned to each agent or group: The identified squatters account for 100% of the unplanned deforestation observed in the Reference Region.

c) Brief Description: the deforestation agents of the Rio Anapu-Pacaja REDD project region are mostly migrants who came especially from other cities in the northern region of the country and the northeast region. These agents are historically attracted to the region by enterprises such as those linked to the Rio Anapu-Pacaja REDD project, infrastructure projects, mining, among others. In addition to the possibility of job offer, such agents are attracted by the possibility of taking on indefinite or theoretically disputed areas. Such agents usually invade areas belonging to the Rio Anapu-Pacaja REDD project claiming to be in lands that belong to the state government or federal government. They clean up areas aims to take ownership, build improvements, and initiate small-scale plantations and small-scale animal husbandry. Through these activities, which impact and change the forest cover, the squatters seek to legitimize their occupation[9]

[9]LIMA and POZZOBON,2005) (LIMA, Deborah and POZZOBON, Jorge . Socioenvironmental Amazon : ecological sustainability and social diversity . Estud. av. [online]. 2005, vol.19, n.54, pp.45-76. ISSN 0103-4014.

3.2 Identification of deforestation drivers

a) Driver variables that explain the quantity (hectares) of deforestation

- *Population growth;*
- *Demand for new areas for agriculture and small pasture.*
- Illegal logging of timber

Population growth:

1. Brief description: The Reference Region is located in a new frontier of expansion of the Amazon region, presenting a process of constant migration of workers to support the projects in the region. In the past, the installation of the major construction project's started the irregular formation of the encampment, which housed most of the manual workers who served the construction project. This is a common phenomenon in the Amazon region, where it is estimated that on average 40% of the migratory population of medium and large projects end up establishing themselves in the regions, after the completion of the construction of the projects. Among the infrastructure projects in the vicinity of the Reference Region, which are a major influence on population growth, the construction of the Santo Antônio hydroelectric plant - in the northeast portion of the region - is scheduled to begin in 2011 and start operations in 2015; the BR-156 paving project linking Laranjal do Jari to the capital of Amapá, and PA-254 to the southwest linking the municipalities of Prainha to Oriximiná; and the activities related to the construction and maintenance of the Oriximiná-Jurupari-Laranjal Transmission Line.

2. Impact on agent group's decision to deforest: Infrastructure projects already carried out in the past or planned for the coming years represent a major impact on the behavior of deforestation agents, since such investments attract labor from other regions and still generate expectations of economic growth in the region.

3. Likely future development: The influence of the infrastructure projects on the deforestation dynamics of the region was simulated in the deforestation model following the same methodology as the REDD+ Project. The main assumption was that population growth may increase the risk of deforestation in the

vicinity of the Santo Antônio hydroelectric plant, the BR-156 and PA-254 highways, and the Oriximiná-Jurupari-Laranjal transmission line. The official population data (IBGE) refer to municipalities, since these are areas of great extensions and the Reference Region is constituted by several parts of the same, besides the data outdated, it is not possible to accurately raise the population numbers of the project region, because of this, it is considered that the population projection data have low accuracy to be projected.

4. Measures that will be implemented: Infrastructure projects represent a real possibility of developing and attracting investments to more remote regions in the Amazon, but generate speculative processes that do not correspond to real demand. In these processes, hundreds of families are attracted to these regions with prospects of jobs and a new life, a fact that does not become reality in most cases. The tendency of marginalization of a large part of the population, due to the lack of employment and infrastructure in urban areas, directly influences the demand for rural areas and the exploitation of natural resources. In this context, the project intends to work directly with the rural populations in the project zone, fomenting actions that provide socioeconomic development in the field, the application of responsible agricultural practices and the reduction of predatory exploitation of natural resources. In this way, the project aims to propagate responsible and whenever possible sustainable practices in the region, generating socioeconomic development and mitigating the impacts generated by population growth.

Demand for new areas for agriculture and small pasture:

1. Brief description: Between 2000 and 2014 102,923 hectares were deforested in the Reference Region, representing an annual average of 7,352 hectares. According to Poema (2005), up to 2005 there were 2,348 rural families (squatters) living in the valley region. According to data collected in the field and presented by these authors, a rural family deforests an average of 1 ha/year for planting the plot, or up to 2 ha/year considering that most of the families maintain two plots. This can have an impact on the forest between 2,500 and 5,000 ha per year in the region. In addition to the area opened annually by rural families, the dynamics of demand for agricultural areas is influenced by population growth in the region, since rural population growth is directly related to deforestation, as highlighted in the analysis of deforestation agents.

2. Impact on agent group's decision to deforest: The demand for new areas of agriculture is influenced by two main factors: the lack of technical knowledge of the rural families, who need to enlarge the cultivated area due to the low productivity of the plantations; and population growth, which increases the pressure for natural resources in rural areas that are easily accessible. Since, in the scenario without project, there is no prospect of a shift from productive systems to a model of agriculture less impacting to the environment, added to the tendency of population growth in the region, the most probable behavior of the agents is related to the practices implemented in the scenario business as usual, increasing the demand for new areas.

3. Likely future development: According to IBGE data, during the reference period analyzed (2000-2014), there was a 43% increase in the area used for agriculture in the municipalities of the Reference Region (SIDRA/IBGE, 2014). In addition, it is important to note that IBGE data are official and refer to the formal agricultural production in these municipalities. On the other hand, much of the agro-extractive production in the region still informal and there are no clear Figures for the total area used for agriculture by the rural population of the region. Nevertheless, the indicators of population growth and deforestation in the region in recent years point to a constant trend of increasing demand for agricultural areas.

4. Measures that will be implemented: The actions planned to be implemented during the project management plan will have as main objective the promotion of socioeconomic development in the field, offering alternatives for families to diversify and increase their productions. Through the provision of technical assistance and organizational support, the project aims to reduce the progress of families over the forest, as well as to provide for the reforestation of degraded areas with the use of species of economic interest.

Illegal logging of timber:

1. Brief description: Brazil is one of the countries with extensive tropical forests and home to 60% of the Amazon rainforest. The country has 27 states with a total land cover of 850 million hectares, where 463 million hectares are estimated to be forested. In addition, natural forests account for the vast majority and plantations account for less than 2%.

There are many factors to be assessed when considering illegal logging: increasing national population, indigenous peoples' property rights, industrialization around the world as well as reports on increasing forest degradation among states in the Amazon. There is the need to delve into these realities in assessing efforts to combat illegal logging. Investigative research has to ascertain whether or not there are underground activities fueling cash, crime and contravention of laws. For example, an environmental official, who assisted illegal logging investigations by providing information for the arrest of some culprits and who was well-known for his aggressive enforcement of deforestation laws was shot dead in October, 2016 in the Brazilian Amazon. That execution gives evidence of danger for land defenders in this region. A major report released in September by the Indigenous Missionary Council (CIMI) indicates that there were 137 killings of indigenous people in Brazil in 2015, with the state of Mato Grosso do Sul recording the highest number (25 for the year). Much of the violence is due to land conflicts exacerbated by the government's failure to demarcate indigenous lands, resulting in conflicts between large-scale farmers and indigenous people. Other reports indicate that there are 96 indigenous lands in Brazil, but only four have been demarcated and approved so far. Another 68 are classified with the status of "no action" according to CIMI. A high number of indigenous people also took their own lives, with 87 registered cases of suicide in 2015 by indigenous people. Though actions to curb illegal logging of mahogany are in place, a new species, Ipê (Handroanthus spp.) is highly sought after and thus drives loggers deeper in search of it. Also, exploring the progress made with tackling illegal logging in the Brazilian Amazon particularly from different sources show that there are realities rather than reported.

2. Impact on agent group's decision to deforest: There is no doubt that illegal logging is a pervasive problem, causing enormous damage to forests, to forest peoples and to the economies of producer countries. After concerns and clear evidence of illegal logging in the Brazilian Amazon, the Brazilian Environmental Crime Law was enacted in 1998 with increased governmental efforts. Enforcement against illegal logging has improved but deforestation is still increasing. Brazil was recorded as the world leader in forest loss from 2000 to 2005 through illegal logging and deforestation.[9] Brazil is a leading producer, processor and consumer of wood-based products for which the majority of the country's log production comes from the less than 2% area of forest lands and as well account for nearly all the country's exports to the EU, China, US and Japan.

3. Likely future development: For the past 30 years, the Brazilian Institute of the Environment and Natural Renewable Resources, known by its acronym IBAMA, has stood at the forefront of the uphill fight against Amazon destruction. Its agents have chased criminal loggers and gold prospectors out of indigenous territories. Its inspectors have uncovered elaborate fraud schemes aimed at the theft and clearing of public land for cattle grazing and agriculture. They have broken up rings that traffic in endangered wildlife, and they have issued heavy fines to powerful players seeking to profit from the Amazon's riches.

4. Measures that will be implemented: The actions planned to be implemented during the project management plan will have as main objective the promotion of socioeconomic development in the field, offering alternatives for families to diversify and increase their earnings. Through the provision of awareness programs and organizational support, the project aims to reduce the illegal logging in and around the area, as well as to provide for the reforestation of degraded areas with the use of species of economic interest.

3.3 Identification of underlying causes of deforestation

1. Brief Description: Based on the data and information presented in the socioeconomic diagnoses carried out by the project (FAO, 2018) and other survey studies used as reference, deforestation data (PRODES, 2014), land use after deforestation (INPE and EMBRAPA, 2014) and consultations with local experts, it was possible to find conclusive evidence explaining the relationships among agents, drivers, underlying causes and the deforestation pressure in the Reference Region. Thus, the hypothesis presented is that population growth influenced by infrastructure projects and undertakings projects in the region, coupled with the inefficiency of the government for regularization and monitoring of rural properties, the precariousness of public services and the weak performance of the State to curb illegal activities, contribute to the deforestation scenario observed during the period analyzed. Considering these evidences, the tendency for the baseline in the future is to maintain the influence of the agents, drivers and underlying causes evidenced during the historical period analyzed in the Reference Region.

2. Impact on agent group's decision to deforest: The opening of roads followed by the consolidation of infrastructures are the main steps for the expansion of deforestation in frontier areas, as is the case of the Reference Region. Therefore, as new infrastructure projects are implemented, and access logistics becomes more attractive to the region, different agents may be drawn in search of natural resources such as timber and mining, or real estate speculation.

3. Likely future development: Consolidated infrastructure projects such as the construction of the Santo Antônio hydroelectric plant, the paving of the BR-156 and PA-245 highways, and the installation of the Oriximiná-Jurupari-Laranjal transmission line, as well as projects under development such as the Hydroelectric Panama, which should be installed near the waterfall of the same name in the Paru River, represent a great potential of influence in the deforestation, causing, besides social impacts, great pressure on natural resources of the region. In addition, the context of fragility, or in some cases non-existent, governance of the federal and state governments (Pará and Amapá) may aggravate these problems, resulting in impunity for most illegal practices and potentially causing a significant increase in deforestation in the region.

4. Measures that will be implemented: the actions proposed by the project should counterpoint the trend of continuity of the activities carried out in the business as usual scenario. Through actions that encourage the responsible exploitation of natural resources, low carbon agriculture and the recovery of degraded areas, the project should promote the conservation of natural resources coupled with socioeconomic development. From these initiatives it is expected that most of the potential impacts that would be generated by the agents, drivers and underlying causes will be mitigated in the project scenario.

3.4 Analysis of chain of events leading to deforestation

The chain of events leading to deforestation in the project region is initially driven by planning for infrastructure implementation, which promote migratory movements along with the need to open up forest areas, generating real estate speculation and access to previously remote areas. This process began in the northern region of Brazil through colonization projects, such as the Jari Project implemented in the late 1960s.

The population growth generated by the investments in infrastructure and enterprises/undertakings installed in the region, initially demand the opening of areas for roads, delimitation of urban areas and areas for installation of improvements. In a second moment, with the growth of the migratory process, many of these people settle in rural and peripheral areas of the enterprises/undertakings. These agents began to live on agro-extractive production, mixing extractive practices with subsistence agriculture, standing out in the Anapu Valley the production of cassava and the extraction of Brazil nuts (GRUPO ORSA/ICCO/BOP INOVATION, 2010).

In the common practice scenario of carried out by the agents identified in the region, it is characterized the opening of plots for the implementation of agricultural crops. The practices adopted by these agents, such as fires, and deforestation to the edge of the rivers, besides generating environmental impact, reduce the productivity of the plantations, generating the need to open new forest areas to maintain

production. This context is directly related to other factors, such as low diversification of production and low productivity, and the difficulty of accessing public policies, which results in low levels of income for these agents.

Over the years infrastructure projects generate a great social burden for the region, since they foment the population growth in regions of low government performance, which, in turn, does not offer the basic conditions to provide the adequate development of these regions. This scenario results in the growth of illegal activities, the disfigurement of forests, and the disorderly occupation of the territory.

The deforestation identified in the project region within the historical reference period shows great influence from the proximity of roads, branches, navigable rivers and previously deforested areas. This pattern is common throughout the Amazon, but becomes more evident in the project region, since most of the region's forests are still preserved due to difficult access.

Conclusion

Based on the data and information presented in the socioeconomic diagnoses carried out by the project (Casa da Floresta, 2016, Coutinho, 2018) and other studies used as reference (POEMA, 2005, ORSA/ICCO/BOP INOVATION GROUP, 2010), deforestation data (PRODES, 2014), land use after deforestation (INPE and EMBRAPA, 2014) and consultations with local experts, it was possible to find conclusive evidence explaining the relationships among agents, drivers, underlying causes and the deforestation pressure in the Reference Region. Thus, the hypothesis presented is that population growth influenced by infrastructure projects and undertakings projects in the region, coupled with the inefficiency of the government for regularization and monitoring of rural properties, the precariousness of public services and the weak performance of the State to curb illegal activities, contribute to the deforestation scenario observed during the period analyzed. Considering these evidences, the tendency for the baseline in the future is to maintain the influence of the agents, drivers and underlying causes evidenced during the historical period analyzed in the Reference Region.

Step 4 of VM0015 - Projection of Future Deforestation

4.1 Projection of the quantity of future deforestation

The Reference Region is not stratified, since the characteristics of the agents, drivers and causes of deforestation are the same throughout its area.

Selection of the baseline approach

The methodology VM0015 suggests the use of three approaches to forecast the amount of future deforestation: (1) historical average of deforestation; (2) deforestation as a function of time; (3) modeling the rate of deforestation. After analyzing the evidences indicated in step three and the conclusions obtained, the modeling approach of the historical mean of deforestation (method 1) was adopted. Approach 1 was selected because the rate of deforestation analyzed does not show a significant trend (R^2 <80%) of increase or decrease in the future, that is, is higher than the average rate observed between 2000 and 2014. The R2 found from PRODES annual deforestation rates was 0.10%.

In addition, a correlation analysis was performed among the data collected for different variables (IBGE/SIDRA) of the project region during the historical reference period and deforestation evidenced in the same period. These variables could be used to perform a modeling, however in this analysis no variable had an adequate correlation index. Therefore, the evaluation of variables explaining deforestation (Figure 57, Figure 58 and Figure 59) showed low correlation index, it was chosen the "a" approach (historical average) to design the baseline of future deforestation.

Figure 57. Correlation between the variables of Deforestation and cattle herd (grazing)

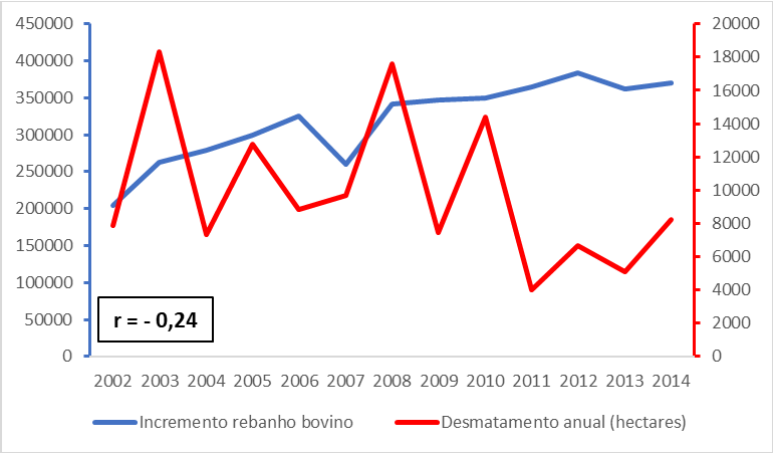


Figure 58. Correlation between the variables of Deforestation and timber production

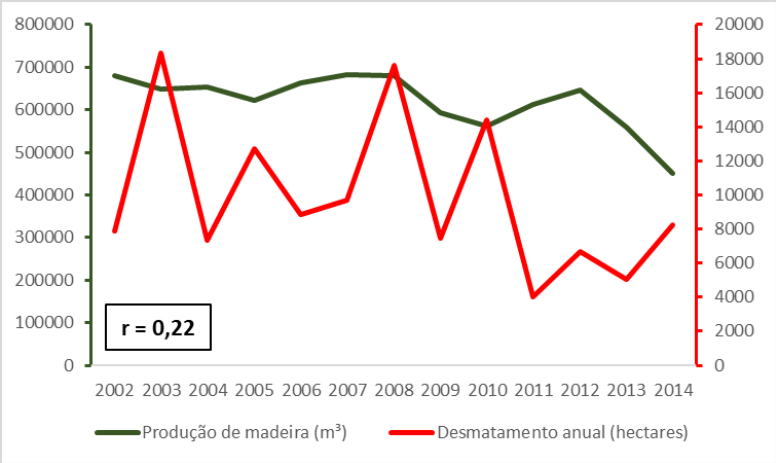
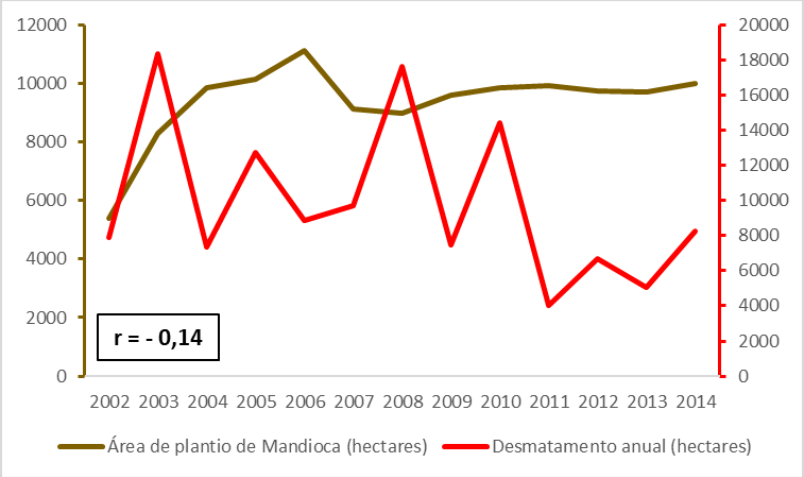


Figure 59. Correlation between the variables of Deforestation and Area for plantations



4.1.2 Quantitative projection of future deforestation

Projection of the annual areas of baseline deforestation in the Reference Region

As presented in the previous item, method a (historical average) was selected to estimate future deforestation and to design the annual deforestation areas in the baseline in the Reference Region. The annual area of deforestation at baseline in year t within the Reference Region was calculated according to Equation 3 of methodology VM0015 version 1.1 (page 44):

ABSLRRi,t = ARRi,t-1 * RBSLRRi,t (2)

Where:

ABSLRRi,t: annual area of baseline deforestation in stratum I within the Reference

Region at year t (ha/year);

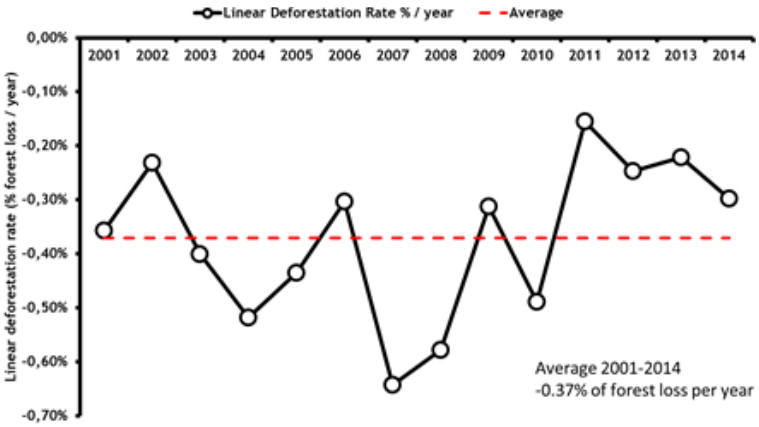
ARRi,t-1: area with forest cover in stratum i within the Reference Region at year t_{-1} (ha); RBSLRRi,t: deforestation rate applicable to stratum i within the Reference Region at year t (%); t: 1, 2, 3 ... T, a year of the proposed project crediting period (dimensionless);

i: 1, 2, 3 ... IRR, a stratum within the Reference Region (dimensionless).

The rate of deforestation observed between 2000 and 2014 was obtained using Equation 7 in Puyravaud (2003), and the value obtained was -0.37% (Figure 60). The projected deforestation over the 30-year period (2015-2044) in the Reference Region is presented in calculation sheet.

[10]Jean-Philippe Puyravaud,Standardizing the calculation of the annual rate of deforestation, Forest Ecology and Management, Volume 177, Issues 1–3,2003,Pages 593-596.

Figure 60. Historical deforestation rate



Projection of the annual areas of baseline deforestation in the Project Area and Leakage Belt

Spatially designed deforestation was used for the entire Reference Region for baseline estimation in the Project Area and in the Leakage Belt produced in step 4.2.4 of methodology VM0015 (page 54).

4.2 Projection of the location of future deforestation

In this section, projection of the future location of the risk of deforestation for the year 2045 as of the preparation of the factors maps, or that encourage the occurrence of deforestation. This was done using the TerrSet software, Land Change Modeler (LCM) module. Following are more details on these steps.

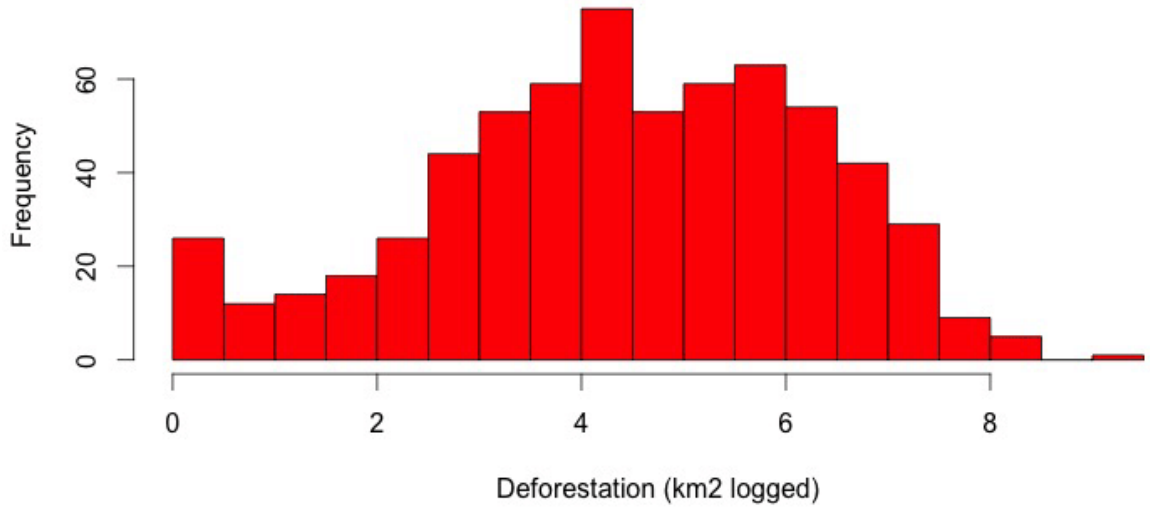
4.2.1 Preparation of factor maps

As of the previous steps, were identified the variables which may influence the occurrence of deforestation within the reference region. The below mentioned Figure and Table present the variables considered as Factors Variable in the deforestation risk model.

Below Figure shows the histogram of these variables as a function of Forest areas in 2000 that changed to Deforestation in 2014. The distance maps were generated using the DIST module of the TerrSet and represent the Euclidean distance of each variable of origin considered. It can be observed in Figure that the areas up to 15 km (15,000 meters) of the change variables (deforestation areas between 2000 and 2014), cumulative deforestation up to 2000 (variable dst_dsm), roads and exterior roads concentrate the majority of Forest areas in 2000 converted to Deforestation in 2014.

In relation to the other variables considered, the dst_para_NavRivers (distance from navigable rivers) has a high concentration of deforestation up to 25 km and between 30 and 80 km. The variable ev_geologia0014 showed a small concentration up to the probability of 0.06, and high concentrations in the values of probability above 0.11. This variable shows the empirical probability of deforestation from the geological type. Finally, the variable srtm (elevation) presented a concentration of deforestation between 2000 and 2014 up to altitude of 210 meters and slope of less than 9.08 degrees.

The construction of these variables (functions used, data source) is described in below Table. Histogram of the variables used in the deforestation risk model is mentioned below;



List of variables, maps and factor maps (Table 10 of methodology VM0015, page 53)

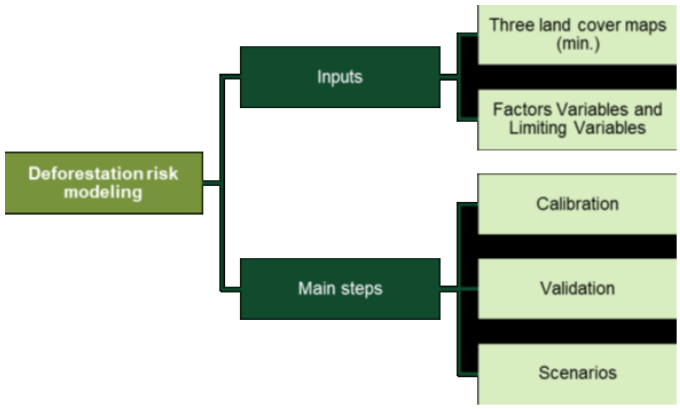
Factor Map		Source	Variable represented		Meaning of pixel categories or values			Other maps and variables used to create the Factor Map		Algorithm or equation used
ID	File name		Variation	Variation	Variation		Meaning	ID	File name	
1	dst_mudanca	INPE	meters	Euclidean distance of deforestation increment cells within the historical period	0	155,195	Distance variation	1	desmatamento_00_14	Distance (TerrSet)
2	dst_assentamentos	INCRA	meters	Euclidean distance of the INCRA settlements	0	105,933	Distance variation	2	assentamentos_INCRA	Distance (TerrSet)
3	dst_dsm	INPE	meter	Euclidea	0	158,215	Distan	3	desmatamento_a	Distan

			s	n distance from cumulative deforestation up to 2000			ce variation		te_00	ce (TerrSet)
4	slope	NASA	degrees	Average declivity per pixel of 100 x 100 meters	0	51.4115372	Slope variation	4	slope	None
5	srtm	NASA	meters	Average elevation per pixel of 100 x 100 meters	0	683	Elevation variation	5	srtm	None
6	dst_estradas	Imazon	meters	Euclidean distance of official and unofficial roads	0	159,219	Distance variation	6	estradas_imazon	Distance (TerrSet)

4.2.2 Preparation of deforestation risk maps

The deforestation risk models are developed from a series of minimum inputs and main steps (Figure 61). The minimum inputs are at least three land cover maps covering the beginning, an intermediate point and the end of the historical period and the factors variables and limiting variables to the occurrence of deforestation. Among key steps include calibration, validation, and scenario generation.

Figure 61. Scheme for the generation of deforestation risk models



Calibration

In the calibration step the first two land cover maps are combined with factors variables and limiting variables using a mathematical model. The objective of this phase is to find out about what conditions deforestation occurs and to represent these conditions through an equation or a set of equations. In this project we used the the Land Change Modeler (LCM) module that conducts this calibration phase as follows.

The first step is to identify the importance of the factors variables for the occurrence of deforestation. This was done using the method called Similarity Weight (SANGERMANO et al., 2010) (Sangermano, lorencia & Eastman, Ronald & Zhu, Honglei. (2010). Similarity Weighted Instance-based Learning for the neration of Transition Potentials in Land Use Change Modeling. T. GIS. 14. 569-580). The method uses the losest neighborhood K logic to identify the relevance of each variable that is considered as a vector to predict locations with the potential for occurrence of the Forest-Deforestation transition. The logic used by SimWeight initially consists of the analysis of the relevance of each variable for the occurrence of deforestation, calculating the importance weight of the variable by the following equation (Equation 3).

Formula to calculate the Importance Weight of Independent Variables (PI):

$$PI = 1 - (DPchange/DPStudyArea)$$

Where:
PI = importance weight;

DPchange = standard deviation of the vector variable in the cells/pixels of change;
DPStudyArea = standard deviation of the vector variable in the cells/pixels of the entire study area.

Then SimWeight calculates the risk of deforestation by combining change cells and persistence. For this was used only the information of the variables with PI greater than 0.1. This information was combined by the following formula adapted from Sangermano et al. (2010) (Equation 4):

Formula to calculate the Deforestation Risk:

$$R\ RiscoDesm = \frac{\sum_{i=1}^{c}\left(1.0 - \frac{1}{1+e^{\frac{1}{d_i}}}\right)}{k};\ (c \leq k)$$

Where:

RiscoDesm = risk value of occurrence of change ranging from 0 (low) to 1 (high);
c = number of cells/pixels of change;
d = distance in cells/pixels between the pixels of change;
i = change pixel identifier;
k = distance in cells/pixels of neighbors closest to the change pixel.
The use of Equation 4 results in a map with transition potential, which detects the areas with favorable conditions of deforestation occurrence over areas with the Forest class (Figure 62). This map is given as the starting point for allocating future rates of deforestation, and from this the annual rates are allocated along with some dynamic variables. The accessibility variable of old deforestation is an example of a dynamic variable.

Validation

The validation consists of comparing the result of the already calibrated mathematical model with the factors variables with a real data. It is generated in this phase, a land cover map simulated of the third point of time of the historical period. The next step is to compare this simulated map with the actual land cover map from the third point of time.

Scenarios

In the scenario step the future deforestation rates are projected for a given time horizon and some main assumptions are assumed. In this REDD+ Project the projection period of deforestation is from 2016 to 2045 and the assumed assumption was that the annual rate of historical deforestation occurred between 2000 and 2014 would reproduce steadily.

Figure: Deforestation rate of Project area from 2000 to 2018

Red is from 2008 to 2018, and the area, with the darkest red being more recent in the last 3 years.

White is primarily deforestation from 1995 to 2008.

Figure 62: Deforestation in the Reference Regions

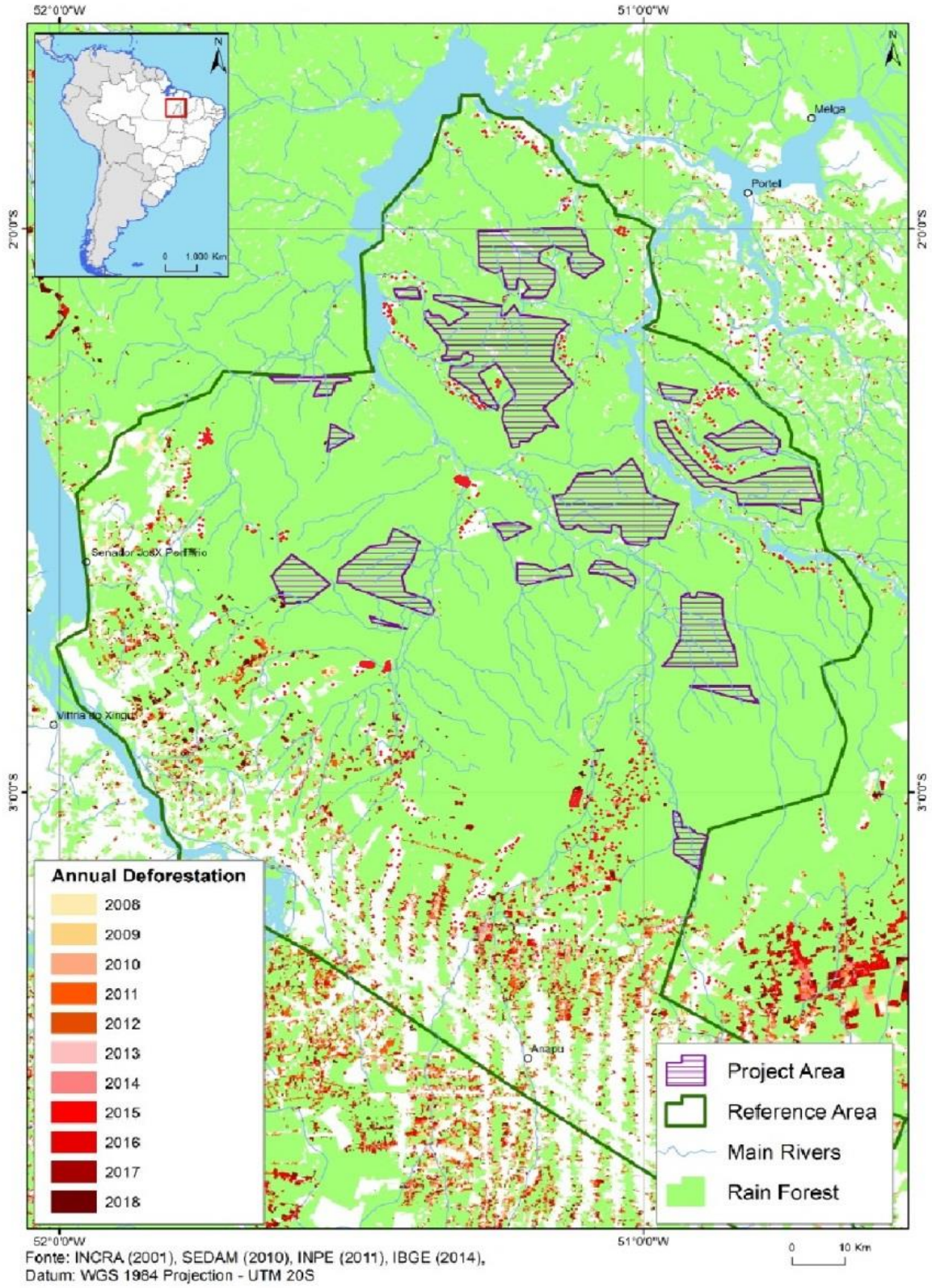


Figure 63 : Deforestation in the southern part of the Reference Region showing secondary and tertiary roads

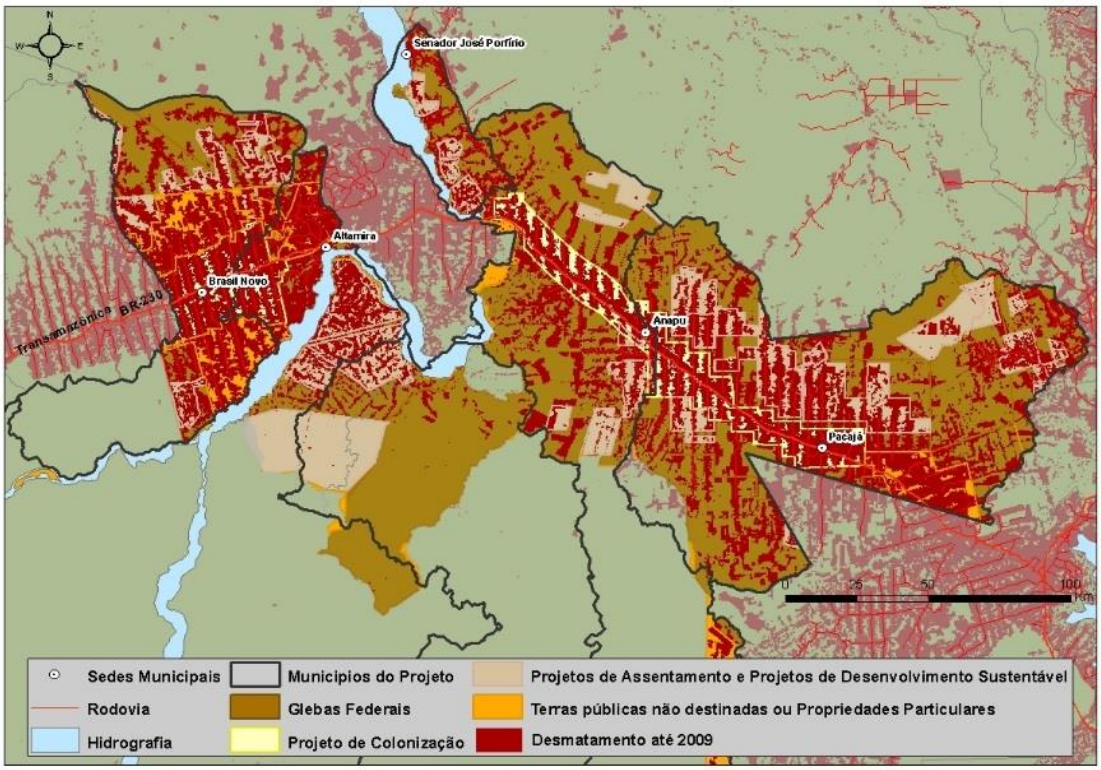
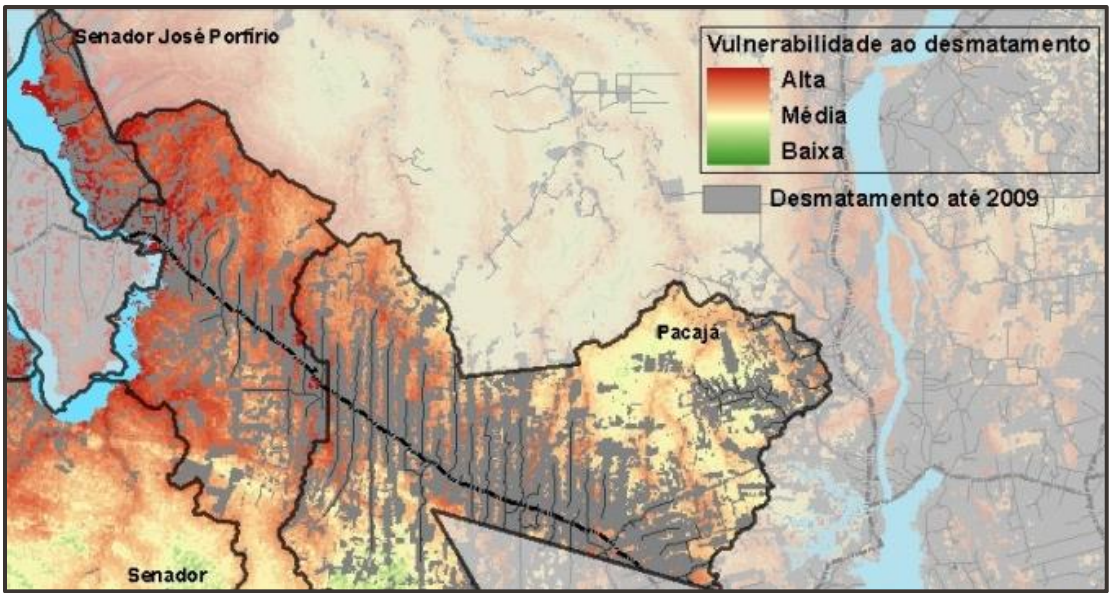


Figure 64: Deforestation in the southern part of the Reference Region and showing high risk for the project area. (Alta translates in English to high)



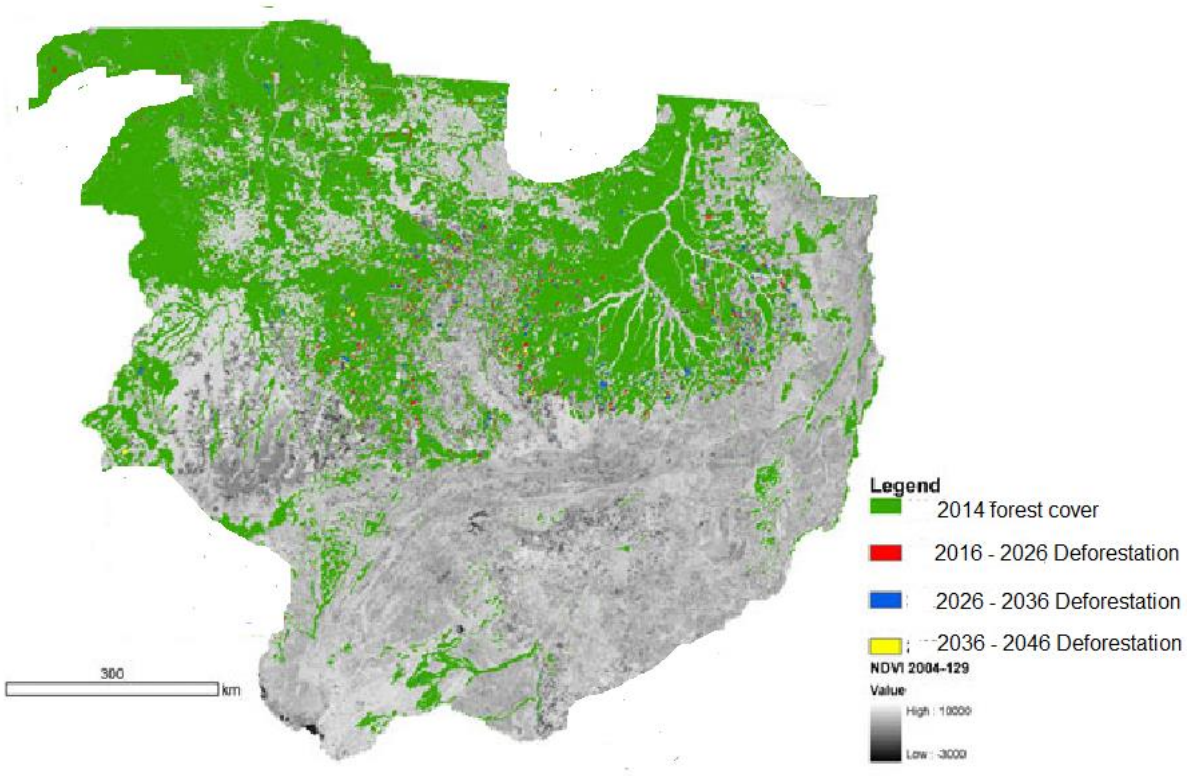
4.2.3 Selection of the most accurate deforestation risk map

The assessment on the quality of the generated model was conducted applying option “a” - calibration and confirmation using two historical subperiods - available in VM0015 methodology version 1.1 (page 53). Deforestation data, occurred between 2000 and 2007, were used to calibrate the model, while the deforestation map occurred by 2014 was used for the confirmation process. In this process, a deforestation map for 2014 was simulated from the data observed in the years 2000-2007.

The FOM technique (Figure of Merit) was applied to evaluate the accuracy of the map simulated in 2014. The FOM is the reason of the intersection of observed changes (changes between reference map at time 1 and time 2), and simulated changes (changes between the reference map at time 1 and the reference map at time 2), to gather the observed change and the expected variation, according to VM0015, equation 9.

This method points out that the minimum threshold for the best adjustment measured by FOM must be defined by the net change observed in the reference region for model calibration period. The net change observed must be calculated as the total area of change being modelled in the reference area during the calibration period, as a percentage of the total area of the reference area, and the FOM value should be the minimum equivalent to this amount. If the FOM value is below this threshold, the project proponent must demonstrate that at least three models were tested (resulting in at least three risk maps), and the one with the best FOM was used.

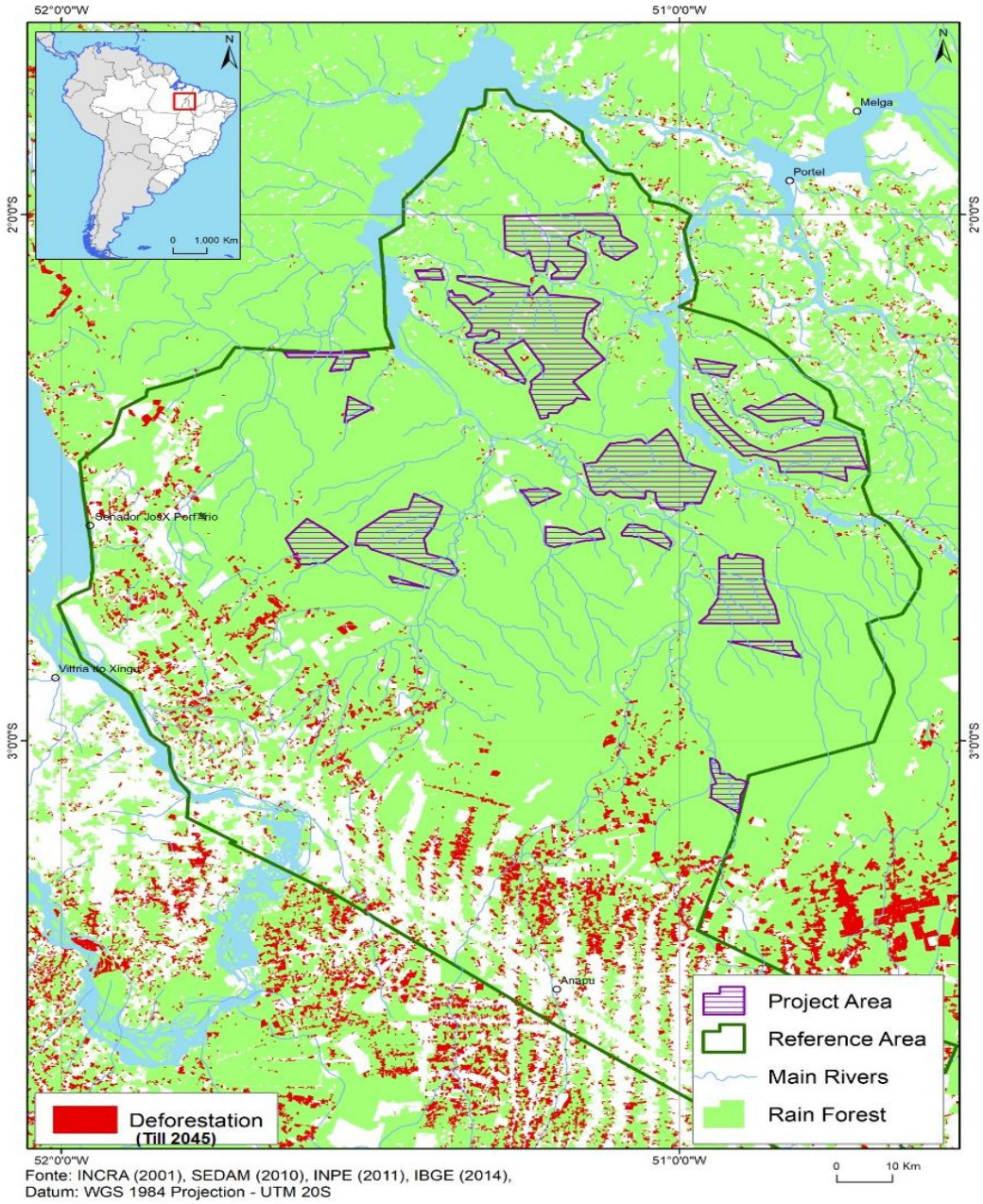
The threshold of net changes observed in the reference region was 0.07, and the FOM value obtained by applying VM0015 equation 9 was 0.73; thus, as the FOM for the first produced risk map is above the minimum threshold, it was not necessary create other two models to perform the allocation of the future deforestation (VM0015 Step 4.2.4). Thus, the deforestation risk map developed at this stage showed acceptable accuracy to project land use changes by 2046 at Project reference region. Below mentioned map is the demonstration of model evaluation method with FOM tool (Figure 65).
Figure 65: Map demonstration of model evaluation method with FOM tool



4.2.4 Mapping of the locations of future deforestation

For the projection of future deforestation, the whole historical period of the project (2000-2014) was considered, with annual deforestation maps projected between 2014 and 2045. The deforestation rate calculated for the historical period was projected until the year 2045. For the spatial allocation of deforestation, the starting point was the combination of the auxiliary variables identified in the model calibration.

The old deforestation distance variable was calculated dynamically in each model interaction. The entire process was conducted in TerrSet software. Figure below shows deforestation in the Reference Regions, Project Area and Leakage Belt (Tables 9b and 9c of methodology VM0015, pages 49 and 50). Index A – Reference region, B – Project area, C- Leakage area and D – Future deforestation rate.



Conclusion

Therefore, in the RRD there are two well-defined fronts of deforestation that are linked by a common dynamic. Now, according to our Social Assessment study, riverine and traditional rural villagers have some experience on timber extraction thus once the deforestation of the consolidated frontier or that one of the pioneer frontiers reaches them, it is most likely that riverine and traditional rural villagers will engage in commercial logging activities, giving space to pastures to develop and causing the traditional way of life to go from a self-sufficient life to a more typical life with high poverty.

In a without project scenario, it is likely that deforestation in the area will continue at a conservative rate of 1.91 % per year which can be used for baseline projections.

3.1.5 Additionality

For the additionality analysis the most recent version of the VCS "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities - VT0001", Version 3.0, is used. The steps defined by the tool for this analysis are as follows:

The tool is applicable under the following conditions:

a) AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced;	All project activities are legal and do not lead to violation of any applicable law. The national and sectoral policies relevant to this project are those derived from laws pertaining to natural resources and forestry activities in Brazil.
b) The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity.	The most plausible baseline scenario is determined following the stepwise approach of the VCS Tool for the demonstration and assessment of Additionality, Ver 3.0. The determination of the baseline scenario was done using determined literatures, public available date from authentic sources, direct field observation, GIS information and scientific research.

The possible identified scenarios are evaluated taking into account investment barriers, historical context, cultural practices, and sector policies in Brazil. Such analysis aims to prove that the Project activity is not the most financially attractive or technically feasible land-use scenario to develop in the Project Area.

Step 1. Identification of the alternative scenarios of land use to the activities of the Project.

This step includes identifying the credible land-use scenarios for the Project Area and assessing the consistency of each scenario based on local regulations.

Sub-step 1a: Identification of alternative land use scenarios for proposed REDD project activities.

Land-use scenarios for this Project have been identified using primary and secondary sources which includes research papers and other documented materials from government and private institutions of information. Primary sources include social assessment activities undertaken for the Project Boundaries through the months of December 2016 and June 2017.

Using these sources of information, three possible scenarios have been identified. These scenarios are:

1. Forest encroachment by pioneer activities (real estate) followed by deforestation to implement pastures

The baseline scenario is a continuation of Business As Usual (BAU) activities in the region if the landowner doesn't implement any type of monitoring or productive activity in the Project Area. Many threats such as deforestation, illegal logging, manmade fires and losing land ownership by illegal means and many other problems has to be faced by the land owner.

Cattle ranching is the main deforestation activity in the RRD. Cattle ranchers can expand their activities by their own means (in the case of well-capitalized agents) or as part of a process that includes pioneer agents such as selective loggers and squatters (in the case of small and medium size ranchers). Interactions among these agents are the result of common drivers and underlying forces of deforestation that are based mostly on securing land ownership and also in economic profits.

Interaction between pioneer and final agents, looked from the standpoint of biological interaction, can one of mutualism or at least of commensalism. For example, in the case of loggers and ranchers, loggers can act independently from the existence of grazing activities. However, grazing activities take advantage of the network of penetration roads built by loggers and usually the revenues from timber extraction are used to finance the implementation of cattle[11] (Margulis 2004).

Intermediary agents with low opportunity costs (squatters) who precede cattle ranching, are probably the direct responsible for much of the deforestation (Margulis 2004). For most of the agents the main driver of deforestation in the area is land speculation , followed by generation of economic revenue (Barreto 2011) Land speculation arises from the expectation of a future re-sale of land. Such speculation is generated by widespread unclear land tenure, bizarre regulations that do not provide security for landowners (Araujo, Bonjean et al. 2009) (Araujo, Claudio & Araujo Bonjean) and from known corruption and weak enforcement at local-level institutions (Larson 2008). Economic revenue is generated by the extraction and sale of timber, changes in land-use from forest to pasture (and implementation of grazing activities) and the sale of meat in the domestic rather than in the international market (Hecht 1993).

[11] (Margulis 2004) (Margulis, Sergio. 2004. Causes of Deforestation of the Brazilian Amazon. World Bank Working Paper;No. 22. Washington, DC: World Bank).
[12] (Kirby, K.R., W.F. Laurance, A.K. Albernaz, G. Schroth, P.M. Fearnside, S. Bergen, E.M.Venticinque and C. da Costa. 2006. The future of deforestation in the Brazilian Amazon. Futures 38: 432-453)
[13] (Manuela Barreto. 2011. CORPORATE SOCIAL RESPONSIBILITY AS A SOURCE OF ORGANIZATIONAL MORALITY, EMPLOYEE COMMITMENT AND SATISFACTION.Journal of Organizational Moral Psychology.1:2(97-124)
[14] Catherine & Combes, Jean-Louis & Combes Motel, Pascale & Reis, Eustaquio. (2009). Property rights and deforestation the Brazilian Amazon. Ecological Economics. 68. 2461-2468. 10.1016/j.ecolecon.2008.12.015.
[15] (Michael L.HechtMichael V.SedanoSodeny R.Ribeau.1993.Understanding culture, communication, and research: Applications to Chicanos and Mexican Americans.International Journal of Intercultural Relations.17(2):157-165).

Land speculation and associated deforestation have their origin on economic incentives given the fact that a cleared area is worth 5 to 10 times more than the same forested area (Kirby, Laurance et al. 2006) and that squatters operate under the expectation of future land resale (Margulis 2004).

At the same time, the Brazilian Constitution of 1988 incentivizes squatters to invade and clear forested land. Under this provision, squatters have the right to claim public or private land that is not under productive use. The Constitution indicates that it is a legal activity to encroach private property if this is not under use, so a squatter can get land-use rights after one year of occupation and full-ownership after proving 5 years of continuous use, as long as the landowner does not manifest legal opposition (Araujo, Bonjean et al.2009).

Land encroachment by squatters is facilitated by the use of the network of unplanned roads developed by illegal loggers that operate in the area. As confirmed by the analysis of the historical reference period using Landsat TM imagery, loggers will continue to build new roads as long as these provide access to profitable timber, moving the logging pressure far from primary roads into areas where the forest resources are abundant (Christoper P Barber (2014). Roads, deforestation, and the mitigating effect of protected areas in the Amazon. Biological Conservation.177:203–209) and regardless increasing distances to selling points (Pfaff 2009) (Joppa LN, Pfaff A (2009) High and Far: Biases in the Location of

Protected Areas. PLoS ONE 4(12): e8273). Also, the historical reference period analysis shows that old pioneer roads linger over time and given the fact that any road will resist so much time in the forest without maintenance (Margulis 2004), it can be inferred that these roads are being used by pioneer agents.

From the literature it is known that, although there is a time gap of 10 or more years between the implementation of logging activities and the development of cattle ranching, the use of the pioneer roads network by ranchers quickly consolidates a pioneer frontier and make it evolve (Mertens, Poccard-Chapuis et al. 2002. Crossing spatial analyses and livestock economics to understand deforestation processes in the Brazilian Amazon: the case of Sao Felix do Xingu in South Para. Agricultural Economics 27:269-294), thus reducing the time the gap for the creation of a consolidated deforestation frontier (Margulis 2004).

Nowadays, these pioneer roads have begun to connect with the network of tertiary and secondary roads that lead the Transamzonica highway, which has been verified by on-the ground testimonies, the results from the PRA and through the analysis of Alos Palsar imagery from 2012. By doing so, pioneer roads cannot longer be differentiated from tertiary roads thus becoming part of one single network.

Now, keeping a cleared land in the Amazonia is a high-maintenance and costly activity. Cattle ranching is a very cheap and self-sustained mean to keep forest from re-growing, to prove land ownership and to generate revenues in the short and medium term. Therefore, although cattle ranching is a highly productive activity (mostly for large and well-capitalized agents) because of its low implementation/operational costs, the financial and tax benefits this activity receives and the growing demand of meat in the domestic market (Margulis 2004), it is an activity mostly implemented as an effective way to claim land ownership (Hecht 1993).

Therefore, depending on the scale of the agent, cattle ranching can be present at an area far from primary roads or “pioneer frontier” or in an area close to primary roads or “consolidated frontier”(Margulis 2004). In our case, the baseline scenario presents deforestation happening simultaneously in two fronts.

1. Timber extraction by the legal landowner
The forest in the Project Area is rich in valuable species that could be easily extracted and commercialized by the landowner.

According to the current Forest Code, the landowner could extract timber in all his area, including the 80% that should be kept as legal reserve. The provision under the legal reserve indicated that a landowner must keep 80% of his land as forest (Government 2012)
(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5530639/).

The issue is that as long as the landowner keeps 80% of his land under the Brazilian definition of forest, any exploratory activity will be legal. However, such definition won’t prevent the forest ecosystem to become fragmented thus loosing biological richness.

2. Proposed AUD activities under REDD+ Project

The Project’s main activity is to continue monitoring to remove and prevent unplanned logging and encroachment activities, which results in the prevention of deforestation activities in the project area. In order to improve monitoring results, local villages within the Project’s Boundary will be offered the opportunity to participate as paid monitoring staff.

At the same time, it is a fact that the lack of land ownership promotes deforestation, so the Project –in and around the project area – in an agreement and in close participation with the landowner, will provide legal land titles to villagers within the Project’s Boundary who develop their activities in the LMA and actively participate –and provide proven results- on forest conservation.
Detailed description of each activity follows as below;

i) Providing training on forest and biodiversity monitoring and management and opportunities to work as a monitoring/enforcement staff

The Project will have monitoring and enforcement brigades that are responsible for protecting subsectors of the Project Area, running demonstrational activities and performing biodiversity monitoring. A leader that is a trained technician or park ranger and a group of local villagers from within or around the Project Boundary will form such brigades. Eventually, brigade leaders will be local villagers that demonstrate exceptional capabilities and proved commitment to forest conservation.

Monitoring staff will communicate any sightseeing of illegal activities to the brigade leader who in turn will be in charge of communicating all events to a base office in Belem or Sao Paulo. The staff at the Sao Paulo office will make the appropriate reports to local authorities for them to go to the Project Area and deal with agents encroaching the Project Area.

Training for monitoring staff

Local villagers who wish to participate in the monitoring program will receive free training in methodologies and procedures to monitor the Project Area and to report any findings. Monitoring staff will be divided in groups dedicated to the surveillance of the Project Area, groups in charge of running demonstrational activities/social surveys and a group in charge of performing biodiversity monitoring.

In order to offer the same chances for all local villagers willing to engage in the monitoring activities, monitoring staff position will be rotational in the case that the supply of workforce is higher than the available jobs. The rotation period should be determined once Project's activities are implemented and the supply of work forced in adequately determined based on the census information. Figure 66 shows how brigades will be organized and Figure 15 shows the process to report illegal activities in the Project Area.

Figure 66. Local organization of monitoring tasks

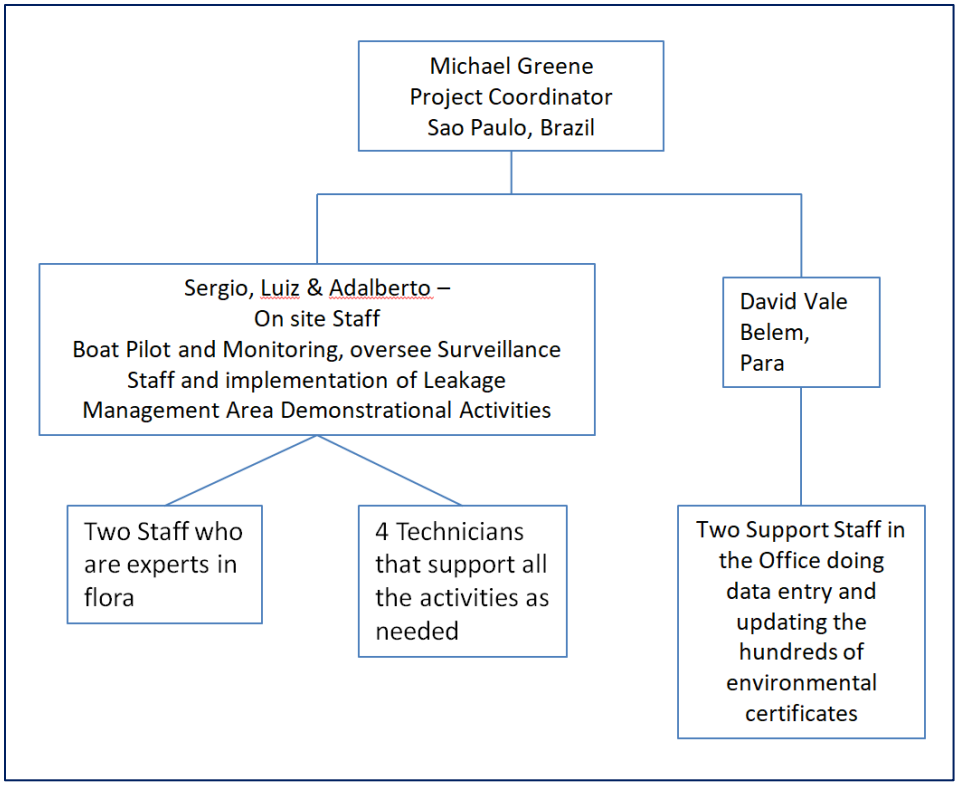
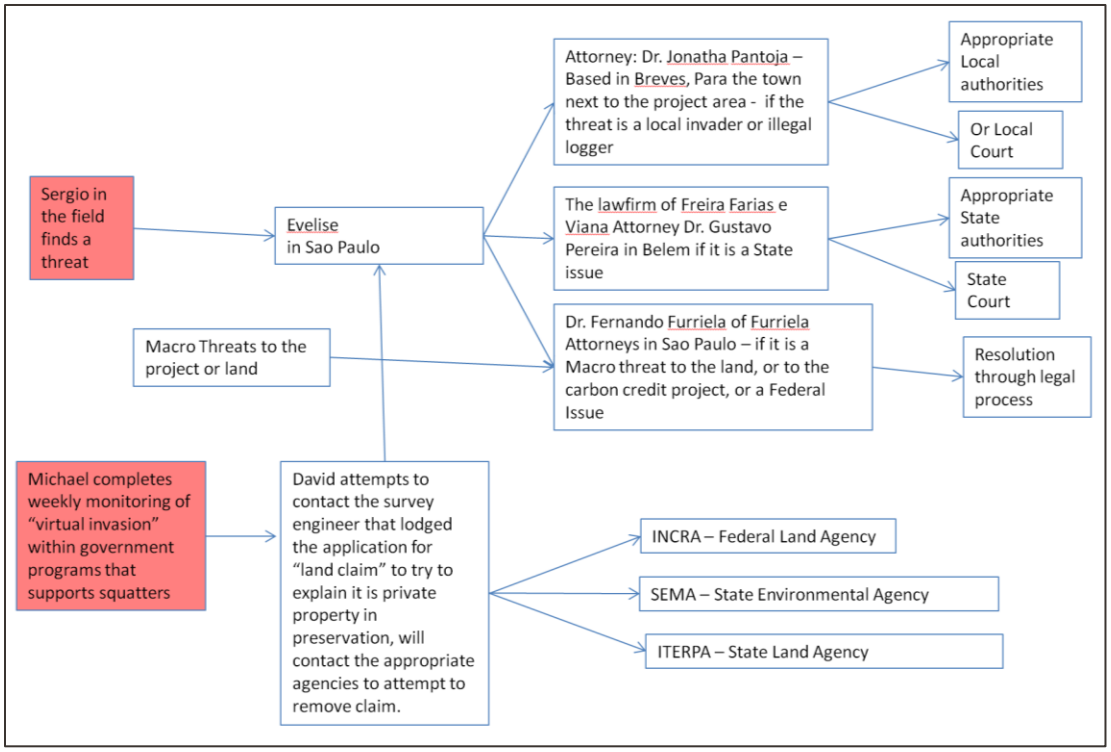


Figure 67. Reporting Sequence and Resolution Sequence



ii) Enhancing community's organizational capabilities

The Project management team will support local villages that wish to improve their level of organization and governance. To do this, the management team will engage local leaders to assess the best way on how to develop an organization system that works best, given the particular needs and economic activities of the villagers.

Villagers in the area usually see local priests, either Christian or Evangelic, as leaders. Therefore, developing and maintaining a good relation with local priests will be the first step to develop this proposed activity.

iii) Provide legal land-ownership rights versus results for conservation The main objective of this activity is to create a sense of ownership and respect over the forest resource through an incentive as evidence shows that secured land tenure is a main factor to reduce deforestation.

The Project's Management Team in cooperation with the landowner have put forward a proposal to regularize land tenure status of those villagers living in the LMA. The landowner has signed an agreement to provide official land-use rights to villagers in the LMA with the hopes that they will own these lands in 40 years. Requirements to participate in this activity will be clearly explained to local villagers through workshops as part of the FPIC process during the census.

As a requirement to receive a land title, each villager will have to sign a conservation agreement that will mainly state that granted lands cannot be sold, productive activities cannot expand into the Project Area and that the land-use of the land cannot change into mining or pasture implementation. Such conservation agreement will be drafted collaboratively with local villagers under several PRA workshops as part of the census process.

Villagers in the LMA will be offered the opportunity to receive legally recognized land-use rights against the provision of conservation services to the Project such as (but not limited to) surveillance of illegal activities in the area and the premise of not encroaching the Project Area. Such land-use rights will be renewed every year accordingly to effective conservation results. At the end of the Project' lifetime

each villager actively and effectively engaged in the proposed activity will receive an official title over his/her land under the binding conditions of the conservation agreement.

iv) Providing capacity building on steps to gain land use rights over Government owned forests

The Project cannot sign agreements as those explained in the aforementioned item number three with families living outside the Project Boundaries. However, the Project aims at providing guidance to these families on how to achieve land-use rights on lands that are not privately owned.

The idea is that the Project will provide capacity building in many areas not only to those families living within the LMA but also to those families in the proximities to help reduce the risk of leakage and to promote sustainable development in the area. So, it doesn't make any sense to provide all this training to families if they feel insecure about their rights over land, thus moving somewhere else. The Project will invest resources in training all these families in order to have them realize the benefits of it and making them to stay and support the Project protecting the forest.

Although the Project cannot guarantee that all families living outside the LMA will achieve a land use permit, the management team will make the best effort to engage local authorities in Portel and to coordinate with local leaders to develop the best approach to solve this issue.

v) Providing capacity building in agroforestry techniques and implement agroforestry

The Project LMA will be used as a showcase for local families to receive capacity training and to participate on agroforestry techniques. The Project will provide economic support to train and to implement agroforestry schemes such as home gardens, improved fallows, forest gardening and forest farming.

Through agroforestry it can be possible to diversify crops and to enhance productivity. This in turn will reduce the amount of land required to practice agriculture, which in turn reduces the risk of deforestation due to small-scale agriculture. Also, through forest gardening and forest farming villagers will come to see how the forest can provide benefits other than timber.

Agroforestry systems can be very simple to implement and can require low-maintenance. Also, such systems help diversifying food production and increases food security in areas of low productivity such as the acidic soils of the Amazon.

vi) Providing capacity building on improved efficiency cook stoves

In order to reduce the amount of firewood needed to produce cassava, the Project LMA will be used as a showcase for local families to receive capacity training and to participate on demonstrative activities on how to implement an energy efficient cook stove. The Project will provide economic support to train and to build such efficient cook stoves to those families willing to participate in the activities both in and outside the LMA.

Different types and sizes of energy efficient cook stoves will be tested to find the one that fits best for the necessities of local families. With this learning curve it will be easier to replicate the experience among other conservation Projects in the region.

vii) Providing capacity building to develop small sustainable business

The Project Proponent will set a trust fund setting aside a percentage of the net income from the sale of carbon credits. Such fund will be additional to the budget envisioned for the Project activities.

The Project will provide – in partnership with local communities- capacity building to local families to develop and submit business plans (individually or in groups) to apply for funding to start small sustainable business that take advantage from non-timber products in the Project Area and LMA (i.e.

based on agroforestry production, seed collection, etc.). The idea is to replace their dependence on timber extraction and sale for sustainable activities that can provide the same or better level of annual income.

viii) Providing capacity building to cattle ranchers that move inside the Project Boundary

Although is not possible to control the decisions of stakeholders in the area it is possible to influence them if they find some benefit in changing their business as usual behavior.

The Project cannot offset the opportunity cost of cattle ranchers so the best it can do is to prevent leakage by providing training on the benefits and techniques of improved pastures managements. Brigades will conduct regular visits made around the perimeter of the project area to neighboring invader origins to meet and invite participation in leakage preventive measure activities.

This way, it is expected that cattle ranchers will internalize the benefits of making their activities more efficient in terms of land use thus requiring less area and in turn reducing the risk of deforestation outside the Project Area.

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

We base our consistency analysis in the laws and regulations which is presented in Table 17 below:

Table 17: Relevant Laws and Regulations Applicable to the Project to Demonstrate Baseline Scenarios Consistency

Law / Regulations	Description Relevant to the Project
Forest Code, Law 12.651, May 25th 2012	The Forest Code indicates that all landowners of forestlands in the Legal Amazonia should preserve 80% of their land as a legal reserve. However, a landowner can explore the legal reserve of his property as long as the legal reserve stays as forest (according to Brazil's definition).
Constitution of the Federative Republic of Brazil, 1988	Chapter II Indicates that is legal to occupy unused (or not under a productive activity) either public or private land. Such land can be expropriated for the benefit of that who put it to generate benefits for the society.
Normative instruction number 5, December 11th 2006	Provides technical procedures for development, presentation, execution and feasibility assessment for Sustainable Forest Management Plan (PMFSs) in primary forest and its successions in Legal Amazon.
Resolution number 406, February 2nd 2009 – Minister of environment – National council for environment	Article 1st establish technical parameters for development, presentation, implementation and technical evaluation of Sustainable Forest Management Plans PMFS with timber processing purposes from native forests and its succession in the Amazon biome. It will have to be applied by any level of competence by the units of the National System for the Environment – SISNAMA observing what is written in this resolution
Normative Instruction number 2, June 27 2007 – MMA	It provides modifications on the Normative instruction number 5, December 2006. Article 1st. The articles 8th, 28th and 43rd of the Normative Instruction No 5, December 5 2006, published in the official daily noticed of December 13th 2006, section 1, page 155 and 159, now has the following written: "I – maintenance of at least 10% of the number of tress per species, in the exploration area UPA, which attend the criteria of selection for harvest previously indicated in the PMFS, respecting the limits of at least 3 trees per species per 100 ha, in each UT; and II – maintenance of all tress which

	abundance of trees with DBH is superior to the DMC is the same or below 3 trees per 100 hectares in the UPA area, for each UT."
Normative Instruction number 012, November 30th 2006 – SECTAM	Establish norms and procedures to guide the use of the Forest Guidance note – GFPA. For transport of products and/or sub-products from forest in Pará. Article 1st – the use of Forest guidance note – GF – PA for the transport of products and or sub-products from forest in Pará, which is written in article 6th item V, of State decree number 2592, November 27 2006. Article 2nd – Forest Guidance note – GF-PA will be issued on the following models for the diverse modalities defined in this Normative Instruction: I. GF Model 1 – GF1- PA; II. GF Modelo 2 – GF2-PA; III. GF Model 3 – GF3-PA; e IV. GF Model 4 – GF4- PA
Normative Instruction number 014, November 30 2006 – SECTAM	Defines the requirements to register activities in a database for activities for technical defense – CTDAM. Considering the necessity to regulate item I, from article 1st, from decree number 5741, December 19th 2002, that established the activities for technical environment defense database, considering the necessity to publish the list of professionals able to develop the environmental Projects in the state of Pará; AGREE: Article 1st – define the necessary documents for the annual registry of the database for the activities for technical environment defense.
Normative Instruction number 7/2006, September 27 2006 – SEMA, regarding the Sustainable Forest Management Plan (PMFS)	Article 10, The Sustainable Forest Management Plan (PMFS) must follow. I – the intensity of harvest no higher than 30 m3/hectare in case machines are used for harvest. In this case the initial rotation is 35 years; II – harvest intensity no higher to 10 m3/hectare in case no machine is used for harvesting. It is understood by harvest intensity: the commercial volume of the harvest trees, estimated by volumetric equations presented in the PMFS base on the inventory 100%, expressed in cubic meters per unit of work (UT). Article 20, The PMFS must follow the criteria for tree selection: I – diameter at breast high lower than 50cm, except in the cases where technical justification based on forest inventory data; II – present in the forest inventory 100% density equal or below 3 units for 100 hectares.

Now, we present first a consistency analysis for the three scenarios, the two without-project scenarios and the project scenario.

1. Forest encroachment by pioneer activities followed by deforestation to implement pastures

The scenario of pastures implementation consists in two different processes that include a set of activities happening simultaneously within the Reference Region of the Project. For this reason, it is necessary to break it down in its individual components, as presented below:

A. Small-scale slash and burn subsistence agriculture along river shores:

Landless people can occupy, gain land-use rights and eventually land titles over public or private forested land that is under no-productive use (land with forest cover is assumed under no use). In the case of private land invasions, it is legal unless the legal landowner makes a claim to INCRA stating his land is being invaded and cannot be expropriated (Araujo, Bonjean et al. 2009).

So, settlements can be created but registration takes time and is not usually done. Settlers can gain legal land-use rights to undertake sustainable land uses after proving five consecutive years of productive use of the land. After this five-year period, settlers can start the process to gain property titles. In both cases, given the long distances to the closest town (Portel), it is not common for settlers to undertake such regularization processes (Araujo, Bonjean et al. 2009).

If the landowner doesn't prove that there are productive activities going on in his/her land (either extractive or non-extractive) then settlers are not acting outside the law when developing a village.

Settlement areas allow landless people to establish and develop small-scale productive activities for self-consumption and to make small economic profits (i.e. non-industrial scale agriculture). Thus, settlers use one of the most common practices in tropical forests to prepare the land for agricultural activities, known as slash and burn which requires the clearing of a small patch of forested land and then burning of the trees that have been cut using a controlled fire. Once the land is ready for agriculture, settlers grow mainly cassava (for consumption and to make "farinha") and other crops.

B. Progressive unplanned timber extraction and post-extraction pastures implementation:

As previously explained, when the presence of a landowner is not made evident by monitoring or other activities, private lands are susceptible to invasion. Invaders make a profit by grabbing forested lands that seem to be free or under no-productive use (or with forest cover), claiming land titles and finally selling the land to final deforestation agents. (Fearnside 2001; Margulis 2004).

Squatters are supported by the current Constitution of 1988, under the provision that public or private land that is not under productive use can be claimed by someone else (Araujo, Bonjean et al. 2009).

Unplanned logging activities are not legal, but there is a state-wide lack on enforcement capacity by IBAMA, which is the institution in charge of environmental monitoring (BRITO 2005, Brito, B., Barreto, P. and Rothman, J. 2005 Brazil's new environmental crimes law: an analysis of its effectiveness in protecting the Amazonian forests. Newsletter INECE no. 11, Belém, Brazil); (Millikan et al., 2015, The context of REDD+ in Brazil Drivers, agents and institutions, Center for International Forestry Research). Lack of enforcement in Portel, Para – which is the smallest administrative unit that encompasses the Project- is made evident by the increasing deforestation area according to INPE (INPE 2012). Also, most of the timber in Brazil is known to come from illegal sources (May, Millikan et al. 2011).

Additionally, logging companies may have forest concessions for sustainable timber extraction but due to corruption and weak law enforcement, come of these companies illegally extract timber from areas outside their concessions with no regards on sustainable forestry practices. As a result, illegal logging is widely spread not only in Portel (which is the one of the administrative unit that encompasses the Project) but entirely in the state of Para as well (Henrique M. Pereira,2010,Scenarios for Global Biodiversity in the 21st Century, science. Vol(330)6010:1496- 1501).

This is also evident by the fact that forest cover loss is increasing in the Project's reference region while illegal logging rates have been decreasing in the last years. In a study developed by IMAZON, it was reported that 435 authorizations for forest management activities in Pará were issued, spanning 280.000 hectares. From this sum, 90% were proved to have legal issuance documents, while 10% had irregularities, such as: the authorized area for exploration was smaller than the area in which the operation took place, the authorized area for exploration was in an already deforested location, or the income of the commercialized wood did not correspond to the area explored (Pedro et al.2018, Fake legal logging in the Brazilian Amazon. science advances. 4(8): eaat1192).

As for cattle ranching, this is a legal activity to undertake in the area. Cattle ranching will start at small scale with squatters and then will scale-up with the arrival of larger agents. In both cases, cattle ranching is used to prove land ownership and of course because of the economic revenues that generates.

2. Timber extraction by the legal landowner

As mentioned before, timber extraction is a legal activity as long as the landowner keeps 80% of his land as a legal reserve. Even so, exploratory activities for timber extraction area allowed to be performed in the legal reserve area as long as this area stays as forest according to the Brazilian definition (1ha with 30% of canopy cover with trees of at least 5 meters high).

In conclusion, a landowner can legally extract timber from his area as long as 80% of his/her area complies with the country's definition of forest.

3. Proposed AUD Project activities

The Project activities aim to conserve the forest, generate long-term positive impact on the climate, communities, and biodiversity. Therefore, the Project activities comply with national and local regulations like the Forest Code and the Constitution of 1988.

Conclusion: The Consistency Analysis shows that all three scenarios are in compliance with mandatory legislation and regulations taking into account their enforcement in the region. In the case of unplanned logging that is an agent that precedes deforestation by ranchers, it has been proven that there is lack of enforcement is widely spread not only in Portel but also in entire Para.

Sub-step 1c. Selection of the baseline scenario

Described in Section 3.1 – Application of the Methodology, specifically in item 3.1.4 – Baseline scenario.

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

Sub-step 2a. Determine appropriate analysis method

Due to the fact that the Project is a conservation Project with no other sources of income besides carbon revenues, a simple cost analysis will be applied to prove additionality. Given that carbon credit revenue is the only source of financing for this Project, without this source (or the future expectation of carbon finance) no AUD activities could be implemented and BaU baseline scenarios would take place in the Project Area.

Consequently, in the absence of VCS-related income, it is expected that the project activity will generate no revenue, and therefore the simple cost analysis is the appropriate method to demonstrate that the project activity is financially less attractive than alternatives.

Since the beginning of the Project, the AUD activities were envisioned to be feasible only if carbon credits revenue would be available. Furthermore, initial financing for the Project, received exclusively from private investors will cover 100% of the Project's costs over the first years. Again, this is a clear indication that without carbon finance Project activities cannot be undertaken and therefore are additional.

Sub-step 2b. Option 1 – Simple cost analysis

The simple cost analysis is basically a Project cost description along the crediting period. It aims to demonstrate all the costs associated to development and implementation of the Project. When Projects have no other revenue but the carbon credits, it is allowed to use this financial analysis.

Annual Rio Anapu-Pacaja REDD project operational expenditures (both planned and actual), covering governance and administration as well as protection and management, for the 2016 to 2020 years are detailed in the table below. Anticipated operational expenditures, with full implementation of the project activity, are expected to be similar to or more than the "planned" budget figures below.

Table 18. Annual Rio Anapu-Pacaja REDD project operational expenditures

	2016	**2016**	**2017**	**2017**	**2018**	**2018**	**2019**	**2019**	**2020**	**2020**
	planned	*actual*	*Planned*	*actual*	*Planned*	*actual*	*planned*	*actual*	*planned*	*Actual (till*

										30th June 2020)
Costs	**US$**	**US$**	**US$**	**US$**	**US$**	**US$**	**US$**	**US$**	**US$**	**US$**
Salary and Allowance for Guards	$ 15,000	$ 18,067	$ 15,000	$ 16,897	$ 15,000	$ 17,690	$ 15,000	$ 15,698	$ 18,987	$ 8,000
Virtual Security - registering the property with INCRA, the Environmental Ministry so land invaders see it is owned with the hopes they will not invade	$ 25,000	$ 53,450	$ 25,000	$ 45,434	$ 25,000	$ 42,234	$ 25,000	$ 45,240	$ 40,400	$ 18,000
Survey work in the field related to the work	$ 25,000	$ 28,670	$ 25,000	$ 45,434	$ 25,000	$ 42,234	$ 25,000	$ 45,240	$ 47,370	$ 30,230
Legal fees each year to target the illegal loggers invading the land	$ 100,000	$ 100,000	$ 30,000	$ 28,404	$ 30,000	$ 23,900	$ 30,000	$ 84,230	$ 74,230	$ 44,480
Project Proponent Payments to Landowner to cover landowner related land expenses	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 90,000
Travel	$ 25,000	$ 24,585	$ 25,000	$ 24,240	$ 25,500	$ 25,063	$ 26,010	$ 26,042	$ 26,042	$ 16,290
Meetings	$ 2,500	$ 2,345	$ 2,500	$ 2,450	$ 2,500	$ 2,350	$ 2,500	$ 2,565	$ 2,565	$ 1,565
Manager	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 25,000
Audit of village development projects	$ 9,000	$ 9,100	$ 9,000	$ 9,100	$ 9,000	$ 9,000	$ 9,000	$ 9,000	$ 9,000	$ 3,000

Cook Stoves (10 per year)	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Oil/petrol/ for boats	$ 15,000	$ 14,590	$ 15,000	$ 15,103	$ 15,000	$ 14,985	$ 15,000	$ 14,998	$ 14,998	$ 8,998
Transportation equipment (boat rental to reach the project area)	$ 15,000	$ 16,230	$ 15,000	$ 16,543	$ 15,000	$ 15,234	$ 15,000	$ 14,980	$ 14,980	$ 6,720
Education/ Workers Teacher - go through project requirements, teach about alternative agro-forestry crops and interviews	$ 10,000	$ 9,800	$ 100,000	$ 9,930	$ 10,000	$ 9,990	$ 10,000	$ 9,954	$ 9,954	$ 5,000
TOTAL	**$ 487,500**	**$ 522,837**	**$ 507,500**	**$ 459,535**	**$ 418,000**	**$ 448,680**	**$ 418,510**	**$ 513,947**	**$ 504,526**	**$ 258,253**

Budget expenditures for the project, in the absence of carbon revenue, are far below what is needed for the effective protection and management of the area. Actual expenditures ranged from 30% to 35% of planned expenditures for the 2016-2020 (June 2020) period (analysis above in table 18). A “low end” estimates of required annual expenditure of US$418,000 far exceeds actual total annual expenditures for 2016-2020 (till date) of ~US$2,203,282 (Table 13, accounting data). As stated, the US$418,000 suggested budget is a low-end estimate - effective anti-poaching efforts at the project area costs the equivalent of 150 km^2 which would put the corresponding project budget requirement at approximately US$700,000. Not surprisingly, with so little financing available, most (>90%) of company expenditures currently go to core governance and administrative costs, and the remainder of only 15.7% is spent on resource management and protection imposing a further constraint on implementation of the REDD project.

Project is uniquely disadvantaged due to its remoteness and difficulty of access, and poor potential for photographic tourism; photo-tourism is a key determining factor in the few “strongly financially viable” forest areas in the state of Para in Brazil. Current project currently has no accommodation infrastructure to facilitate tourism. While PP currently has some hope to generate some revenue from VCS which is essential to achieve effective resource protection and effectively carry out the project REDD activity.

Compare annual budget spent from 2016-2019 destined for management of the project, to the estimated required annual budget of US$500,000 on an average; current revenue sources is “zero”. And as explained above, other activities like small scale agriculture, tourism revenue is expected to be zero without effective management and protection measures in place.

In conclusion it is demonstrated that a large amount of initial capital is required for the set-up of the Project.

As demonstrated above, the project without the financial benefits of VCS-related carbon payments is not financially competitive with reasonable alternative economic activities.

STEP 3. Barrier analysis

Not applicable.

STEP 4. Common practice analysis

The project activity, Alternative 2, involving sufficient financing and effective implementation of current REDD project is not a common practice. The clearly-demonstrated financial challenges of the PP are not peculiar to forest areas in Brazil. Most forest areas are not earning sufficient revenue to cover costs. Brazil needs compensation if it is to protect the Amazon.

An evaluation from National and Subnational Analysis for the Period 2009 through 2016 from a forest trend REDDX report says that ;

“More financial resources are needed. Over US$2.2 billion has been committed to the development of REDD+ activities in Brazil from 2009 through September 2016, and this helped Brazil to become a global leader in reducing its emissions from deforestation. But in order to continue this progress and meet its current and future deforestation reduction goals, they need to find additional resources that are predictable and can generate a large amount of resources for performance-based payments”.

Similarly, a recent evaluation of the financial viability of forests in Brazil (2016) assessed more than half of those forest types evaluated as “marginally viable” or “non-viable.”

Thus, a native amazon forest with sufficient financing for effective management and protection, in the absence of carbon revenue (or other as yet to be developed alternative revenue sources), cannot be characterized as a common practice.

[12](Andreea Leonte, 2019, https://www.ft.com/content/37179794-cef8-11e9-b018-ca4456540ea6.

Results of the Additionality Analysis:

As demonstrated, the project activity, without revenue from carbon credits, faces severe financial constraints, and is not a common practice in the region. Therefore, the project is determined to be additional.

3.1.6 Methodology Deviations

No Deviations

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

Development of the project baseline emissions from unplanned deforestation, both rate and location, was conducted in conformance with the VCS REDD methodology VM0015 Ver1.1.

Step 5 of VM0015 - Definition of the Component of Changes in Land Use and Coverage in the Baseline activity data calculation by forest class:

5.1 Calculation of baseline activity data per forest class

This calculation combined the maps (Figure 36) of annual baseline deforestation of each future year produced with the land-use and land-cover map (Figure 27) produced for the initial situation in Step 2 to produce a set of maps showing for each forest class the polygons that would be deforested each year in absence of the project activity. Were extract from these maps the number of hectares of each forest class that would be deforested and the results of the baseline projections showed a deforestation of approximately 563,638 in the reference region, 49,910 hectares in the Project Area between 2016 and 2045 and 513,729 hectares in the Leakage Belt.

Table 19. Annual areas deforested per forest class icl within the Project Area in the baseline case (Table 11b of VM0015)

		Total baseline deforestation in the reference region	
IDz >	1		
Name >	Zone 1	$ABSLRR_t$	*ABSLRR*
Project year *t*	ha	ha	ha
0	-	-	-
1	18,788	18,788	18,788
2	18,788	18,788	37,576
3	18,788	18,788	56,364
4	18,788	18,788	75,152
5	18,788	18,788	93,940
6	18,788	18,788	1,12,728
7	18,788	18,788	1,31,516
8	18,788	18,788	1,50,304
9	18,788	18,788	1,69,092
10	18,788	18,788	1,87,880
11	18,788	18,788	2,06,667
12	18,788	18,788	2,25,455
13	18,788	18,788	2,44,243
14	18,788	18,788	2,63,031
15	18,788	18,788	2,81,819
16	18,788	18,788	3,00,607

17	18,788	18,788	3,19,395
18	18,788	18,788	3,38,183
19	18,788	18,788	3,56,971
20	18,788	18,788	3,75,759
21	18,788	18,788	3,94,547
22	18,788	18,788	4,13,335
23	18,788	18,788	4,32,123
24	18,788	18,788	4,50,911
25	18,788	18,788	4,69,699
26	18,788	18,788	4,88,487
27	18,788	18,788	5,07,275
28	18,788	18,788	5,26,063
29	18,788	18,788	5,44,851
30	18,788	18,788	5,63,638

Table 20. Annual areas deforested per forest class icl within the Project Area in the baseline case (Table 11b of VM0015)

Area deforested per forest class *icl* within the project area		Total baseline deforestation in the project area	
ID_{icl}>	1		
Name >	Ombrophile Dense	annual	cumulative
Project year *t*	*ha*	$ABSLPA_t$ ha	*ABSLPA* ha
1	1,695.9	1,695.9	1,695.9
2	2,248.2	2,248.2	3,944.1
3	2,571.6	2,571.6	6,515.7
4	2,457.8	2,457.8	8,973.5
5	2,256.0	2,256.0	11,229.4

6	1,913.2	1,913.2	13,142.6
7	1,948.1	1,948.1	15,090.7
8	1,719.1	1,719.1	16,809.9
9	1,578.2	1,578.2	18,388.0
10	1,447.5	1,447.5	19,835.5
11	1,349.2	1,349.2	21,184.7
12	1,325.9	1,325.9	22,510.6
13	1,259.9	1,259.9	23,770.6
14	1,134.5	1,134.5	24,905.0
15	1,223.7	1,223.7	26,128.7
16	1,244.4	1,244.4	27,373.1
17	1,214.7	1,214.7	28,587.8
18	1,214.7	1,214.7	29,802.5
19	1,209.5	1,209.5	31,011.9
20	1,228.9	1,228.9	32,240.8
21	1,303.9	1,303.9	33,544.8
22	1,275.5	1,275.5	34,820.2
23	1,557.5	1,557.5	36,377.7
24	1,655.8	1,655.8	38,033.4
25	1,632.5	1,632.5	39,665.9
26	1,760.5	1,760.5	41,426.4
27	1,773.5	1,773.5	43,199.9
28	1,886.0	1,886.0	45,085.9
29	2,267.6	2,267.6	47,353.6
30	2,556.1	2,556.1	49,909.7

Table 21. Annual areas deforested per forest class icl within the Leakage Belt in the baseline case (Table 11c of VM0015)

Area deforested per forest class *icl* within the leakage belt		Total baseline deforestation in the leakage belt	
ID_{icl}>	1		
Name >	Ombrophile Dense	annual	cumulative
Project year *t*	*ha*	$ABSLLK_t$ ha	*ABSLLK* ha
1	17,092.1	17,092.1	17,092.1
2	16,539.7	16,539.7	33,631.8
3	16,216.3	16,216.3	49,848.2
4	16,330.2	16,330.2	66,178.3
5	16,532.0	16,532.0	82,710.3
6	16,874.8	16,874.8	99,585.1
7	16,839.8	16,839.8	1,16,424.9
8	17,068.8	17,068.8	1,33,493.7
9	17,209.8	17,209.8	1,50,703.5
10	17,340.4	17,340.4	1,68,044.0
11	17,438.8	17,438.8	1,85,482.7
12	17,462.0	17,462.0	2,02,944.8
13	17,528.0	17,528.0	2,20,472.8
14	17,653.5	17,653.5	2,38,126.3
15	17,564.2	17,564.2	2,55,690.5
16	17,543.5	17,543.5	2,73,234.1
17	17,573.3	17,573.3	2,90,807.3
18	17,573.3	17,573.3	3,08,380.6
19	17,578.5	17,578.5	3,25,959.1
20	17,559.1	17,559.1	3,43,518.2
21	17,484.0	17,484.0	3,61,002.2
22	17,512.5	17,512.5	3,78,514.7
23			

	17,230.5	17,230.5	3,95,745.2
24	17,132.2	17,132.2	4,12,877.4
25	17,155.5	17,155.5	4,30,032.8
26	17,027.4	17,027.4	4,47,060.3
27	17,014.5	17,014.5	4,64,074.7
28	16,901.9	16,901.9	4,80,976.7
29	16,520.3	16,520.3	4,97,497.0
30	16,231.9	16,231.9	5,13,728.8

5.2 Calculation of baseline activity data by post-deforestation class:

As available in methodology VM0015, method 1 was used to determine the substitute class of forest cover in the baseline of the Project (indicated as anthropic Vegetation in Balance). Table 22 shows the area of project zone, which comprises the Project area, the leakage belt and the leakage management areas, as well as the corresponding areas of each class of use and coverage after deforestation.

Table 22: Areas of the reference region covering different combinations of potential post deforestation classes.

Zone		Name		Total of all other LU/LC closes present in the zone		Total Area	
		Zone					
		ID_{fcl}	1				
		Area	% of Zone	Area	% of Zone	Area	% of Zone
Idz	Name	Ha	%	Ha	Ha	ha	%
1	Rio Anapu Pacaja	165,707	100	20,133.00	12.15%	165,707	100
Total Area per class fcl		165,707	100	20,133.00	12.15%	165,707	100

The reference region for rate of deforestation (RRD) has a total area of 1,991,227 ha and is delineated as shown in Figure 68. It excludes the project area and leakage belt, and all non-forested areas at the start of the historical reference period in the year 2005. Further, the reference region has been defined with knowledge of the drivers of unplanned deforestation in the region. A guiding principle in the delineation of the reference region was, to the extent possible within the requirements of the VM0015 methodology, to reflect political boundaries (districts), to facilitate any eventual alignment with an anticipated Government of Brazil jurisdictional REDD framework. The main agents of deforestation in the RRD are small scale farmers who intend on establishing croplands through conversion of forest land. The proportion of agriculturalist to ranchers is the same in the RRD as is expected in the project area in the baseline case. Landscape factors (i.e., soil type, vegetation type, elevation, and slope) do not drive agricultural decisions for small scale farmers. Maps of the landscape factors, including forest type, soil type, slope, and elevation that were used to help define the reference region and ensure similarity to the project area can be found in the project database. Incorporation of these landscape factors had little effect on delineating the RRD as almost all land in the RRD is suitable for conversion to agricultural land. Land tenure was also used to help delineate the RRD. Specifically, national parks, forest reserves, and game reserve were excluded from the RRD as these areas differ from the privately-owned project area. Comparison of the area covered by landscape factors, transportation networks and human infrastructure are detailed in the Table 23 below.

Figure 68**:** Reference Region for Rate (RRD) and Reference Region for Location (RRL)

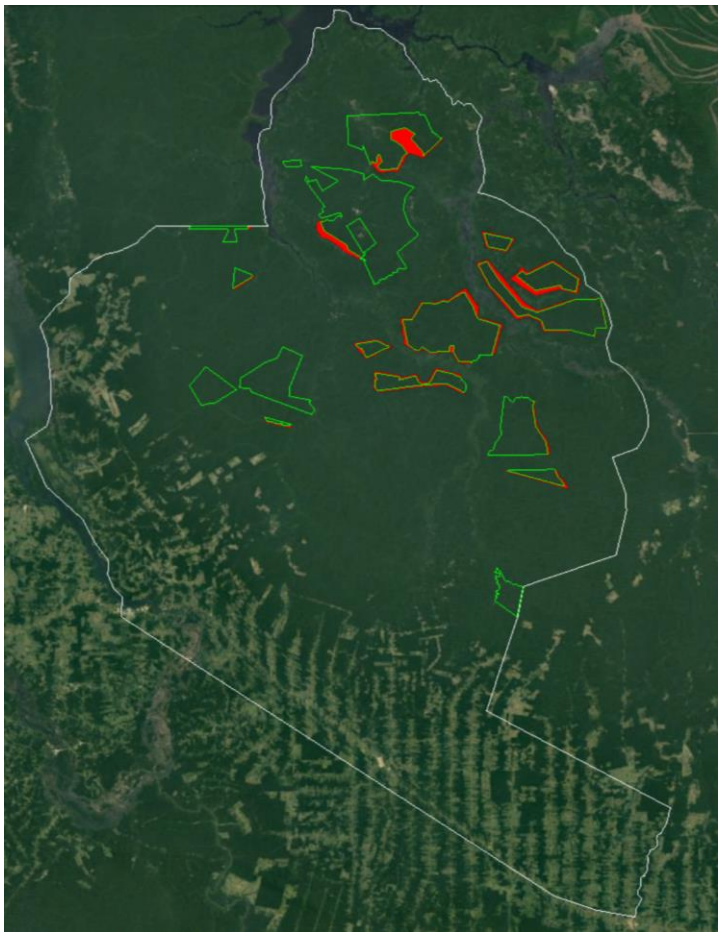


Table 23. Criteria for defining the boundary of the RRD and leakage belt.

Class Identifier		Broad class	Trend in Carbon stock[1]	Presence in[2]	Activities in the baseline case[3]		
ID_{cl}	Name				LG	FW	CP
001	Ombrofile Forest	Forest Land	decreasing	RR	yes	No	no
002	Grassland	Grassland	constant	RR	no	No	no
003	Cropland	Crop Land	constant	RR	no	No	no
004	Ombrofile Forest	Forest Land	decreasing	PA	yes	No	no
005	Grassland	Grassland	constant	PA	no	No	no
006	Cropland	Crop Land	constant	PA	no	No	no
007	Ombrofile Forest	Forest Land	decreasing	LK	yes	No	no
008	Grassland	Grassland	constant	LK	no	No	no
009	Cropland	Crop Land	constant	LK	no	No	no

The area of the RRD is larger than the minimum required (MREF). The MREF was calculated to be 1,991,227 ha. The reference region for projecting location of deforestation (RRL) is delineated as shown in Figure 69. The entire RRL is located within the outer perimeter of the RRD and has an area of 3,982,454 hectares. Conservation lands removed include national parks, forest reserves, and game reserves.

Figure 69. Forest/non-forest map, with the non-forest class

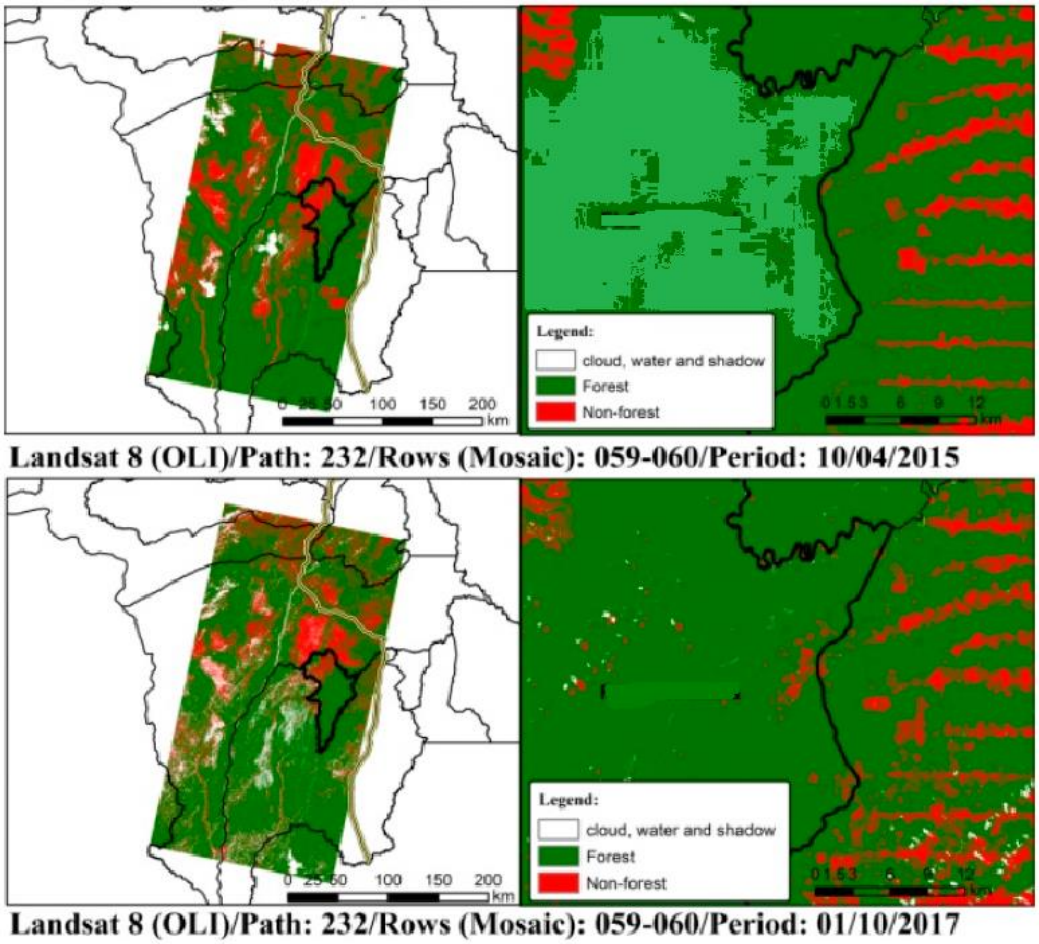


Table 24. Annual areas deforested in each zone within the Project Area in the baseline case (Table 13b of VM0015)

Area established after deforestation per zone within the project area		Total baseline deforestation in the project area	
IDz >	1		
Name >	Zone 1	$ABSLPA_t$	*ABSLPA*
Project year *t*	ha	ha	ha
0	0	0	0
1	1,696	1695.864851	1695.864851
2	2,248	2248.217476	3944.082328
3	2,572	2571.608943	6515.691271
4	2,458	2457.775147	8973.466418
5	2,256	2255.978872	11229.44529
6	1,913	1913.183917	13142.62921

7	1,948	1948.110195	15090.7394
8	1,719	1719.149037	16809.88844
9	1,578	1578.150357	18388.0388
10	1,448	1447.500205	19835.539
11	1,349	1349.189199	21184.7282
12	1,326	1325.905013	22510.63321
13	1,260	1259.933154	23770.56637
14	1,134	1134.457265	24905.02363
15	1,224	1223.71331	26128.73694
16	1,244	1244.410364	27373.14731
17	1,215	1214.658349	28587.80566
18	1,215	1214.658349	29802.464
19	1,209	1209.484085	31011.94809
20	1,229	1228.887573	32240.83566
21	1,304	1303.914394	33544.75006
22	1,275	1275.455945	34820.206
23	1,557	1557.453304	36377.65931
24	1,656	1655.764309	38033.42362
25	1,632	1632.480124	39665.90374
26	1,761	1760.543145	41426.44688
27	1,773	1773.478803	43199.92569
28	1,886	1886.019034	45085.94472
29	2,268	2267.620964	47353.56569
30	2,556	2556.086153	49909.65184

Table 25. Annual areas deforested in each zone within the Leakage Belt in the baseline case (Table 13c of VM0015)

IDz >	1	Total baseline deforestation in the leakage belt	
Name >	Zone 1	$ABSLLK_t$	*ABSLLK*
Project year *t*	ha	ha	ha
0		0	0
1	17092.09	17,092.09	17,092.09
2	16539.73	16,539.73	33,631.82
3	16216.34	16,216.34	49,848.16
4	16330.17	16,330.17	66,178.33
5	16531.97		

		16,531.97	82,710.30
6	16874.77	16,874.77	99,585.07
7	16839.84	16,839.84	1,16,424.91
8	17068.80	17,068.80	1,33,493.71
9	17209.80	17,209.80	1,50,703.51
10	17340.45	17,340.45	1,68,043.96
11	17438.76	17,438.76	1,85,482.72
12	17462.04	17,462.04	2,02,944.77
13	17528.02	17,528.02	2,20,472.78
14	17653.49	17,653.49	2,38,126.28
15	17564.24	17,564.24	2,55,690.51
16	17543.54	17,543.54	2,73,234.05
17	17573.29	17,573.29	2,90,807.34
18	17573.29	17,573.29	3,08,380.64
19	17578.47	17,578.47	3,25,959.10
20	17559.06	17,559.06	3,43,518.16
21	17484.04	17,484.04	3,61,002.20
22	17512.49	17,512.49	3,78,514.69
23	17230.50	17,230.50	3,95,745.19
24	17132.19	17,132.19	4,12,877.38
25	17155.47	17,155.47	4,30,032.85
26	17027.41	17,027.41	4,47,060.25
27	17014.47	17,014.47	4,64,074.72
28	16901.93	16,901.93	4,80,976.66
29	16520.33	16,520.33	4,97,496.98
30	16231.86	16,231.86	5,13,728.85

Table 26. Physical Boundaries of the project

Reference Region for Deforestation (RRD)	Area: 1,991,227 Ha Historical deforestation rate: 1.91% Vegetation: Ombrophilous Forest Elevation range: 0 to 150 m Average slope: 12 Annual average precipitation: 2000 mm Agents and drivers of deforestation: main agents of deforestation are cattle ranchers (98%) followed by smallscale farmers (2%) Land Tenure: both public and private lands Law enforcement on land tenure rights: weak.
Project Boundary (PB)	Refers to the total area under control of the Project Proposer and includes the Project Area and LMA Area: 182,210 Ha Agents and drivers of deforestation: small-scale Farmers, illegal logging, grazing and others Land Tenure: private lands Law enforcement on land tenure rights: weak.
Project Area (PA)	Forested land where GHG emission reduction benefits will be accounted. The Minimum Mapping Unit (MMU) was the Brazilian definition of Forest, which is 1ha with more than 30% forest cover, and 5 meters of tree height. Area: 165,707 Ha Vegetation: Ombrophilous Forest Elevation range: 0-40m Average slope: 6 Annual average precipitation: 2300 mm Land Tenure: private lands Law enforcement on land tenure rights: weak.
Leakage Belt (LK)	Cumulative of areas that presents the highest risk of deforestation due to displacement of deforestation agents by the Project Activities. Area: 16,503 Ha Agents and drivers of deforestation: illegal loggers, squatters, and small-scale farmers
Leakage Management Areas (LMA)	Non-forest areas within the PB. It is currently in these areas that local population and communities live and where the Project Activities will take place. Area: 16,503 Ha

Project Area:
The project area consists of one contiguous parcel of land near the Portel and other two municipalities of the Belem boundary in north east Brazil which is under threat of deforestation. The project proponents are undertaking project activities in and around the project area to mitigate deforestation pressures and stop deforestation. The total project area is 165,707hectares and was 100% forested at the start of the project. The project areas boundaries were delineated and georeferenced as part of the establishment of the REDD project.

Leakage Belt:

The leakage belt is the area surrounding or in the immediate vicinity of the project area where leakage caused by activity displacement is expected to occur. Parts of the leakage belt boundaries were

delineated and georeferenced were delineated and georeferenced as part of the establishment of the Rio Anapu-Pacaja REDD project, as the leakage belt shares a border with the project area. See Map 5 (leakage belt map)

5.3 Calculation of activity data by category of change in land use and land cover

Does not apply.

Step 6 of VM0015 - Estimation of Changes in Carbon Stocks and non-CO2 Emissions at Baseline

The estimate of the carbon stock for the Forest class was reached through forest inventory carried out by the technical team of Rio Anapu-Pacaja REDD proejct, in the year 2019. The main results found in this study will be described below,

6.1.1 Estimate of average carbon stock by land use class and change in land cover

The implementation of the forest inventory in the REDD project area adopted the recommendations presented in the VCS approved methodology VM0015, distributing the plots proportionally to the area of each typology and considering a uniform distribution of plots in the management area. Physical Parameters a total of 3 strata were identified in the Project area, which resulted in a total of 146 planned initial sample units. In addition, it was also considered an analysis for the plots implanted in managed areas and unmanaged areas. All plots were evenly distributed to cover much of the Project area.

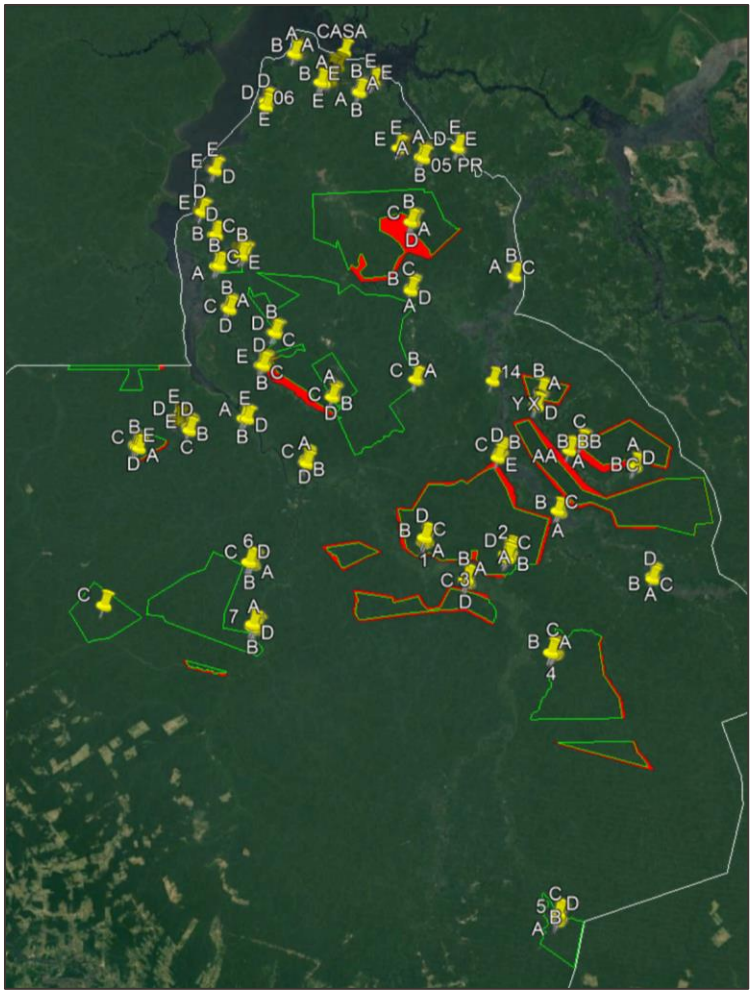
Average carbon stocks are estimated for:

1. the forest classes existing within the project area
2. the forest classes existing within the leakage belt
3. the post-deforestation classes projected to exist in the project area in the baseline case
4. the post-deforestation classes projected to exist in the leakage belt in the project case
5. the non-forest classes existing in leakage management areas

According to E. Tomppo et al. (eds.), National Forest Inventories (2010), the permanent plots may be have a circular, square or rectangular shape. However, the most used shape is the square in tropical forests. Based on this guideline, the inventory was carried out in 1-hectare square plots, as it was found that with this format and dimension it is possible to obtain greater representativity and less difficulty of operation.

For each plot, data will be collected from the arboreal stratum, collecting individuals with Diameter at the Chest Height (DCH) of more than 15 centimeters and for better ordering each plot was divided into subunits of 0.25 hectares. Each implemented plot received an identification plate with the unit number, this numbering was allocated at the start point of each plot, and was also done for the subunits (Figure 70).

Figure 70. Allocation of sample forest inventory units in the Project Area



Estimated Variables: Biomass and Carbon

Dry Biomass

The above-ground dry biomass of the Project area was estimated using allometric equations, and ten different models were tested (Chave et al., 2005; Tre allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia 145(1):87-99). All of them adopt the diameter above the soil (DCH> 10 cm) of the trees sampled as an independent variable, while others consider, in addition to the DCH, the basic density of the tree species. DCH values above the maximum value used for the development of the allometric equations tested were truncated to the maximum value. Basic wood density values were obtained from the Global Wood Density Database. Due to the fact that the database reports more than one density value per species, the average of the values reported by species for the Project region was preferably used.

For cases where this information was not present, the global averages of the values reported for the species were adopted. However, when species-specific values were not available, the average biomass of the arboreal genus was adopted, according to the standard procedure typically reported in the literature (IPCC default values). We emphasize that below-ground biomass is already included in the estimation. To quantify the biomass, we used the allometric equation described by Nogueira et al. (2008) (Euler MeloNogueira, 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories.

Forest Ecology and Management.256(11):1853-1867), showing more appropriate for the region of study. The following is a description of equation (23):

B = exp (-1.715 + 2.413*ln(DAP))

Where:

B: dry biomass (kg);

DCH: Diameter at Breast height (1.30cm):

Carbon Content

In accordance with the methodology VM0015, the carbon stocks were quantified in tons of carbon dioxide equivalent per hectare (tCO2-e ha-1). For calculations and conservatively, the estimated carbon stocks considered only the biomass reservoirs above and below the ground. The following equation was used for the conversion of the dry biomass into tCO2-e ha-1 based on the sampled trees and their respective plots and subplots (equation 24):

$$C_{i,j,k} = \sum_{i=1}^{N} \left(\frac{B_{i,j,k} \cdot (1+S) \cdot FC \cdot \left(\frac{44}{12}\right)}{1000} \right)$$

Where:
$B_{i,j,k}$: ton of dry biomass per hectare of tree *i* in plot *j* and sub plot *k;*
S: fraction of biomass below the ground in relation to B_i;
FC: fraction of biomass carbon.

The carbon fraction of biomass used for the calculations was 0.485, value reported by Silva (2007) and previously used in other REDD+ Projects implemented in the Brazilian Amazon. The proportion of below-ground biomass was estimated with the standard value reported by Nogueira et al. (2008), corresponding to 25.8% of above-ground biomass.

Sampling Effort

The sampling effort (number of plots to be implanted) was estimated according to the equation A3-1 of the methodology VM0015:

$$n = \frac{t_{st}^2 \cdot CV^2}{E^2 + \frac{t_{st}^2 \cdot CV^2}{N}}$$

Where:

t: value of the *t*-student table at the 95% confidence level;
E: maximum allowed value of sampling error (10%);
CV: coefficient of variation for biomass in tropical forests (%);
N: possible number of sample plots

Furthermore, VM0015 recommends the adoption of different strata in order to reduce sample effort in the area of carbon project. For this purpose, strata were tested based (1) on managed areas and unmanaged areas and (2) based on the different forest typologies present in the study area.

Number of Individuals

A total of 8,668 individuals species distributed in 376 species were identified in the 75 inventoried plots. The identified species that presented the greatest wealth were: *Breu vermelho* (4,90%), *Cariperana* (3,97%), *Mandioqueira escamosa* (1,56%) and *Cupiúba* (3,41%).

The 378 identified species are distributed in 58 families, in addition to 2 unidentified class, and the families that showed the greatest diversity were: Fabaceae (23.4%), Sapotaceae (6.5%), Lecythidaceae (7.3%) and Lauraceae (3.7%).

Carbon Stock

The adoption of a single stratum for the Project area is presented as the best sampling strategy for the biomass inventory. Still, this measure proves to be interesting in the context of the study because it tends to improve future calculations related to the baseline modelling of the REDD+ Project area.

For the estimation of the carbon stock an average final stock of total dry biomass 45,948 tCO2-e ha-1, was obtained, considering only one stratum. Considering the strata of forest typology, the typology that presented the highest carbon stock was the Montane Dense Ombrophilous Forest 604,545 tCO2-e ha-1.

Calculation of Reduced Emissions

For the determination of the reduced emissions, the estimated stock in the inventory should be multiplied by 3.6667 (44/12), due to the fact that 1 kg of C corresponds to 3.66667 kg of CO2 (mass of CO2 = 44 and the mass of C = 12; 44/12 = 3.66667). The average carbon values per hectare for each initial class of land use and cover considered for the baseline scenario present in the area of the project and leakage belt can be seen in the table below.

Table 27. Estimated values of carbon stocks per hectare of initial forest classes icl existing in the Project Area and Leakage Belt (Table 15a of VM0015)

Project year *t*	Initial forest class *icl*							
	Name:	1						
	IDicl							
	Average carbon stock per hectare ± 90% CI							
	***Cab*$_{icl}$**		***Cbb*$_{icl}$**		***Cl*$_{icl}$**		***Ctot*$_{cl}$**	
	C stock tCO$_2$e ha^{-1}	± 90% CI tCO$_2$e ha^{-1}	*C stock* tCO$_2$e ha^{-1}	± 90% CI tCO$_2$e ha^{-1}	*C stock* tCO$_2$e ha^{-1}	± 90% CI tCO$_2$e ha^{-1}	*C stock* tCO$_2$e ha^{-1}	± 90% CI tCO$_2$e ha^{-1}
0	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
1	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69

2	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
3	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
4	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
5	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
6	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
7	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
8	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
9	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
10	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
11	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
12	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
13	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
14	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
15	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
16	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
17	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
18	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
19	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
20	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
21	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
22	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
23	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
24	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
25	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
26	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
27	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
28	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
29	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
30	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69

Where:
Cab*icl* : Average equivalent carbon stock per hectare for the above-ground biomass reservoir for the initial forest class;

Cbb*icl* : Average equivalent carbon stock per hectare for the below-ground biomass reservoir for the initial forest class;

Cdw*icl* : Average equivalent carbon stock per hectare for the dead biomass reservoir for the initial forest class;
Ctot*icl* : Average carbon stock per hectare for the total biomass reservoir for the initial forest class.

Post-deforestation classes projected for the Project area and leakage belt in the baseline scenario and non-forest classes existing in the areas of leakage management

The methodology VM0015 (Section 6.1.1, page No. 62) allows the use of estimates from local studies, and thus a value of 60.1 tCO2e ha-1 was taken as reference for the carbon stock of the anthropic vegetation class in equilibrium, the class projected to exist in the project area and the leakage belt in the Project scenario. This estimation of carbon stock was obtained by Weighted average (by area obtained in Terra Class database):2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 6: Grassland, pg. 6.27, Table 6.4 (for Pasture: 76.1% of area) 2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 4: Forest Land, pg. 4.63, Table 4.12 (for Pasture with regeneration: 23.9% of area). Wanderlli & Fearnside, P.M. 2015. Deforestation soars in the Amazon. Nature 521:423), through a long-term study of the landscape and average vegetation composition in deforested areas of the Brazilian Amazon, which consists of a matrix composed of pastures, small-scale agriculture and secondary vegetation, usually found in a post-deforestation scenario in the Amazon.
[16]2006 IPCC Guidelines for National Greenhouse Gas Inventories

Wanderlli & Fearnside (2015) is a revised scientific literature and represents one of the most updated studies for the Brazilian Amazon on the carbon stock in deforested areas, satisfying the requirements of section 4.5.6 of the VCS Standard:

1. Data were not collected directly from primary sources;

2. The data were collected from secondary sources, by researchers from INPA (renowned research institute for the subject in Brazil), published by an international and reputed scientific journal (*Forest Ecology and Management*, 2015);

3. The data are from a period that accurately reflects the current practice available for the determination of carbon stock;

4. No sampling was applied on these data;

5. The data are available to the public through the website: http://www.ppginpa.eco.br/documents/teses_dissertacoes/wandelli-fearnside-2015-forcolman_Land-use-history-and-capoeira-growth.pdf. Accessed on June 18, 2018;

6. They are available for independent evaluation of VCSA and VVB;

7. The data are appropriate for the geographic scope of VM0015,

8. Expert review was not necessary;

9. Data are not maintained only in a central storage repository.

6.1.2 Calculation of the carbon stock change factors
The baseline scenario of the Project considers the changes in forest carbon stock replaced by a type of vegetation that may be areas of pasture, small-scale plantations or temporary and permanent agricultural crops. The requirements of the AFOLU VCS document require consideration of the carbon stock decay of carbon reservoirs in organic soil, above-ground biomass, below-ground biomass, litter, dead wood, and timber products.

To calculate this decay, VM0015 version 1.1 applies a linear function to account for the initial carbon stock decay for the initial forest class (icl) and an increase in the carbon stock in the class after deforestation (fcl). Table 28 show how the carbon stock change factor was calculated.

Year after deforestation	$\Delta C_{AB\,icl,t}$	$\Delta C_{BB\,icl,t}$	$\Delta C_{L\,icl,t}$

1	t*	-422.9	-9.47	-7.88
2	t*+1	0	-9.47	0
3	t*+2	0	-9.47	0
4	t*+3	0	-9.47	0
5	t*+4	0	-9.47	0
6	t*+5	0	-9.47	0
7	t*+6	0	-9.47	0
8	t*+7	0	-9.47	0
9	t*+8	0	-9.47	0
10	t*+9	0	-9.47	0
11	t*+10	0	0.00	0
12	t*+11	0	0.00	0
13	t*+12	0	0.00	0
14	t*+13	0	0.00	0
15	t*+14	0	0.00	0
16	t*+15	0	0.00	0
17	t*+16	0	0.00	0
18	t*+17	0	0.00	0
19	t*+18	0	0.00	0
20	t*+19	0	0.00	0
21	t*+20	0	0.00	0
22	t*+21	0	0.00	0
23	t*+22	0	0.00	0
24	t*+23	0	0.00	0
25	t*+24	0	0.00	0
26	t*+25	0	0.00	0
27	t*+26	0	0.00	0
28	t*+27	0	0.00	0
29	t*+28	0	0.00	0
30	t*+29	0	0.00	0

Table 29. Carbon stock change factor for forest class fcl or z zones (Method 1) (Table 20b of VM0015).

		Zone 1			
Year after deforestation		$\Delta C_{ab\ z,t}$	$\Delta C_{bb\ z,t}$	$\Delta C_{l\ z,t}$	$\Delta Tot_{z,t}$
1	t*	1.93	1.93	1.93	5.805
2	t*+1	1.93	1.93	1.93	5.805
3	t*+2	1.93	1.93	1.93	5.805
4	t*+3	1.93	1.93	1.93	5.805
5	t*+4	1.93	1.93	1.93	5.805
6	t*+5	1.93	1.93	1.93	5.805
7	t*+6	1.93	1.93	1.93	5.805
8	t*+7	1.93	1.93	1.93	5.805
9	t*+8	1.93	1.93	1.93	5.805
10	t*+9	0.00	0.00	0.00	0.00
11	t*+10	0.00	0.00	0.00	0.00
12	t*+11	0.00	0.00	0.00	0.00
13	t*+12	0.00	0.00	0.00	0.00
14	t*+13	0.00	0.00	0.00	0.00
15	t*+14	0.00	0.00	0.00	0.00
16	t*+15	0.00	0.00	0.00	0.00
17	t*+16	0.00	0.00	0.00	0.00
18	t*+17	0.00	0.00	0.00	0.00
19	t*+18	0.00	0.00	0.00	0.00
20	t*+19	0.00	0.00	0.00	0.00
21	t*+20	0.00	0.00	0.00	0.00
22	t*+21	0.00	0.00	0.00	0.00
23	t*+22	0.00	0.00	0.00	0.00
24	t*+23	0.00	0.00	0.00	0.00
25	t*+24	0.00	0.00	0.00	0.00
26	t*+25	0.00	0.00	0.00	0.00
27	t*+26	0.00	0.00	0.00	0.00
28	t*+27	0.00	0.00	0.00	0.00
29	t*+28	0.00	0.00	0.00	0.00
30	t*+29	0.00	0.00	0.00	0.00

6.1.3 Calculation of baseline changes in carbon stock:

For the calculation of the baseline changes in carbon stock of the Project area (Table 30) and

leakage belt (Table 31) for year t was used, Method 1 of VM0015 version 1.1, according to equation 10 on page 72 of VM0015 version 1.1. is used.

Table 30. Table 21.a.1. Baseline carbon stock change in the above-ground biomass in the reference region

Carbon stock changes in the above-ground biomass per initial forest class *icl*		Total carbon stock change in the above-ground biomass of the initial forest classes in the reference region		**Carbon stock changes in the above-ground biomass per post deforestation zone *z***			Total carbon stock change in the above-ground biomass of post-deforestation zones in the reference region		Total net carbon stock change in the above-ground biomass of the reference region	
ID icl> Name >	*1*	$\triangle Cab\ BSLRR_{icl,t}$ annual	$\triangle Cab\ BSLRR_{icl}$ cumulative	*ID iz>* Name >	*1*		$\triangle Cab\ BSLRR_{z,t}$ annual	$\triangle Cab\ BSLRR_{z}$ cumulative	$\triangle Cab\ BSLRR_{t}$ annual	$\triangle Cab\ BSLRR$ cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
-	-	-	-	-	-		-	-	-	-
1	(1,29,22,352)	(1,29,22,352)	(1,29,22,352)	1	36,352		36,352	36,352	(1,29,58,704)	(1,29,58,704)
2	(1,29,22,352)	(1,29,22,352)	(2,58,44,704)	2	36,352		36,352	72,703	(1,29,58,704)	(2,59,17,407)
3	(1,29,22,352)	(1,29,22,352)	(3,87,67,056)	3	36,352		36,352	1,09,055	(1,29,58,704)	(3,88,76,111)
4	(1,29,22,352)	(1,29,22,352)	(5,16,89,408)	4	36,352		36,352	1,45,406	(1,29,58,704)	(5,18,34,814)
5	(1,29,22,352)	(1,29,22,352)	(6,46,11,760)	5	36,352		36,352	1,81,758	(1,29,58,704)	(6,47,93,518)
6	(1,29,22,352)	(1,29,22,352)	(7,75,34,112)	6	36,352		36,352	2,18,109	(1,29,58,704)	(7,77,52,221)
7	(1,29,22,352)	(1,29,22,352)	(9,04,56,464)	7	36,352		36,352	2,54,461	(1,29,58,704)	(9,07,10,925)
8	(1,29,22,352)	(1,29,22,352)	(10,33,78,816)	8	36,352		36,352	2,90,812	(1,29,58,704)	(10,36,69,628)
9	(1,29,22,352)	(1,29,22,352)	(11,63,01,168)	9	36,352		36,352	3,27,164	(1,29,58,704)	(11,66,28,332)
10	(1,29,22,352)	(1,29,22,352)	(12,92,23,520)	10	36,352		36,352	3,63,516	(1,29,58,704)	(12,95,87,036)
11	(1,29,22,352)	(1,29,22,352)	(14,21,45,872)	11	36,352		36,352	3,99,867	(1,29,58,704)	(14,25,45,739)

12	(1,29,22,352)	(1,29,22,352)	(15,50,68,224)	12	36,352		36,352	4,36,219	(1,29,58,704)	(15,55,04,443)
13	(1,29,22,352)	(1,29,22,352)	(16,79,90,576)	13	36,352		36,352	4,72,570	(1,29,58,704)	(16,84,63,146)
14	(1,29,22,352)	(1,29,22,352)	(18,09,12,928)	14	36,352		36,352	5,08,922	(1,29,58,704)	(18,14,21,850)
15	(1,29,22,352)	(1,29,22,352)	(19,38,35,280)	15	36,352		36,352	5,45,273	(1,29,58,704)	(19,43,80,553)
16	(1,29,22,352)	(1,29,22,352)	(20,67,57,632)	16	36,352		36,352	5,81,625	(1,29,58,704)	(20,73,39,257)
17	(1,29,22,352)	(1,29,22,352)	(21,96,79,984)	17	36,352		36,352	6,17,976	(1,29,58,704)	(22,02,97,961)
18	(1,29,22,352)	(1,29,22,352)	(23,26,02,336)	18	36,352		36,352	6,54,328	(1,29,58,704)	(23,32,56,664)
19	(1,29,22,352)	(1,29,22,352)	(24,55,24,688)	19	36,352		36,352	6,90,679	(1,29,58,704)	(24,62,15,368)
20	(1,29,22,352)	(1,29,22,352)	(25,84,47,040)	20	36,352		36,352	7,27,031	(1,29,58,704)	(25,91,74,071)
21	(1,29,22,352)	(1,29,22,352)	(27,13,69,392)	21	36,352		36,352	7,63,383	(1,29,58,704)	(27,21,32,775)
22	(1,29,22,352)	(1,29,22,352)	(28,42,91,744)	22	36,352		36,352	7,99,734	(1,29,58,704)	(28,50,91,478)
23	(1,29,22,352)	(1,29,22,352)	(29,72,14,096)	23	36,352		36,352	8,36,086	(1,29,58,704)	(29,80,50,182)
24	(1,29,22,352)	(1,29,22,352)	(31,01,36,448)	24	36,352		36,352	8,72,437	(1,29,58,704)	(31,10,08,885)
25	(1,29,22,352)	(1,29,22,352)	(32,30,58,800)	25	36,352		36,352	9,08,789	(1,29,58,704)	(32,39,67,589)
26	(1,29,22,352)	(1,29,22,352)	(33,59,81,152)	26	36,352		36,352	9,45,140	(1,29,58,704)	(33,69,26,293)
27	(1,29,22,352)	(1,29,22,352)	(34,89,03,504)	27	36,352		36,352	9,81,492	(1,29,58,704)	(34,98,84,996)
28	(1,29,22,352)	(1,29,22,352)	(36,18,25,856)	28	36,352		36,352	10,17,843	(1,29,58,704)	(36,28,43,700)
29	(1,29,22,352)	(1,29,22,352)	(37,47,48,208)	29	36,352		36,352	10,54,195	(1,29,58,704)	(37,58,02,403)
30	(1,29,22,352)	(1,29,22,352)	(38,76,70,560)	30	36,352		36,352	10,90,547	(1,29,58,704)	(38,87,61,107)

Table 31. Table 21.a.2. Baseline carbon stock change in the below-ground biomass in the reference region

Carbon stock changes in the below-ground biomass per initial forest class *icl*		Total carbon stock change in the below-ground biomass of the initial forest classes in the reference region	
ID icl>	*1*	$\triangle Cab\ BSLRR_{icl,t}$	$\triangle Cab\ BSLRR_{icl}$
Name >		annual	cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e
0	-	-	-
1	(2,87,888)	(2,87,888)	(2,87,888)
2	(2,87,888)	(2,87,888)	(5,75,776)
3	(2,87,888)	(2,87,888)	(8,63,663)
4	(2,87,888)	(2,87,888)	(11,51,551)
5	(2,87,888)	(2,87,888)	(14,39,439)
6	(2,87,888)	(2,87,888)	(17,27,327)
7	(2,87,888)	(2,87,888)	(20,15,214)
8	(2,87,888)	(2,87,888)	(23,03,102)
9	(2,87,888)	(2,87,888)	(25,90,990)
10	(2,87,888)	(2,87,888)	(28,78,878)
11	(2,87,888)	(2,87,888)	(31,66,765)
12	(2,87,888)	(2,87,888)	(34,54,653)
13			

Carbon stock changes in the below-ground biomass per post deforestation zone *z*			Total carbon stock change in the below-ground biomass of post-deforestation zones in the reference region	
ID iz>	*1*		$\triangle Cab\ BSLRR_{z,t}$	$\triangle Cab\ BSLRR_{z}$
Name >			annual	cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
0	-		-	-
1	36,352		36,352	36,352
2	36,352		36,352	72,703
3	36,352		36,352	1,09,055
4	36,352		36,352	1,45,406
5	36,352		36,352	1,81,758
6	36,352		36,352	2,18,109
7	36,352		36,352	2,54,461
8	36,352		36,352	2,90,812
9	36,352		36,352	3,27,164
10	36,352		36,352	3,63,516
11	36,352		36,352	3,99,867
12	36,352		36,352	4,36,219
13				

Total net carbon stock change in the below-ground biomass of the reference region	
$\triangle Cab\ BSLRR_{t}$	$\triangle Cab\ BSLRR$
annual	cumulative
tCO_2-e	tCO_2-e
-	-
(2,51,536)	(2,51,536)
(2,51,536)	(5,03,072)
(2,51,536)	(7,54,609)
(2,51,536)	(10,06,145)
(2,51,536)	(12,57,681)
(2,51,536)	(15,09,217)
(2,51,536)	(17,60,753)
(2,51,536)	(20,12,290)
(2,51,536)	(22,63,826)
(2,51,536)	(25,15,362)
(2,51,536)	(27,66,898)
(2,51,536)	(30,18,434)

	(2,87,888)	(2,87,888)	(37,42,541)		36,352		36,352	4,72,570	(2,51,536)	(32,69,971)
14	(2,87,888)	(2,87,888)	(40,30,429)	14	36,352		36,352	5,08,922	(2,51,536)	(35,21,507)
15	(2,87,888)	(2,87,888)	(43,18,316)	15	36,352		36,352	5,45,273	(2,51,536)	(37,73,043)
16	(2,87,888)	(2,87,888)	(46,06,204)	16	36,352		36,352	5,81,625	(2,51,536)	(40,24,579)
17	(2,87,888)	(2,87,888)	(48,94,092)	17	36,352		36,352	6,17,976	(2,51,536)	(42,76,116)
18	(2,87,888)	(2,87,888)	(51,81,980)	18	36,352		36,352	6,54,328	(2,51,536)	(45,27,652)
19	(2,87,888)	(2,87,888)	(54,69,867)	19	36,352		36,352	6,90,679	(2,51,536)	(47,79,188)
20	(2,87,888)	(2,87,888)	(57,57,755)	20	36,352		36,352	7,27,031	(2,51,536)	(50,30,724)
21	(2,87,888)	(2,87,888)	(60,45,643)	21	36,352		36,352	7,63,383	(2,51,536)	(52,82,260)
22	(2,87,888)	(2,87,888)	(63,33,531)	22	36,352		36,352	7,99,734	(2,51,536)	(55,33,797)
23	(2,87,888)	(2,87,888)	(66,21,418)	23	36,352		36,352	8,36,086	(2,51,536)	(57,85,333)
24	(2,87,888)	(2,87,888)	(69,09,306)	24	36,352		36,352	8,72,437	(2,51,536)	(60,36,869)
25	(2,87,888)	(2,87,888)	(71,97,194)	25	36,352		36,352	9,08,789	(2,51,536)	(62,88,405)
26	(2,87,888)	(2,87,888)	(74,85,082)	26	36,352		36,352	9,45,140	(2,51,536)	(65,39,941)
27	(2,87,888)	(2,87,888)	(77,72,969)	27	36,352		36,352	9,81,492	(2,51,536)	(67,91,478)
28	(2,87,888)	(2,87,888)	(80,60,857)	28	36,352		36,352	10,17,843	(2,51,536)	(70,43,014)
29	(2,87,888)	(2,87,888)	(83,48,745)	29	36,352		36,352	10,54,195	(2,51,536)	(72,94,550)
30	(2,87,888)	(2,87,888)	(86,36,633)	30	36,352		36,352	10,90,547	(2,51,536)	(75,46,086)

6.2 Baseline of non-CO2 emissions from forest fires:

Non-CO2 emissions were not considered and accounted for the REDD+ Project. Data related to forest fires are unavailable and of insufficient accuracy, emissions from biomass burning are not considered. Emissions from fires used to clear forests in the baseline can always be omitted as per the methodology.

Total baseline emissions = 1,466,872 tCO_2e
Average baseline emissions = 48,896 tCO_2e

Project Emissions

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

Non-CO2 emissions were not considered and accounted for the Project.

7.1 Ex ante estimation of actual carbon stock changes

7.1.1 Ex ante estimation of actual carbon stock changes due to planned activities

The Project Area has a forest management plan within its limits, which follows all the current regulations, norms and laws, aiming at the forest exploitation in a conscious way through low impact activities that conserve and allow the development of natural regeneration and, consequently, biomass and carbon stocks.

The Project does not include planned deforestation, logging or fuel wood collection and charcoal production activities thus Tables 25a,b,c,d and 26a,b,c,d of the vm0015 methodology do not apply to the Project.

The Project does not account for soil organic carbon thus Tables 18a,b as well as Tables 9a,b,c of the VM0015 methodology do not apply to the Project. Project emissions occurring due to manmade conditions has been calculated and mentioned in the below table.

Table 32. Ex ante estimated actual carbon stock decrease due to manmade fires in the Project Area (Table 23 of Methodology VM0015)

Initial Forest Class		**Parameters**																
ID cl	Name	% $Fburnt_{icl}$	$tCO_2e\ ha^{-1}$ Cab	$tCO_2e\ ha^{-1}$ Cdw	$tCO_2e\ ha^{-1}$ Cl	% $Pburnt_{ab,icl}$	% $Pburnt_{dw,icl}$	% $Pburnt_{l,icl}$	% $CE_{ab,icl}$	% $CE_{dw,icl}$	% $CE_{l,icl}$	$tCO_2e\ ha^{-1}$ $ECO2\text{-}ab$	$tCO_2e\ ha^{-1}$ $ECO2\text{-}dw$	$tCO_2e\ ha^{-1}$ $ECO2\text{-}l$	$tCO_2e\ ha^{-1}$ $EBBCO2\text{-}tot$	$tCO_2e\ ha^{-1}$ $EBBnN2O_{icl}$	$tCO_2e\ ha^{-1}$ $EBBCH4_{icl}$	$tCO_2e\ ha^{-1}$ $EBBtot_{icl}$
1	Ombrofile Forest	96 %	-687.8	0	-7.9	96 %	0	100 %	0.5	0	0.5	-330.144	0	-3.95	-321	0	-29.4	-29.39

Above-ground biomass calculations for DBH < 10cm were performed using allometric equations as described below;

Above-ground biomass for a DBH ≥ 10cm was calculated using Overman's equation (Overman, Witte etal. 1994) (Johannes Petrus Maria Overman, Hendrik Johannes Louis Witte and Juan Guillermo Saldarriaga.1994.Journal of Tropical Ecology. 10(2):207-218) corrected for biomass moisture content. Overman's equation is presented below (Figure 37):

Figure 37: Original Overman's equation (Overman 1994)

No.	Regression model	Coefficient symbol	Coefficient value	Standard error	Width of 95% confidence interval	R^2	δB* (%)
1	$DW = \alpha DBH^{\beta}$	α	0.465	0.307	1.23	0.90	39.4
		β	2.202	0.151	0.61		

Araujo tested Overman's equation in a location 250Km from Belem in Para, obtaining predicted results within ±0.6% of the weight determined in the field (Araujo, Higuchi et al. 1999). Overman's equation used for our calculations is:

DB= α(DBH)β
DB= 0.465(DBH)2.202

Where:
Overman's coefficients: 0.465 and 2.202

Biomass results for 1 hectare of forest in the RRD, Project Area and Leakage Belt are showed in

Table 33: Carbon stocks per hectare of initial forest classes icl existing in the project area and leakage belt (Refer to Table 15.a – VM0015 methodology)

Project year *t*	Initial forest class *icl*							
	Name:	1						
	IDicl							
	Average carbon stock per hectare ± 90% CI							
	***Cab*$_{icl}$**		***Cbb*$_{icl}$**		***Cl*$_{icl}$**		***Ctot*$_{cl}$**	
	C stock	± 90% CI	*C stock*	± 90% CI	*C stock*	± 90% CI	*C stock*	± 90% CI
	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
1	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
2	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
3	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
4	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
5	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69

6	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
7	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
8	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
9	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
10	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
11	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
12	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
13	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
14	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
15	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
16	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
17	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
18	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
19	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
20	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
21	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
22	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
23	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
24	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
25	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
26	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
27	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
28	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
29	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
30	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69

Table 34: Values to be used after discounts for uncertainties (Refer to Table 15.b – VM0015 methodology)

Project year *t*	Initial forest class *icl*							
	Name:	1						
	IDicl							
	Average carbon stock per hectare ± 90% CI							
	***Cab*$_{icl}$**		***Cbb*$_{icl}$**		***Cl*$_{icl}$**		***Ctot*$_{cl}$**	
	C stock	*C stock change*	*C stock*	*C stock change*	*C stock*	*C stock change*	*C stock*	*C stock change*
	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
0	687.8		153.23		7.9		848.93	
1	687.8		153.23		7.9		848.93	
2	687.8		153.23		7.9		848.93	
3	687.8		153.23		7.9		848.93	

4	687.8		153.23		7.9		848.93	
5	687.8		153.23		7.9		848.93	
6	687.8		153.23		7.9		848.93	
7	687.8		153.23		7.9		848.93	
8	687.8		153.23		7.9		848.93	
9	687.8		153.23		7.9		848.93	
10	687.8		153.23		7.9		848.93	
11	687.8		153.23		7.9		848.93	
12	687.8		153.23		7.9		848.93	
13	687.8		153.23		7.9		848.93	
14	687.8		153.23		7.9		848.93	
15	687.8		153.23		7.9		848.93	
16	687.8		153.23		7.9		848.93	
17	687.8		153.23		7.9		848.93	
18	687.8		153.23		7.9		848.93	
19	687.8		153.23		7.9		848.93	
20	687.8		153.23		7.9		848.93	
21	687.8		153.23		7.9		848.93	
22	687.8		153.23		7.9		848.93	
23	687.8		153.23		7.9		848.93	
24	687.8		153.23		7.9		848.93	
25	687.8		153.23		7.9		848.93	
26	687.8		153.23		7.9		848.93	
27	687.8		153.23		7.9		848.93	
28	687.8		153.23		7.9		848.93	
29	687.8		153.23		7.9		848.93	
30	687.8		153.23		7.9		848.93	

Carbon stock in post-deforestation class was obtained from the default values from IPCC 2003. This value was increased in 75% to account for the highest boundary of the error range table 35:

Table 35: Long-term (20-years) average carbon stocks per hectare of post-deforestation LU/LC classes present in the reference region (Refer to Table 16 – VM0015 methodology)

Project year *t*	**Post deforestation class *fcl*** Name: Grassland; ID*fcl* 002 — **Average carbon stock per hectare ± 90% CI**							
	***Cab*$_{fcl}$**		***Cbb*$_{fcl}$**		***Cl*$_{fcl}$**		***Ctot*$_{fcl}$**	
	C stock $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$	*C stock* $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$	*C stock* $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$	*C stock* $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$
Average to be used in calculations							58.045	

As mentioned before the Project assumes only one Zone and one post-deforestation land-use class that is grassland Table 36:

Table 36: Long-term (20-years) area weighted average carbon stock per zone (Refer to Table 17 – VM0015 methodology)

Zone IDz	Name	**Post - deforestation LU/LC - classe *fcl*** Name: Cropland; ID *fcl* ´003 — ***Cab*$_{fcl}$** *C stock* $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$	***Cbb*$_{fcl}$** *C stock* $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$	***Cl*$_{fcl}$** *C stock* $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$	**Area weighted long-term (20 years average carbon stocks per zone *z*** ***Cab*$_z$** *C stock* $tCO_2e\ ha^{-1}$	***Cbb*$_z$** *C stock* $tCO_2e\ ha^{-1}$	***Cl*$_z$** *C stock* $tCO_2e\ ha^{-1}$	***Ctot* $_z$** *C stock* $tCO_2e\ ha^{-1}$
1	Zone 1										**58.045**

As a result, the net emissions per ha from LULC-change in the Project Area is 583.5 tCO2e/ha for Dense Forest and 573.6 tCO2e/ha for Degraded Forest.

Carbon stock changes factors calculated with Method 1 are presented below (Tables 37 and 38). Table 20c of the VM 0015 methodology does not apply to the Project because it is only used when carbon stock change factor is calculated using Method 2.

Because the IPCC 2003 value for carbon stock in Grassland is a total, the value was divided by three to account for above-ground, below-ground and litter carbon pools. All three pools are required to undertake linear decay over a 10-year period, so there is no mathematical difference in how the total carbon stock is allocated among these three pools (Table 32);

Table 37: Carbon stock change factors for initial forest classes icl (Refer to Table 20.a – VM0015 methodology)

Year after deforestation		$\Delta C_{AB\ icl,t}$	$\Delta C_{BB\ icl,t}$	$\Delta C_{L\ icl,t}$
1	t*	-687.8	-15.32	-7.9
2	t*+1	0	-15.32	0
3	t*+2	0	-15.32	0
4	t*+3	0	-15.32	0
5	t*+4	0	-15.32	0
6	t*+5	0	-15.32	0
7	t*+6	0	-15.32	0
8	t*+7	0	-15.32	0
9	t*+8	0	-15.32	0
10	t*+9	0	-15.32	0
11	t*+10	0	0.00	0
12	t*+11	0	0.00	0
13	t*+12	0	0.00	0
14	t*+13	0	0.00	0
15	t*+14	0	0.00	0
16	t*+15	0	0.00	0
17	t*+16	0	0.00	0
18	t*+17	0	0.00	0
19	t*+18	0	0.00	0
20	t*+19	0	0.00	0
21	t*+20	0	0.00	0
22	t*+21	0	0.00	0
23	t*+22	0	0.00	0
24	t*+23	0	0.00	0
25	t*+24	0	0.00	0
26	t*+25	0	0.00	0
27	t*+26	0	0.00	0
28	t*+27	0	0.00	0
29	t*+28	0	0.00	0
30	t*+29	0	0.00	0

Table 38: Carbon stock change factors for final forest classes icl (Refer to Table 20.b – VM0015 methodology)

		Zone 1			
Year after deforestation		$\Delta C_{ab\ z,t}$	$\Delta Cbb_{z,t}$	$\Delta Cl_{z,t}$	$\Delta Tot_{z,t}$
1	t*	1.93	1.93	1.93	5.805
2	t*+1	1.93	1.93	1.93	5.805
3	t*+2	1.93	1.93	1.93	5.805
4	t*+3	1.93	1.93	1.93	5.805
5	t*+4	1.93	1.93	1.93	5.805
6	t*+5	1.93	1.93	1.93	5.805
7	t*+6	1.93	1.93	1.93	5.805
8	t*+7	1.93	1.93	1.93	5.805
9	t*+8	1.93	1.93	1.93	5.805
10	t*+9	0.00	0.00	0.00	0.00
11	t*+10	0.00	0.00	0.00	0.00
12	t*+11	0.00	0.00	0.00	0.00
13	t*+12	0.00	0.00	0.00	0.00
14	t*+13	0.00	0.00	0.00	0.00
15	t*+14	0.00	0.00	0.00	0.00
16	t*+15	0.00	0.00	0.00	0.00
17	t*+16	0.00	0.00	0.00	0.00
18	t*+17	0.00	0.00	0.00	0.00
19	t*+18	0.00	0.00	0.00	0.00
20	t*+19	0.00	0.00	0.00	0.00
21	t*+20	0.00	0.00	0.00	0.00
22	t*+21	0.00	0.00	0.00	0.00
23	t*+22	0.00	0.00	0.00	0.00
24	t*+23	0.00	0.00	0.00	0.00
25	t*+24	0.00	0.00	0.00	0.00
26	t*+25	0.00	0.00	0.00	0.00
27	t*+26	0.00	0.00	0.00	0.00
28	t*+27	0.00	0.00	0.00	0.00
29	t*+28	0.00	0.00	0.00	0.00
30	t*+29	0.00	0.00	0.00	0.00

Baseline carbon stocks calculated with Method 1 for the RRD, Project Area and Leakage Belt are presented below (Tables 39, 40, 41, 42, 43, 44, 45, 46 and 47). Tables 22a,b,c of the vm0015 methodology do not apply to the Project because those are meant for baseline carbon stocks calculated with Method 2.

Table 39: Baseline carbon stock change in above-ground biomass in the reference region (Refer to Table 21.a.1 – VM0015 methodology)

Carbon stock changes in the above-ground biomass per initial forest class *icl*		Total carbon stock change in the above-ground biomass of the initial forest classes in the reference region		**Carbon stock changes in the above-ground biomass per post deforestation zone *z***			Total carbon stock change in the above-ground biomass of post-deforestation zones in the reference region		Total net carbon stock change in the above-ground biomass of the reference region	
ID icl>	*1*	$\triangle Cab\ BSLRR_{icl,t}$	$\triangle Cab\ BSLRR_{icl}$	*ID iz>*	*1*		$\triangle Cab\ BSLRR_{z,t}$	$\triangle Cab\ BSLRR_{z}$	$\triangle Cab\ BSLRR_{t}$	$\triangle Cab\ BSLRR$
Name >		annual	cumulative	Name >			annual	cumulative	annual	cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
-	-	-	-	-	-		-	-	-	-
1	(1,29,22,352)	(1,29,22,352)	(1,29,22,352)	1	36,352		36,352	36,352	(1,29,58,704)	(1,29,58,704)
2	(1,29,22,352)	(1,29,22,352)	(2,58,44,704)	2	36,352		36,352	72,703	(1,29,58,704)	(2,59,17,407)
3	(1,29,22,352)	(1,29,22,352)	(3,87,67,056)	3	36,352		36,352	1,09,055	(1,29,58,704)	(3,88,76,111)
4	(1,29,22,352)	(1,29,22,352)	(5,16,89,408)	4	36,352		36,352	1,45,406	(1,29,58,704)	(5,18,34,814)
5	(1,29,22,352)	(1,29,22,352)	(6,46,11,760)	5	36,352		36,352	1,81,758	(1,29,58,704)	(6,47,93,518)
6	(1,29,22,352)	(1,29,22,352)	(7,75,34,112)	6	36,352		36,352	2,18,109	(1,29,58,704)	(7,77,52,221)
7	(1,29,22,352)	(1,29,22,352)	(9,04,56,464)	7	36,352		36,352	2,54,461	(1,29,58,704)	(9,07,10,925)
8	(1,29,22,352)	(1,29,22,352)	(10,33,78,816)	8	36,352		36,352	2,90,812	(1,29,58,704)	(10,36,69,628)
9	(1,29,22,352)	(1,29,22,352)	(11,63,01,168)	9	36,352		36,352	3,27,164	(1,29,58,704)	(11,66,28,332)
10	(1,29,22,352)	(1,29,22,352)	(12,92,23,520)	10	36,352		36,352	3,63,516	(1,29,58,704)	(12,95,87,036)
11	(1,29,22,352)	(1,29,22,352)	(14,21,45,872)	11	36,352		36,352	3,99,867	(1,29,58,704)	(14,25,45,739)
12	(1,29,22,	(1,29,22,	(15,50,68,	12	36,3		36,3	4,36,21	(1,29,58,	(15,55,04,

	352)	352)	224)		52		52	9	704)	443)
13	(1,29,22,352)	(1,29,22,352)	(16,79,90,576)	13	36,352		36,352	4,72,570	(1,29,58,704)	(16,84,63,146)
14	(1,29,22,352)	(1,29,22,352)	(18,09,12,928)	14	36,352		36,352	5,08,922	(1,29,58,704)	(18,14,21,850)
15	(1,29,22,352)	(1,29,22,352)	(19,38,35,280)	15	36,352		36,352	5,45,273	(1,29,58,704)	(19,43,80,553)
16	(1,29,22,352)	(1,29,22,352)	(20,67,57,632)	16	36,352		36,352	5,81,625	(1,29,58,704)	(20,73,39,257)
17	(1,29,22,352)	(1,29,22,352)	(21,96,79,984)	17	36,352		36,352	6,17,976	(1,29,58,704)	(22,02,97,961)
18	(1,29,22,352)	(1,29,22,352)	(23,26,02,336)	18	36,352		36,352	6,54,328	(1,29,58,704)	(23,32,56,664)
19	(1,29,22,352)	(1,29,22,352)	(24,55,24,688)	19	36,352		36,352	6,90,679	(1,29,58,704)	(24,62,15,368)
20	(1,29,22,352)	(1,29,22,352)	(25,84,47,040)	20	36,352		36,352	7,27,031	(1,29,58,704)	(25,91,74,071)
21	(1,29,22,352)	(1,29,22,352)	(27,13,69,392)	21	36,352		36,352	7,63,383	(1,29,58,704)	(27,21,32,775)
22	(1,29,22,352)	(1,29,22,352)	(28,42,91,744)	22	36,352		36,352	7,99,734	(1,29,58,704)	(28,50,91,478)
23	(1,29,22,352)	(1,29,22,352)	(29,72,14,096)	23	36,352		36,352	8,36,086	(1,29,58,704)	(29,80,50,182)
24	(1,29,22,352)	(1,29,22,352)	(31,01,36,448)	24	36,352		36,352	8,72,437	(1,29,58,704)	(31,10,08,885)
25	(1,29,22,352)	(1,29,22,352)	(32,30,58,800)	25	36,352		36,352	9,08,789	(1,29,58,704)	(32,39,67,589)
26	(1,29,22,352)	(1,29,22,352)	(33,59,81,152)	26	36,352		36,352	9,45,140	(1,29,58,704)	(33,69,26,293)
27	(1,29,22,352)	(1,29,22,352)	(34,89,03,504)	27	36,352		36,352	9,81,492	(1,29,58,704)	(34,98,84,996)
28	(1,29,22,352)	(1,29,22,352)	(36,18,25,856)	28	36,352		36,352	10,17,843	(1,29,58,704)	(36,28,43,700)
29	(1,29,22,352)	(1,29,22,352)	(37,47,48,208)	29	36,352		36,352	10,54,195	(1,29,58,704)	(37,58,02,403)
30	(1,29,22,352)	(1,29,22,352)	(38,76,70,560)	30	36,352		36,352	10,90,547	(1,29,58,704)	(38,87,61,107)

Table 40: Baseline carbon stock change in below-ground biomass in the reference region (Refer to Table 21.a.2 – VM0015 methodology)

Carbon stock changes in the below-ground biomass per initial forest class *icl*		Total carbon stock change in the below-ground biomass of the initial forest classes in the reference region		**Carbon stock changes in the below-ground biomass per post deforestation zone *z***			Total carbon stock change in the below-ground biomass of post-deforestation zones in the reference region		Total net carbon stock change in the below-ground biomass of the reference region	
ID icl> Name >	*1*	$\triangle Cab\ BSLRR_{icl,t}$ annual	$\triangle Cab\ BSLRR_{icl}$ cumulative	*ID iz*> Name >	*1*		$\triangle Cab\ BSLRR_{z,t}$ annual	$\triangle Cab\ BSLRR_{z}$ cumulative	$\triangle Cab\ BSLRR_{t}$ annual	$\triangle Cab\ BSLRR$ cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
0	-	-	-	0	-		-	-	-	-
1	(2,87,888)	(2,87,888)	(2,87,888)	1	36,352		36,352	36,352	(2,51,536)	(2,51,536)
2	(2,87,888)	(2,87,888)	(5,75,776)	2	36,352		36,352	72,703	(2,51,536)	(5,03,072)
3	(2,87,888)	(2,87,888)	(8,63,663)	3	36,352		36,352	1,09,055	(2,51,536)	(7,54,609)
4	(2,87,888)	(2,87,888)	(11,51,551)	4	36,352		36,352	1,45,406	(2,51,536)	(10,06,145)
5	(2,87,888)	(2,87,888)	(14,39,439)	5	36,352		36,352	1,81,758	(2,51,536)	(12,57,681)
6	(2,87,888)	(2,87,888)	(17,27,327)	6	36,352		36,352	2,18,109	(2,51,536)	(15,09,217)
7	(2,87,888)	(2,87,888)	(20,15,214)	7	36,352		36,352	2,54,461	(2,51,536)	(17,60,753)
8	(2,87,888)	(2,87,888)	(23,03,102)	8	36,352		36,352	2,90,812	(2,51,536)	(20,12,290)
9	(2,87,888)	(2,87,888)	(25,90,990)	9	36,352		36,352	3,27,164	(2,51,536)	(22,63,826)
10	(2,87,888)	(2,87,888)	(28,78,878)	10	36,352		36,352	3,63,516	(2,51,536)	(25,15,362)
11	(2,87,888)	(2,87,888)	(31,66,765)	11	36,352		36,352	3,99,867	(2,51,536)	(27,66,898)
12				12						

	(2,87,888)	(2,87,888)	(34,54,653)		36,352		36,352	4,36,219	(2,51,536)	(30,18,434)
13	(2,87,888)	(2,87,888)	(37,42,541)	13	36,352		36,352	4,72,570	(2,51,536)	(32,69,971)
14	(2,87,888)	(2,87,888)	(40,30,429)	14	36,352		36,352	5,08,922	(2,51,536)	(35,21,507)
15	(2,87,888)	(2,87,888)	(43,18,316)	15	36,352		36,352	5,45,273	(2,51,536)	(37,73,043)
16	(2,87,888)	(2,87,888)	(46,06,204)	16	36,352		36,352	5,81,625	(2,51,536)	(40,24,579)
17	(2,87,888)	(2,87,888)	(48,94,092)	17	36,352		36,352	6,17,976	(2,51,536)	(42,76,116)
18	(2,87,888)	(2,87,888)	(51,81,980)	18	36,352		36,352	6,54,328	(2,51,536)	(45,27,652)
19	(2,87,888)	(2,87,888)	(54,69,867)	19	36,352		36,352	6,90,679	(2,51,536)	(47,79,188)
20	(2,87,888)	(2,87,888)	(57,57,755)	20	36,352		36,352	7,27,031	(2,51,536)	(50,30,724)
21	(2,87,888)	(2,87,888)	(60,45,643)	21	36,352		36,352	7,63,383	(2,51,536)	(52,82,260)
22	(2,87,888)	(2,87,888)	(63,33,531)	22	36,352		36,352	7,99,734	(2,51,536)	(55,33,797)
23	(2,87,888)	(2,87,888)	(66,21,418)	23	36,352		36,352	8,36,086	(2,51,536)	(57,85,333)
24	(2,87,888)	(2,87,888)	(69,09,306)	24	36,352		36,352	8,72,437	(2,51,536)	(60,36,869)
25	(2,87,888)	(2,87,888)	(71,97,194)	25	36,352		36,352	9,08,789	(2,51,536)	(62,88,405)
26	(2,87,888)	(2,87,888)	(74,85,082)	26	36,352		36,352	9,45,140	(2,51,536)	(65,39,941)
27	(2,87,888)	(2,87,888)	(77,72,969)	27	36,352		36,352	9,81,492	(2,51,536)	(67,91,478)
28	(2,87,888)	(2,87,888)	(80,60,857)	28	36,352		36,352	10,17,843	(2,51,536)	(70,43,014)
29	(2,87,888)	(2,87,888)	(83,48,745)	29	36,352		36,352	10,54,195	(2,51,536)	(72,94,550)
30	(2,87,888)	(2,87,888)	(86,36,633)	30	36,352		36,352	10,90,547	(2,51,536)	(75,46,086)

Table 41: Baseline carbon stock change in litter biomass in the reference region (Refer to Table

21.a.3 – VM0015 methodology)

Carbon stock changes in litter per initial forest class *icl*		Total carbon stock change in litter of the initial forest classes in the reference region		**Carbon stock changes in litter per post deforestation zone *z***			Total carbon stock change in litter of post-deforestation zones in the reference region		Total net carbon stock change in litter of the reference region	
ID icl> Name >	*1*	$\triangle Cab\ BSLRR_{icl,t}$ annual	$\triangle Cab\ BSLRR_{icl}$ cumulative	*ID iz>* Name >	*1*		$\triangle Cab\ BSLRR_{z,t}$ annual	$\triangle Cab\ BSLRR_{z}$ cumulative	$\triangle Cab\ BSLRR_{t}$ annual	$\triangle Cab\ BSLRR$ cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
0	0	0	0	0	0		0	0	0	0
1	(1,48,425)	(1,48,425)	(1,48,425)	1	36,352		36,352	36,352	(1,12,073)	(1,12,073)
2	(1,48,425)	(1,48,425)	(2,96,850)	2	36,352		36,352	72,703	(1,12,073)	(2,24,147)
3	(1,48,425)	(1,48,425)	(4,45,274)	3	36,352		36,352	1,09,055	(1,12,073)	(3,36,220)
4	(1,48,425)	(1,48,425)	(5,93,699)	4	36,352		36,352	1,45,406	(1,12,073)	(4,48,293)
5	(1,48,425)	(1,48,425)	(7,42,124)	5	36,352		36,352	1,81,758	(1,12,073)	(5,60,366)
6	(1,48,425)	(1,48,425)	(8,90,549)	6	36,352		36,352	2,18,109	(1,12,073)	(6,72,440)
7	(1,48,425)	(1,48,425)	(10,38,974)	7	36,352		36,352	2,54,461	(1,12,073)	(7,84,513)
8	(1,48,425)	(1,48,425)	(11,87,398)	8	36,352		36,352	2,90,812	(1,12,073)	(8,96,586)
9	(1,48,425)	(1,48,425)	(13,35,823)	9	36,352		36,352	3,27,164	(1,12,073)	(10,08,659)
10	(1,48,425)	(1,48,425)	(14,84,248)	10	36,352		36,352	3,63,516	(1,12,073)	(11,20,733)
11	(1,48,425)	(1,48,425)	(16,32,673)	11	36,352		36,352	3,99,867	(1,12,073)	(12,32,806)
12	(1,48,425)	(1,48,425)	(17,81,098)	12	36,352		36,352	4,36,219	(1,12,073)	(13,44,879)
13	(1,48,42	(1,48,42	(19,29,52	13	36,35		36,35	4,72,570	(1,12,07	(14,56,95

	5)	5)	2)		2		2		3)	2)
14	(1,48,425)	(1,48,425)	(20,77,947)	14	36,352		36,352	5,08,922	(1,12,073)	(15,69,026)
15	(1,48,425)	(1,48,425)	(22,26,372)	15	36,352		36,352	5,45,273	(1,12,073)	(16,81,099)
16	(1,48,425)	(1,48,425)	(23,74,797)	16	36,352		36,352	5,81,625	(1,12,073)	(17,93,172)
17	(1,48,425)	(1,48,425)	(25,23,222)	17	36,352		36,352	6,17,976	(1,12,073)	(19,05,245)
18	(1,48,425)	(1,48,425)	(26,71,646)	18	36,352		36,352	6,54,328	(1,12,073)	(20,17,319)
19	(1,48,425)	(1,48,425)	(28,20,071)	19	36,352		36,352	6,90,679	(1,12,073)	(21,29,392)
20	(1,48,425)	(1,48,425)	(29,68,496)	20	36,352		36,352	7,27,031	(1,12,073)	(22,41,465)
21	(1,48,425)	(1,48,425)	(31,16,921)	21	36,352		36,352	7,63,383	(1,12,073)	(23,53,538)
22	(1,48,425)	(1,48,425)	(32,65,346)	22	36,352		36,352	7,99,734	(1,12,073)	(24,65,612)
23	(1,48,425)	(1,48,425)	(34,13,771)	23	36,352		36,352	8,36,086	(1,12,073)	(25,77,685)
24	(1,48,425)	(1,48,425)	(35,62,195)	24	36,352		36,352	8,72,437	(1,12,073)	(26,89,758)
25	(1,48,425)	(1,48,425)	(37,10,620)	25	36,352		36,352	9,08,789	(1,12,073)	(28,01,831)
26	(1,48,425)	(1,48,425)	(38,59,045)	26	36,352		36,352	9,45,140	(1,12,073)	(29,13,905)
27	(1,48,425)	(1,48,425)	(40,07,470)	27	36,352		36,352	9,81,492	(1,12,073)	(30,25,978)
28	(1,48,425)	(1,48,425)	(41,55,895)	28	36,352		36,352	10,17,843	(1,12,073)	(31,38,051)
29	(1,48,425)	(1,48,425)	(43,04,319)	29	36,352		36,352	10,54,195	(1,12,073)	(32,50,124)
30	(1,48,425)	(1,48,425)	(44,52,744)	30	36,352		36,352	10,90,547	(1,12,073)	(33,62,198)

Table 42: Baseline carbon stock change in above-ground biomass in the project area (Refer to Table 21.b.1 – VM0015 methodology)

Carbon stock changes in the above-ground biomass per initial forest class *icl*		Total carbon stock change in the above-ground biomass of the initial forest classes in the project area	
ID icl>	*1*	$\triangle Cab\ BSLPA_{icl,t}$	$\triangle Cab\ BSLPA_{icl}$
Name >		annual	cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e
0	0	0	0
1	(11,66,416)	(11,66,416)	(11,66,416)
2	(15,46,324)	(15,46,324)	(27,12,740)
3	(17,68,753)	(17,68,753)	(44,81,492)
4	(16,90,458)	(16,90,458)	(61,71,950)
5	(15,51,662)	(15,51,662)	(77,23,612)
6	(13,15,888)	(13,15,888)	(90,39,500)
7	(13,39,910)	(13,39,910)	(1,03,79,411)
8	(11,82,431)	(11,82,431)	(1,15,61,841)
9	(10,85,452)	(10,85,452)	(1,26,47,293)
10	(9,95,591)	(9,95,591)	(1,36,42,884)
11	(9,27,972)	(9,27,972)	(1,45,70,856)
12	(9,11,957)	(9,11,957)	(1,54,82,814)
13	(8,66,582)	(8,66,582)	(1,63,49,396)
14	(7,80,280)	(7,80,280)	(1,71,29,675)

Carbon stock changes in the above-ground biomass per post-deforestation zone *z*		Total carbon stock change in the above-ground biomass of post-deforestation zones in the project area	
ID iz>	*1*	$\triangle Cab\ BSLPA_{z,t}$	$\triangle Cab\ BSLPA_{z}$
Name >		annual	cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e
0	0	0	0
1	-	-	-
2	3,281	3,281	3,281
3	7,631	7,631	10,912
4	12,607	12,607	23,519
5	17,362	17,362	40,881
6	21,727	21,727	62,608
7	25,429	25,429	88,037
8	29,198	29,198	1,17,235
9	32,524	32,524	1,49,760
10	35,578	35,578	1,85,337
11	38,378	38,378	2,23,716
12	40,989	40,989	2,64,705
13	43,554	43,554	3,08,259
14	45,992	45,992	3,54,251

Total net carbon stock change in the above-ground biomass of the project area	
$\triangle Cab\ BSLPA_{t}$	$\triangle Cab\ BSLPA$
annual	cumulative
tCO_2-e	tCO_2-e
0	0
(11,66,416)	(11,66,416)
(15,49,605)	(27,16,021)
(17,76,384)	(44,92,405)
(17,03,065)	(61,95,469)
(15,69,024)	(77,64,494)
(13,37,615)	(91,02,109)
(13,65,339)	(1,04,67,448)
(12,11,629)	(1,16,79,077)
(11,17,976)	(1,27,97,053)
(10,31,168)	(1,38,28,221)
(9,66,351)	(1,47,94,572)
(9,52,946)	(1,57,47,518)
(9,10,136)	(1,66,57,655)
(8,26,272)	(1,74,83,926)

15	(8,41,670)	(8,41,670)	(1,79,71,345)	15	48,187	48,187	4,02,438	(8,89,857)	(1,83,73,784)
16	(8,55,905)	(8,55,905)	(1,88,27,251)	16	50,555	50,555	4,52,993	(9,06,460)	(1,92,80,244)
17	(8,35,442)	(8,35,442)	(1,96,62,693)	17	52,962	52,962	5,05,955	(8,88,404)	(2,01,68,648)
18	(8,35,442)	(8,35,442)	(2,04,98,135)	18	55,313	55,313	5,61,268	(8,90,755)	(2,10,59,403)
19	(8,31,883)	(8,31,883)	(2,13,30,018)	19	57,663	57,663	6,18,931	(8,89,546)	(2,19,48,949)
20	(8,45,229)	(8,45,229)	(2,21,75,247)	20	60,003	60,003	6,78,934	(9,05,232)	(2,28,54,181)
21	(8,96,832)	(8,96,832)	(2,30,72,079)	21	62,381	62,381	7,41,315	(9,59,213)	(2,38,13,394)
22	(8,77,259)	(8,77,259)	(2,39,49,338)	22	64,904	64,904	8,06,218	(9,42,162)	(2,47,55,556)
23	(10,71,216)	(10,71,216)	(2,50,20,554)	23	67,371	67,371	8,73,589	(11,38,588)	(2,58,94,143)
24	(11,38,835)	(11,38,835)	(2,61,59,389)	24	70,385	70,385	9,43,974	(12,09,219)	(2,71,03,363)
25	(11,22,820)	(11,22,820)	(2,72,82,209)	25	73,588	73,588	10,17,562	(11,96,408)	(2,82,99,771)
26	(12,10,902)	(12,10,902)	(2,84,93,110)	26	76,747	76,747	10,94,309	(12,87,648)	(2,95,87,419)
27	(12,19,799)	(12,19,799)	(2,97,12,909)	27	80,153	80,153	11,74,463	(12,99,952)	(3,08,87,371)
28	(12,97,204)	(12,97,204)	(3,10,10,113)	28	83,585	83,585	12,58,047	(13,80,789)	(3,22,68,160)
29	(15,59,670)	(15,59,670)	(3,25,69,782)	29	87,234	87,234	13,45,281	(16,46,903)	(3,39,15,063)
30	(17,58,076)	(17,58,076)	(3,43,27,859)	30	91,621	91,621	14,36,902	(18,49,697)	(3,57,64,761)

Table 43: Baseline carbon stock change in below-ground biomass in the project area (Refer to Table 21.b.2 – VM0015 methodology)

Carbon stock changes in the below-ground biomass per initial forest class *icl*		Total carbon stock change in the below-ground biomass of the initial forest classes in the project area	
ID icl> Name >	*1*	$\triangle Cab\ BSLPA_{icl,t}$ annual	$\triangle Cab\ BSLPA_{icl}$ cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e
0	0	0	0
1	(25,986)	(25,986)	(25,986)
2	(60,435)	(60,435)	(86,421)
3	(99,840)	(99,840)	(1,86,261)
4	(1,37,500)	(1,37,500)	(3,23,761)
5	(1,72,069)	(1,72,069)	(4,95,830)
6	(2,01,385)	(2,01,385)	(6,97,215)
7	(2,31,235)	(2,31,235)	(9,28,450)
8	(2,57,578)	(2,57,578)	(11,86,028)
9	(2,81,760)	(2,81,760)	(14,67,788)
10	(3,03,940)	(3,03,940)	(17,71,728)
11	(3,24,614)	(3,24,614)	(20,96,341)
12	(3,44,930)	(3,44,930)	(24,41,272)
13	(3,64,236)	(3,64,236)	(28,05,508)
14	(3,81,620)	(3,81,620)	(31,87,128)
15	(4,00,371)	(4,00,371)	(35,87,498)
16			

Carbon stock changes in the below-ground biomass per post-deforestation zone *z*		Total carbon stock change in the below-ground biomass of post-deforestation zones in the project area	
ID iz> Name >	*1*	$\triangle Cab\ BSLPA_{z,t}$ annual	$\triangle Cab\ BSLPA_{z}$ cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e
0	0	0	0
1	-	-	-
2	3,281	3,281	3,281
3	7,631	7,631	10,912
4	12,607	12,607	23,519
5	17,362	17,362	40,881
6	21,727	21,727	62,608
7	25,429	25,429	88,037
8	29,198	29,198	1,17,235
9	32,524	32,524	1,49,760
10	35,578	35,578	1,85,337
11	38,378	38,378	2,23,716
12	40,989	40,989	2,64,705
13	43,554	43,554	3,08,259
14	45,992	45,992	3,54,251
15	48,187	48,187	4,02,438
16			

Total net carbon stock change in the below-ground biomass of the project area	
$\triangle Cab\ BSLPA_{t}$ annual	$\triangle Cab\ BSLPA$ cumulative
tCO_2-e	tCO_2-e
0	0
(25,986)	(25,986)
(57,154)	(83,140)
(92,209)	(1,75,348)
(1,24,894)	(3,00,242)
(1,54,707)	(4,54,949)
(1,79,657)	(6,34,606)
(2,05,807)	(8,40,413)
(2,28,380)	(10,68,793)
(2,49,236)	(13,18,028)
(2,68,362)	(15,86,390)
(2,86,235)	(18,72,626)
(3,03,942)	(21,76,567)
(3,20,682)	(24,97,249)
(3,35,628)	(28,32,877)
(3,52,184)	(31,85,060)

	(4,19,439)	(4,19,439)	(40,06,937)		50,555	50,555	4,52,993	(3,68,884)	(35,53,944)
17	(4,38,051)	(4,38,051)	(44,44,988)	17	52,962	52,962	5,05,955	(3,85,088)	(39,39,033)
18	(4,56,663)	(4,56,663)	(49,01,651)	18	55,313	55,313	5,61,268	(4,01,351)	(43,40,383)
19	(4,75,196)	(4,75,196)	(53,76,847)	19	57,663	57,663	6,18,931	(4,17,533)	(47,57,917)
20	(4,94,026)	(4,94,026)	(58,70,874)	20	60,003	60,003	6,78,934	(4,34,023)	(51,91,940)
21	(5,14,006)	(5,14,006)	(63,84,880)	21	62,381	62,381	7,41,315	(4,51,626)	(56,43,565)
22	(5,33,550)	(5,33,550)	(69,18,430)	22	64,904	64,904	8,06,218	(4,68,647)	(61,12,212)
23	(5,57,415)	(5,57,415)	(74,75,845)	23	67,371	67,371	8,73,589	(4,90,044)	(66,02,256)
24	(5,82,786)	(5,82,786)	(80,58,631)	24	70,385	70,385	9,43,974	(5,12,401)	(71,14,657)
25	(6,07,801)	(6,07,801)	(86,66,432)	25	73,588	73,588	10,17,562	(5,34,212)	(76,48,869)
26	(6,34,777)	(6,34,777)	(93,01,209)	26	76,747	76,747	10,94,309	(5,58,031)	(82,06,900)
27	(6,61,952)	(6,61,952)	(99,63,162)	27	80,153	80,153	11,74,463	(5,81,799)	(87,88,699)
28	(6,90,852)	(6,90,852)	(1,06,54,013)	28	83,585	83,585	12,58,047	(6,07,267)	(93,95,966)
29	(7,25,599)	(7,25,599)	(1,13,79,612)	29	87,234	87,234	13,45,281	(6,38,365)	(1,00,34,331)
30	(7,64,766)	(7,64,766)	(1,21,44,378)	30	91,621	91,621	14,36,902	(6,73,144)	(1,07,07,476)

Table 44: Baseline carbon stock change in litter biomass in the project area (Refer to Table 21.b.3 – VM0015 methodology)

Carbon stock changes in litter per initial forest class *icl*		Total carbon stock change in litter of the initial forest classes in the project area	
ID icl>	*1*	$\triangle Cab\ BSLPA_{icl,t}$	$\triangle Cab\ BSLPA_{icl}$
Name >		annual	cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e
0	0	0	0
1	(13,397)	(13,397)	(13,397)
2	(17,761)	(17,761)	(31,158)
3	(20,316)	(20,316)	(51,474)
4	(19,416)	(19,416)	(70,890)
5	(17,822)	(17,822)	(88,713)
6	(15,114)	(15,114)	(1,03,827)
7	(15,390)	(15,390)	(1,19,217)
8	(13,581)	(13,581)	(1,32,798)
9	(12,467)	(12,467)	(1,45,266)
10	(11,435)	(11,435)	(1,56,701)
11	(10,659)	(10,659)	(1,67,359)
12	(10,475)	(10,475)	(1,77,834)
13	(9,953)	(9,953)	(1,87,787)
14	(8,962)	(8,962)	(1,96,750)
15	(9,667)	(9,667)	(2,06,417)
16	(9,831)	(9,831)	(2,16,248)
17	(9,596)	(9,596)	(2,25,844)
18	(9,596)	(9,596)	(2,35,439)
19	(9,555)	(9,555)	(2,44,994)
20	(9,708)	(9,708)	(2,54,703)
21	(10,301)	(10,301)	(2,65,004)
22	(10,076)	(10,076)	(2,75,080)
23	(12,304)	(12,304)	(2,87,384)
24			

Carbon stock changes in litter per post-deforestation zone *z*		Total carbon stock change in litter of post-deforestation zones in the project area	
ID iz>	*1*	$\triangle Cab\ BSLPA_{z,t}$	$\triangle Cab\ BSLPA_{z}$
Name >		annual	cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e
0	0	0	0
1	-	-	-
2	3,281	3,281	3,281
3	7,631	7,631	10,912
4	12,607	12,607	23,519
5	17,362	17,362	40,881
6	21,727	21,727	62,608
7	25,429	25,429	88,037
8	29,198	29,198	1,17,235
9	32,524	32,524	1,49,760
10	35,578	35,578	1,85,337
11	38,378	38,378	2,23,716
12	40,989	40,989	2,64,705
13	43,554	43,554	3,08,259
14	45,992	45,992	3,54,251
15	48,187	48,187	4,02,438
16	50,555	50,555	4,52,993
17	52,962	52,962	5,05,955
18	55,313	55,313	5,61,268
19	57,663	57,663	6,18,931
20	60,003	60,003	6,78,934
21	62,381	62,381	7,41,315
22	64,904	64,904	8,06,218
23	67,371	67,371	8,73,589
24			

Total net carbon stock change in litter of the project area	
$\triangle Cab\ BSLPA_{t}$	$\triangle Cab\ BSLPA$
annual	cumulative
tCO_2-e	tCO_2-e
0	0
(13,397)	(13,397)
(14,480)	(27,877)
(12,685)	(40,562)
(6,810)	(47,371)
(460)	(47,831)
6,613	(41,218)
10,039	(31,180)
15,617	(15,563)
20,057	4,494
24,143	28,637
27,720	56,356
30,514	86,871
33,601	1,20,472
37,030	1,57,501
38,520	1,96,021
40,724	2,36,745
43,367	2,80,112
45,717	3,25,829
48,108	3,73,937
50,295	4,24,231
52,080	4,76,311
54,827	5,31,138
55,067	5,86,206

	(13,081)	(13,081)	(3,00,464)		70,385	70,385	9,43,974	57,304	6,43,510
25	(12,897)	(12,897)	(3,13,361)	25	73,588	73,588	10,17,562	60,692	7,04,202
26	(13,908)	(13,908)	(3,27,269)	26	76,747	76,747	10,94,309	62,839	7,67,040
27	(14,010)	(14,010)	(3,41,279)	27	80,153	80,153	11,74,463	66,143	8,33,183
28	(14,900)	(14,900)	(3,56,179)	28	83,585	83,585	12,58,047	68,685	9,01,868
29	(17,914)	(17,914)	(3,74,093)	29	87,234	87,234	13,45,281	69,320	9,71,188
30	(20,193)	(20,193)	(3,94,286)	30	91,621	91,621	14,36,902	71,428	10,42,616

Table 45: Baseline carbon stock change in above-ground biomass in the leakage belt (Refer to table 21.c.1 – VM0015 methodology)

Carbon stock changes in the above-ground biomass per initial forest class *icl*		Total carbon stock change in the above-ground biomass of the initial forest classes in the project area		**Carbon stock changes in the above-ground biomass per post-deforestation zone *z***		Total carbon stock change in the above-ground biomass of post-deforestation zones in the project area		Total net carbon stock change in the above-ground biomass of the project area	
ID icl> Name >	*1*	$\triangle Cab\ BSLLK_{icl,t}$ annual	$\triangle Cab\ BSLLK_{icl}$ cumulative	*ID iz>* Name >	*1*	$\triangle Cab\ BSLLK_{z,t}$ annual	$\triangle Cab\ BSLLK_{z}$ cumulative	$\triangle Cab\ BSLLK_{t}$ annual	$\triangle Cab\ BSLLK$ cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
0	-	-	-	0	-	-	-	-	-
1	(1,45,82,967.05)	(1,45,82,967.05)	(1,45,82,967.05)	1	-	-	-	(1,45,82,967.05)	(1,45,82,967.05)
2	(1,41,11,699.79)	(1,41,11,699.79)	(2,86,94,666.84)	2	4,204	4,204.18	4,204.18	(1,41,15,903.97)	(2,86,98,871.02)
3	(1,38,35,782.19)	(1,38,35,782.19)	(4,25,30,449.03)	3	4,068	4,068.31	8,272.49	(1,38,39,850.50)	(4,25,38,721.52)
4	(1,39,32,905.18)	(1,39,32,905.18)	(5,64,63,354.21)	4	3,989	3,988.77	12,261.26	(1,39,36,893.95)	(5,64,75,615.47)
5	(1,41,05,077.77)	(1,41,05,077.77)	(7,05,68,431.98)	5	4,017	4,016.77	16,278.03	(1,41,09,094.54)	(7,05,84,710.01)
6	(1,43,97,550.42)	(1,43,97,550.42)	(8,49,65,982.40)	6	4,066	4,066.41	20,344.44	(1,44,01,616.83)	(8,49,86,326.84)
7	(1,43,67,751.32)	(1,43,67,751.32)	(9,93,33,733.72)	7	4,151	4,150.72	24,495.16	(1,43,71,902.05)	(9,93,58,228.88)
8	(1,45,63,100.98)	(1,45,63,100.98)	(11,38,96,834.70)	8	4,142	4,142.13	28,637.29	(1,45,67,243.11)	(11,39,25,472.00)

9	(1,46,83,401.06)	(1,46,83,401.06)	(12,85,80,235.76)	9	4,198	4,198.45	32,835.74	(1,46,87,599.51)	(12,86,13,071.50)
10	(1,47,94,871.77)	(1,47,94,871.77)	(14,33,75,107.52)	10	4,233	4,233.13	37,068.88	(1,47,99,104.90)	(14,34,12,176.40)
11	(1,48,78,750.72)	(1,48,78,750.72)	(15,82,53,858.24)	11	4,265	4,265.27	41,334.15	(1,48,83,015.98)	(15,82,95,192.39)
12	(1,48,98,616.78)	(1,48,98,616.78)	(17,31,52,475.02)	12	4,289	4,289.45	45,623.60	(1,49,02,906.23)	(17,31,98,098.62)
13	(1,49,54,903.97)	(1,49,54,903.97)	(18,81,07,378.99)	13	4,295	4,295.18	49,918.78	(1,49,59,199.15)	(18,81,57,297.77)
14	(1,50,61,960.00)	(1,50,61,960.00)	(20,31,69,339.00)	14	4,311	4,311.41	54,230.18	(1,50,66,271.41)	(20,32,23,569.18)
15	(1,49,85,806.74)	(1,49,85,806.74)	(21,81,55,145.74)	15	4,342	4,342.27	58,572.45	(1,49,90,149.01)	(21,82,13,718.19)
16	(1,49,68,148.02)	(1,49,68,148.02)	(23,31,23,293.76)	16	4,320	4,320.31	62,892.76	(1,49,72,468.33)	(23,31,86,186.52)
17	(1,49,93,532.44)	(1,49,93,532.44)	(24,81,16,826.19)	17	4,315	4,315.22	67,207.99	(1,49,97,847.66)	(24,81,84,034.18)
18	(1,49,93,532.44)	(1,49,93,532.44)	(26,31,10,358.63)	18	4,323	4,322.54	71,530.53	(1,49,97,854.98)	(26,31,81,889.16)
19	(1,49,97,947.12)	(1,49,97,947.12)	(27,81,08,305.75)	19	4,323	4,322.54	75,853.07	(1,50,02,269.66)	(27,81,84,158.82)
20	(1,49,81,392.06)	(1,49,81,392.06)	(29,30,89,697.81)	20	4,324	4,323.81	80,176.88	(1,49,85,715.88)	(29,31,69,874.70)
21	(1,49,17,379.18)	(1,49,17,379.18)	(30,80,07,076.99)	21	4,319	4,319.04	84,495.93	(1,49,21,698.22)	(30,80,91,572.92)
22	(1,49,41,659.93)	(1,49,41,659.93)	(32,29,48,736.92)	22	4,301	4,300.59	88,796.51	(1,49,45,960.52)	(32,30,37,533.43)
23	(1,47,01,059.78)	(1,47,01,059.78)	(33,76,49,796.70)	23	4,308	4,307.59	93,104.10	(1,47,05,367.37)	(33,77,42,900.80)
24	(1,46,17,180.83)	(1,46,17,180.83)	(35,22,66,977.53)	24	4,238	4,238.22	97,342.32	(1,46,21,419.05)	(35,23,64,319.86)
25	(1,46,37,046.90)	(1,46,37,046.90)	(36,69,04,024.43)	25	4,214	4,214.04	1,01,556.37	(1,46,41,260.94)	(36,70,05,580.80)
26	(1,45,27,783.53)	(1,45,27,783.53)	(38,14,31,807.96)	26	4,220	4,219.77	1,05,776.13	(1,45,32,003.30)	(38,15,37,584.09)
27	(1,45,16,746.82)	(1,45,16,746.82)	(39,59,48,554.78)	27	4,188	4,188.27	1,09,964.40	(1,45,20,935.09)	(39,60,58,519.19)
28	(1,44,20,727.50)	(1,44,20,727.50)	(41,03,69,282.28)	28	4,185	4,185.09	1,14,149.49	(1,44,24,912.59)	(41,04,83,431.78)
29	(1,40,95,144.73)	(1,40,95,144.73)	(42,44,64,427.02)	29	4,157	4,157.41	1,18,306.90	(1,40,99,302.14)	(42,45,82,733.91)
30	(1,38,49,026.23)	(1,38,49,026.23)	(43,83,13,453.25)	30	4,064	4,063.54	1,22,370.44	(1,38,53,089.78)	(43,84,35,823.69)

Table 46: Baseline carbon stock change in below-ground biomass in the leakage belt (Refer to Table 21.c.2 – VM0015 methodology)

Carbon stock changes in the below-ground biomass per initial forest class *icl*		Total carbon stock change in the below-ground biomass of the initial forest classes in the project area		**Carbon stock changes in the below-ground biomass per post-deforestation zone *z***		Total carbon stock change in the below-ground biomass of post-deforestation zones in the project area		Total net carbon stock change in the below-ground biomass of the project area	
ID icl> Name >	*1*	$\triangle Cab\ BSLLK_{icl,t}$ annual	$\triangle Cab\ BSLLK_{icl}$ cumulative	*ID iz>* Name >	*1*	$\triangle Cab\ BSLLK_{z,t}$ annual	$\triangle Cab\ BSLLK_{z}$ cumulative	$\triangle Cab\ BSLLK_{t}$ annual	$\triangle Cab\ BSLLK$ cumulative
Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
0	-	-	-	0	-	-	-	-	-
1	(3,24,083)	(3,24,083)	(3,24,083)	1	-	-	-	(3,24,083)	(3,24,083)
2	(6,37,693)	(6,37,693)	(9,61,776)	2	4,204	4,204	4,204	(6,33,489)	(9,57,572)
3	(9,45,171)	(9,45,171)	(19,06,947)	3	8,272	8,272	12,477	(9,36,898)	(18,94,470)
4	(12,54,807)	(12,54,807)	(31,61,754)	4	12,261	12,261	24,738	(12,42,546)	(31,37,016)
5	(15,68,270)	(15,68,270)	(47,30,024)	5	16,278	16,278	41,016	(15,51,992)	(46,89,008)
6	(18,88,233)	(18,88,233)	(66,18,257)	6	20,344	20,344	61,360	(18,67,888)	(65,56,896)
7	(22,07,533)	(22,07,533)	(88,25,790)	7	24,495	24,495	85,856	(21,83,038)	(87,39,934)
8	(25,31,174)	(25,31,174)	(1,13,56,964)	8	28,637	28,637	1,14,493	(25,02,537)	(1,12,42,471)
9	(28,57,489)	(28,57,489)	(1,42,14,453)	9	32,836	32,836	1,47,329	(28,24,654)	(1,40,67,125)
10	(31,86,282)	(31,86,282)	(1,74,00,735)	10	37,069	37,069	1,84,397	(31,49,213)	(1,72,16,337)
11	(31,92,855)	(31,92,855)	(2,05,93,590)	11	41,334	41,334	2,25,732	(31,51,521)	(2,03,67,858)
12	(35,34,426)	(35,34,426)	(2,41,28,015)	12	41,419	41,419	2,67,151	(34,93,006)	(2,38,60,864)
13	(38,72,906)	(38,72,906)	(2,80,00,922)	13	45,850	45,850	3,13,002	(38,27,056)	(2,76,87,920)
14	(42,05,476)	(42,05,476)	(3,22,06,398)	14	50,241	50,241	3,63,243	(41,55,234)	(3,18,43,155)
15	(45,34,68	(45,34,685	(3,67,41,083)	15	54,556	54,556	4,17,799	(44,80,129	(3,63,23,284)

	5)	)						)	
16	(48,60,828)	(48,60,828)	(4,16,01,911)	16	58,826	58,826	4,76,625	(48,02,002)	(4,11,25,286)
17	(51,94,698)	(51,94,698)	(4,67,96,609)	17	63,057	63,057	5,39,682	(51,31,641)	(4,62,56,927)
18	(55,23,564)	(55,23,564)	(5,23,20,173)	18	67,388	67,388	6,07,071	(54,56,175)	(5,17,13,102)
19	(58,54,196)	(58,54,196)	(5,81,74,368)	19	71,655	71,655	6,78,725	(57,82,541)	(5,74,95,643)
20	(61,84,656)	(61,84,656)	(6,43,59,024)	20	75,944	75,944	7,54,669	(61,08,712)	(6,36,04,355)
21	(65,14,306)	(65,14,306)	(7,08,73,330)	21	80,231	80,231	8,34,900	(64,34,076)	(7,00,38,431)
22	(68,45,919)	(68,45,919)	(7,77,19,250)	22	84,507	84,507	9,19,407	(67,61,412)	(7,67,99,843)
23	(71,71,376)	(71,71,376)	(8,48,90,625)	23	88,809	88,809	10,08,216	(70,82,567)	(8,38,82,410)
24	(74,93,840)	(74,93,840)	(9,23,84,465)	24	93,031	93,031	11,01,247	(74,00,809)	(9,12,83,219)
25	(78,20,817)	(78,20,817)	(10,02,05,283)	25	97,214	97,214	11,98,461	(77,23,603)	(9,90,06,822)
26	(81,44,066)	(81,44,066)	(10,83,49,349)	26	1,01,456	1,01,456	12,99,916	(80,42,611)	(10,70,49,433)
27	(84,66,114)	(84,66,114)	(11,68,15,463)	27	1,05,649	1,05,649	14,05,566	(83,60,464)	(11,54,09,897)
28	(87,86,591)	(87,86,591)	(12,56,02,054)	28	1,09,827	1,09,827	15,15,393	(86,76,764)	(12,40,86,661)
29	(90,99,735)	(90,99,735)	(13,47,01,789)	29	1,13,984	1,13,984	16,29,377	(89,85,751)	(13,30,72,412)
30	(94,07,875)	(94,07,875)	(14,41,09,664)	30	1,18,047	1,18,047	17,47,424	(92,89,829)	(14,23,62,241)

3.2.2 Project Emissions

Non-CO2 emissions from fires area accounted because fire is the main technology used to clear the forest (slash and burn). Parameters (Table 47) and baseline non-CO2 emissions from forest fires in the project area (Table 48) are presented below:

Table 47: Parameters used to calculate non-CO2 emissions from forest fires (Refer to Table 23 – VM0015 methodology)

Initial Forest Class		Parameters															
ID cl	Name	% *Fburnt* $_{icl}$	$tCO_2e\ ha^{-1}$ *Cab*	$tCO_2e\ ha^{-1}$ *Cdw*	$tCO_2e\ ha^{-1}$ *Cl*	% *Pburnt* $_{ab,icl}$	% *Pburnt* $_{dw,icl}$	% *Pburnt* $_{l,icl}$	% $CE_{ab,icl}$	% $CE_{dw,icl}$	% $CE_{l,icl}$	$tCO_2e\ ha^{-1}$ *ECO2-ab*	$tCO_2e\ ha^{-1}$ *ECO2-dw*	$tCO_2e\ ha^{-1}$ *ECO2-l*	$tCO_2e\ ha^{-1}$ *EBBCO2-tot*	$tCO_2e\ ha^{-1}$ *EBBnN2O*$_{icl}$	$tCO_2e\ ha^{-1}$ *EBBCH4*$_{icl}$	$tCO_2e\ ha^{-1}$ *EBBtot*$_{icl}$
1	Ombrofile Forest	96%	-687.8	0	-7.9	96%	0	100%	0.5	0	0.5	-330.144	0	-3.95	-321	0	-29.4	-29.39

Table 48: Baseline non-CO2 emissions from forest fires in the project area (Refer to Table 24 – VM0015 methodology)

Project year *t*	Emissions of non-CO_2 gasses from baseline forest fires *ID*$_{icl}$ = 1		Total baseline non-CO2 emissions from forest fires in the project area	
	ABSLPA$_{icl,t}$	*EBBBSLtot*$_{icl}$	annual	cumulative
			EBBBSLPA$_t$	*EBBBSLPA*
	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
1	1,696	(29)	(49,842)	(49,842)
2	2,248	(29)	(66,076)	(1,15,919)
3	2,572	(29)	(75,581)	(1,91,500)
4	2,458	(29)	(72,235)	(2,63,735)
5	2,256	(29)	(66,304)	(3,30,040)
6	1,913	(29)	(56,230)	(3,86,269)
7	1,948	(29)	(57,256)	(4,43,525)

8	1,719	(29)	(50,527)	(4,94,052)
9	1,578	(29)	(46,383)	(5,40,435)
10	1,448	(29)	(42,543)	(5,82,977)
11	1,349	(29)	(39,653)	(6,22,631)
12	1,326	(29)	(38,969)	(6,61,600)
13	1,260	(29)	(37,030)	(6,98,630)
14	1,134	(29)	(33,342)	(7,31,972)
15	1,224	(29)	(35,966)	(7,67,938)
16	1,244	(29)	(36,574)	(8,04,512)
17	1,215	(29)	(35,699)	(8,40,211)
18	1,215	(29)	(35,699)	(8,75,911)
19	1,209	(29)	(35,547)	(9,11,458)
20	1,229	(29)	(36,118)	(9,47,576)
21	1,304	(29)	(38,323)	(9,85,899)
22	1,275	(29)	(37,486)	(10,23,385)
23	1,557	(29)	(45,774)	(10,69,160)
24	1,656	(29)	(48,664)	(11,17,823)
25	1,632	(29)	(47,979)	(11,65,803)
26	1,761	(29)	(51,743)	(12,17,546)
27	1,773	(29)	(52,124)	(12,69,670)
28	1,886	(29)	(55,431)	(13,25,101)
29	2,268	(29)	(66,647)	(13,91,747)
30	2,556	(29)	(75,125)	(14,66,872)

Total ex ante estimated actual emissions of non-CO2 gasses due to forest fires in the project area

The Project does not include planned deforestation, logging or fuel wood collection and charcoal production activities thus Tables 25a,b,c,d and 26a,b,c,d of the vm0015 methodology do not apply to the Project.

The Project has been effective in identifying illegal logging operations and invasion attempts since 2014 by undertaking on-site patrolling and reporting (FAO, 2019). As mentioned through the PD (particularly in Sections 1.10, 2.4.1, and 2.4.6.3) unplanned deforestation is a process that requires loggers to open roads and squatters to invade the land. For this to happen the management team should have left unspotted illegal logging operations and squattering in the PA to the point that significant extensions of forest are slashed and burned to implement pastures (because squatters will not invade small areas as they are driven by the expectation of selling the land to ranchers). Given the experience gained since 2014 on in-site monitoring and enforcement (which is proven by the fact that squattering initiatives have been stopped over the years as proved in the patrolling reports and no ranching operations can be spotted in the PA during field visits) plus the additional funding to scale-up these activities and involvement of local villagers (the Project has secured funding for implementation for the first three years), the Project is conservative in assuming that it will prevent at least 95% of the deforestation in the project area.

In conclusion, the Project assumes an Effectiveness Index (EI) 0.95. Ex ante estimation of carbon stock changes due to unavoidable unplanned deforestation within the project area are presented below (Table 49):

Table 49: Ex ante estimated net carbon stock change in the project area under the project scenario (Refer to Table 27 – VM0015 methodology)

Project year *t*	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\triangle CPAdPA_t$	$\triangle CPAdPA$	$\triangle CPAiPA_t$	$\triangle CPAiPA$	$\triangle CUDdPA_t$	$\triangle CUDdPA$	$\triangle CPSPA_t$	$\triangle CPSPA$
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
0	0	0	0	0	0	0	0	0
1	0	0	0	0	(60,290)	(60,290)	(60,290)	(60,290)
2	0	0	0	0	(81,062)	(1,41,352)	(81,062)	(81,062)
3	0	0	0	0	(94,064)	(2,35,416)	(94,064)	(94,064)
4	0	0	0	0	(91,738)	(3,27,154)	(91,738)	(91,738)
5	0	0	0	0	(86,210)	(4,13,364)	(86,210)	(86,210)
6	0	0	0	0	(75,533)	(4,88,897)	(75,533)	(75,533)
7	0	0	0	0	(78,055)	(5,66,952)	(78,055)	(78,055)
8	0	0	0	0	(71,220)	(6,38,172)	(71,220)	(71,220)
9	0	0	0	0	(67,358)	(7,05,529)	(67,358)	(67,358)
10	0	0	0	0				

					(63,769)	(7,69,299)	(63,769)	(63,769)
11	0	0	0	0	(61,243)	(8,30,542)	(61,243)	(61,243)
12	0	0	0	0	(61,319)	(8,91,861)	(61,319)	(61,319)
13	0	0	0	0	(59,861)	(9,51,722)	(59,861)	(59,861)
14	0	0	0	0	(56,243)	(10,07,965)	(56,243)	(56,243)
15	0	0	0	0	(60,176)	(10,68,141)	(60,176)	(60,176)
16	0	0	0	0	(61,731)	(11,29,872)	(61,731)	(61,731)
17	0	0	0	0	(61,506)	(11,91,378)	(61,506)	(61,506)
18	0	0	0	0	(62,319)	(12,53,698)	(62,319)	(62,319)
19	0	0	0	0	(62,949)	(13,16,646)	(62,949)	(62,949)
20	0	0	0	0	(64,448)	(13,81,094)	(64,448)	(64,448)
21	0	0	0	0	(67,938)	(14,49,032)	(67,938)	(67,938)
22	0	0	0	0	(67,799)	(15,16,831)	(67,799)	(67,799)
23	0	0	0	0	(78,678)	(15,95,510)	(78,678)	(78,678)
24	0	0	0	0	(83,216)	(16,78,725)	(83,216)	(83,216)
25	0	0	0	0	(83,496)	(17,62,222)	(83,496)	(83,496)
26	0	0	0	0	(89,142)	(18,51,364)	(89,142)	(89,142)
27	0	0	0	0	(90,780)	(19,42,144)	(90,780)	(90,780)
28	0	0	0	0	(95,969)	(20,38,113)	(95,969)	(95,969)
29	0	0	0	0	(1,10,797)	(21,48,910)	(1,10,797)	(1,10,797)

30	0	0	0	0	(1,22,571)	(22,71,481)	(1,22,571)	(1,22,571)

Table 50: Total ex ante estimated actual emissions of non-CO2 gasses due to forest fires in the project area (Refer to Table 28 – VM0015 methodology)

Project year *t*	Total *ex ante* estimated actual non-CO2 emissions from forest fires in the Project area	
	***EBBPSPA*$_t$** annual tCO_2-e	***EBBPSPA*** cumulative tCO_2-e
0	0	0
1	(2,492)	(2,492)
2	(3,304)	(5,796)
3	(3,779)	(9,575)
4	(3,612)	(13,187)
5	(3,315)	(16,502)
6	(2,811)	(19,313)
7	(2,863)	(22,176)
8	(2,526)	(24,703)
9	(2,319)	(27,022)
10	(2,127)	(29,149)
11	(1,983)	(31,132)
12	(1,948)	(33,080)
13	(1,852)	(34,932)
14	(1,667)	(36,599)
15	(1,798)	(38,397)
16	(1,829)	(40,226)
17	(1,785)	(42,011)
18	(1,785)	(43,796)

19	(1,777)	(45,573)
20	(1,806)	(47,379)
21	(1,916)	(49,295)
22	(1,874)	(51,169)
23	(2,289)	(53,458)
24	(2,433)	(55,891)
25	(2,399)	(58,290)
26	(2,587)	(60,877)
27	(2,606)	(63,483)
28	(2,772)	(66,255)
29	(3,332)	(69,587)
30	(3,756)	(73,344)

The total project emission calculated is 73,344 tCO_2e.

3.2.3 Leakage

Step 8 of VM0015 - Ex-ante leakage estimate

8.1 Ex-ante estimate of carbon stock reduction and increased GHG emissions due to leakage prevention measures

The Project's activities won't generate GHG emissions thus there won't be GHG emissions from leakage prevention activities. Tables 30a,b,c as well as Tables 34 and 35 of the vm0015 methodology do not apply to the Project. In the same way, the Project will not implement grazing activities in the LMA thus Tables 31, 32, and 33 of the VM 0015 methodology do not apply.

GHG emissions by activity displacement could only be considered as leakage if such emissions are located within the leakage belt (LK) and happen above baseline projections. A mobility analysis was used to calculate the extent of the leakage belt of the Project and results from this analysis are presented in Section 3.1.3. (As indicated in the footnote in page 101 of the VCS VM 0015 methodology "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" thus if all the agents are given the opportunity to participate in the activities of the Project, then the LDF should be zero).

Starting from 2012 the cattle were gradually sold as they reached maturity for the marketing of the meat. Since January 2016, of the beginning of the Project until today there are no cattle in the farm, except several milk cows owned by the farm keeper for his self-consumption. Because of that, no leakage management zone was identified.

Also, the VM0015 methodology indicates that the amount of leakage will depend on the Leakage Displacement Factor (LDF) which is equal to the proportion of agents of deforestation that do not participate in the Project's activities.

Following these guidelines, the Project will not generate displacement leakage as the Project's activities are designed to provide all the deforestation agents that arrive to the Project's Boundary with the opportunity to participate.

Total calculated leakage is 0.

3.2.4 Net GHG Emission Reductions and Removals

Step 9 if VM0015 - Net ex-ante net reduction in anthropogenic GHG emissions significance Assessment

9.1 Significance assessment

Using the document "EB-CDM approved "Tool for testing significance of GHG emissions in A/R CDM Project activities" it was possible to verify that above-ground biomass will contribute 79% of the expected emissions in the baseline scenario and biomass below ground will contribute 21%.

9.2 Calculation of ex ante estimates of total net GHG emission reductions

The equation 19 suggested by VM0015 was used for the ex-ante estimation of the project emissions reductions.

$$\Delta REDD_t = (\Delta CBSLPA_t + EBBBSLPA_t) - (\Delta CPSPA_t + EBBPSPA_t) - (\Delta CLK_t + ELK_t)$$

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);

$EBBBSLPA_t$: 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* (tCO_2e); $EBBPSPA_t$: Sum of (ex ante estimated) actual emissions from biomass burning in the project area at year *t* (tCO_2e);

ΔCLK_t: Sum of ex ante estimated leakage net carbon stock changes at year *t* (tCO_2e);

ELK_t: Sum of ex ante estimated leakage emissions at year t (tCO_2e);

t: 1, 2, 3 ... T, a year of the proposed project crediting period (dimensionless).

9.3 Ex-ante calculation of Verified Carbon Units (VCUs)

To estimate the number of VCUs, we used equation 20 and 21 of VM0015. The Risk Factor parameter of the Project was estimated through the document *VCS AFOLU Non-Permanence Risk Tool*, resulting in 11.75%.

$$VCU_t = \Delta REDD_t - VBC_t$$

$$VBC_t = (\Delta CBSLPA_t - \Delta CPSPA_t) * RF_t$$

Where:

VCU_t: Number of Verified Carbon Units that can be traded at time *t* (tCO_2e);

$\Delta REDD_t$: Ex ante estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year *t* (tCO_2e);

VBC_t: Number of Buffer Credits deposited in the VCS Buffer at time *t* ($t CO_2$-e);
$\Delta CBSLPA_t$: Sum of baseline carbon stock changes in the project area at year *t* (tCO_2e);

$\Delta CPSPA_t$: Sum of ex ante estimated actual carbon stock changes in the project area at year *t* (tCO_2e);

RF_t: Risk factor used to calculate VCS buffer credits (%);

t: 1, 2, 3 ... T, a year of the proposed project crediting period (dimensionless).

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated Buffer Credits	Estimated net GHG emission reduction or removals (tCO_2e)
1	49,842.41	2,492	-	1,34,304	10,58,555
2	66,076.35	3,304	-	1,80,583	14,22,367
3	75,581.01	3,779	-	2,09,554	16,49,462
4	72,235.37	3,612	-	2,04,382	16,07,271
5	66,304.47	3,315	-	1,92,073	15,08,898
6	56,229.53	2,811	-	1,68,297	13,20,248
7	57,256.04	2,863	-	1,73,922	13,63,523
8	50,526.74	2,526	-	1,58,701	12,42,472
9	46,382.71	2,319	-	1,50,104	11,73,757
10	42,542.83	2,127	-	1,42,115	11,09,919
11	39,653.42	1,983	-	1,36,493	10,64,801
12	38,969.08	1,948	-	1,36,665	10,65,411
13	37,030.13	1,852	-	1,33,422	10,39,113
14	33,342.33	1,667	-	1,25,368	9,74,934
15	35,965.61	1,798	-	1,34,132	10,43,380
16	36,573.91	1,829	-	1,37,600	10,70,035
17	35,699.48	1,785	-	1,37,103	10,65,431
18	35,699.48	1,785	-	1,38,918	10,79,065

19	35,547.41	1,777	-	1,40,324	10,89,469
20	36,117.69	1,806	-	1,43,668	11,15,156
21	38,322.76	1,916	-	1,51,446	11,75,781
22	37,486.36	1,874	-	1,51,141	11,72,653
23	45,774.41	2,289	-	1,75,380	13,62,991
24	48,663.83	2,433	-	1,85,493	14,41,838
25	47,979.49	2,399	-	1,86,124	14,45,889
26	51,743.34	2,587	-	1,98,706	15,44,149
27	52,123.52	2,606	-	2,02,361	15,71,984
28	55,431.14	2,772	-	2,13,924	16,62,138
29	66,646.63	3,332	-	2,46,964	19,21,502
30	75,124.79	3,756	-	2,73,198	21,27,014
	27,053,401	45,431	-	3,072,019	23,981,381

The project will generate over the life of the project: 39,489,204 Tradable VCUs for the period January 1, 2016 to December 31st, 2045.

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Data / Parameter	**Deforestation**
Data unit	Hectare (ha)
Description	Maps of forest cover areas converted into non-forest cover areas
Source of data	Measured through data from the PRODES/INPE Project
Value applied	0.40%/year on average (2000-2014)
Justification of choice of data or description of measurement methods and procedures applied	Data from the PRODES Digital program (official mapping satellite of Brazilian Amazon Forest) were used to map the deforestation and production of the Forest Cover Excellence Brand Map. During the analyzed period, a total of 46 Landsat images were used. And for the classification of the images in the mapping of forest classes, non-forest vegetation, hydrography and deforestation, the ISOSEG method of unsupervised classification was used
Purpose of data	• - Determination of baseline scenario • - Calculation of baseline emissions • - Calculation of project emissions - Calculation of leakage
Comments	View the documents: - Câmara et al. 2006. Methodology for the calculation of the annual rate of deforestation in the Legal Amazon - Determination of the Forest Carbon Stock for the REDD+ Project

Data / Parameter	**CF**
Data unit	T
Description	Carbon contained in dry biomass
Source of data	Nogueira et al. (2008). Estimates of forest biomass in the Brazilian Amazon: New allometric equations and biomass adjustments of wood volume inventories. Forest Ecology and Management, v. 256, n. 11, p. 1853-1867, 2008
Value applied	0.485
Justification of choice of data or description of measurement methods and procedures applied	Value found in scientific literature
Purpose of data	• - Determination of baseline scenario • - Calculation of baseline emissions • - Calculation of project emissions - Calculation of leakage
Comments	

Data / Parameter	ABSLRRt
Data unit	Ha
Description	Annual area of baseline deforestation within the RR at year t
Source of data	Calculated, see Annex VM0015 tables
Value applied	Table 9a, 11a Annex VM0015 tables
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015 v1.1.
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLRR
Data unit	Ha
Description	Cumulative area of baseline deforestation in the reference region

	at year t
Source of data	Calculated, see VCS Annex
Value applied	Table 9a, 11a Annex VM0015 tables
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015 v1.1.
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPAt
Data unit	Ha
Description	Annual area of baseline deforestation in the project area at year t
Source of data	Calculated, see VCS Annex
Value applied	Table 9b, 11b, 13b of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015 v1.1.
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPAicl,t
Data unit	Ha
Description	Area of initial (pre-deforestation) forest class icl deforested at time t within the project area in the baseline
Source of data	Calculated, see VCS Annex
Value applied	Table 11b of Annex VM0015

Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1, 5.1 by applying land cover map to the result of Table 9b
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPAi,t
Data unit	Ha
Description	Annual area of baseline deforestation within stratum (i) of the project area at year t
Source of data	Calculated, see VCS Annex
Value applied	Table 9b of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1, 4.1.2.2
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPA
Data unit	Ha
Description	Cumulative area of baseline deforestation within the project area at year t
Source of data	Calculated, see VCS Annex
Value applied	Table 9b, Table 11b, Table 13b of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015 v1.1.
Purpose of data	Calculation of baseline emissions

Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPAz,t
Data unit	Ha
Description	Area of the zone z “deforested” at time t within the project area in the baseline case; ha
Source of data	Calculated, see VCS Annex
Value applied	Table 13b of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Equal to values of Table 11b grouped by zones.
Purpose of data	Calculation of baseline em issions
Comments	Calculating net GHG emissions via post-deforestation C-stocks

Data / Parameter	ABSLLKt
Data unit	Ha
Description	Annual area of baseline deforestation within the leakage belt at year t
Source of data	Calculated, see VCS Annex
Value applied	Table 9c, 11c, 13c of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1.
Purpose of data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLLKicl,t
Data unit	Ha

Description	Area of initial (post-deforestation) forest class fcl deforested at time t within the leakage belt in the baseline case
Source of data	Calculated, see VCS Annex
Value applied	Table 11c of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1, 5.1 by applying land cover map to the result of Table 9c
Purpose of data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLLKl,t
Data unit	Ha
Description	Annual area of deforestation in stratum (i) within the leakage belt at year t
Source of data	Calculated. See VCS annex – section 4
Value applied	Table 9c, 11c, 13c of Annex VM0015.
Justification of choice of data or description of measurement methods and procedures applied	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Purpose of data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLLK
Data unit	Ha
Description	Cumulative area of baseline deforestation within the leakage belt at year t
Source of data	Calculated
Value applied	Table 9c, 11c, 13c of Annex VM0015.

Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1.
Purpose of data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	CFj
Data unit	Dimensionless
Description	Carbon fraction for tree tr, of species, group of species or forest type j
Source of data	IPCC GPG 2006 Chapter 6
Value applied	forest classes: 0.5 Post-deforestation classes: 0.47
Justification of choice of data or description of measurement methods and procedures applied	Default values IPCC GPG 2006, Chapter 6
Purpose of data	Calculation of baseline emission
Comments	Conversion from biomass to CO2e

Data / Parameter	Cabcl
Data unit	t CO2e ha-1
Description	Average carbon stock per hectare in the above-ground biomass carbon pool of LU/LC class cl
Source of data	Calculated, see calculation sheet
Value applied	forest class: bh-M: 250.75 bh-MB: 350.22 bh-PM: 196.63 bmh-M: 216.28 bmh-MB: 448.24 bmh-PM and and bmh-PMt: 460.92 bms-T: 169.23 bp-M: 183.36

	bp-MB: 181.47 bp-PM: 398.95 bs-MB: 165.78
Justification of choice of data or description of measurement methods and procedures applied	Derived from forest inventory data, IDEAM. See VCS Annex.
Purpose of data	Calculation of baseline emission
Comments	Emissions factors for estimating GHG emissions from deforestation.

Data / Parameter	Rj
Data unit	Relation factor
Description	Root shoot ratio
Source of data	IPCC/Literature value
Value applied	0.24
Justification of choice of data or description of measurement methods and procedures applied	Default value of 0.24 from IPCC Guidelines for National Greenhouse Gas Inventories. 2006. Table 4.3/Mokany 2006
Purpose of data	Calculation of baseline emission
Comments	Belowground biomass estimation

Data / Parameter	Cbbcl
Data unit	t CO2e ha-1
Description	Average carbon stock per hectare in the below-ground biomass carbon pool of LU/LC class cl
Source of data	Calculated, see Table Biomass, Annex GEI DB
Value applied	forest class: bh-M=60.18 bh-MB=122.05 bh-PM=47.19 bmh-M=51.91

	bmh-MB=107.58 bmh-PM and bmh-PMt=75.65 bms-T=40.62 bp-M=44.01 bp-MB=43.55 bp-PM=95.75 bs-T=39.79
Justification of choice of data or description of measurement methods and procedures applied	Calculated by applying the default value of 0.24 from IPCC Guidelines for National Greenhouse Gas Inventories. 2006. Table Table 4.3/Mokany 2006
Purpose of data	Calculation of baseline emission
Comments	Emissions factors for estimating GHG emissions from deforestation.

Data / Parameter	Ctot(icl)
Data unit	t CO2e ha-1
Description	Average carbon stock per hectare in the below-ground biomass carbon pool of LU/LC class cl
Source of data	Calculated, see Table Biomass, Annex GEI DB
Value applied	forest class: bh-M=310.92 bh-MB=630.61 bh-PM=243.82 bmh-M=268.19 bmh-MB=555.82 bmh-PM y bmh-PMt=390.85 bms-T=209.85 bp-M=227.37 bp-MB=225.02 bp-PM=494.70 bs-T=205.57
Justification of choice of data or description of measurement methods and procedures applied	Derived from various forest inventory data. See Table Biomass, Annex GEI DB.

Purpose of data	Calculation of baseline emission
Comments	Emissions factors for estimating GHG emissions from deforestation.

Data / Parameter	Ctoticl,t
Data unit	t CO2e ha-1
Description	Average carbon stock of all accounted carbon pools in forest class icl at time t
Source of data	Calculated, see Table Significancia, Annex VM0015
Value applied	Deemed de-minimus
Justification of choice of data or description of measurement methods and procedures applied	Significance analysis.
Purpose of data	Calculation of baseline emission
Comments	N.A

Data / Parameter	Cabfcl
Data unit	t CO2e ha-1
Description	Average carbon stock per hectare in the above-ground biomass carbon pool of final post-deforestation class fcl
Source of data	Calculated, see table CarbonPostdef, Annex GEI DB
Value applied	Grassland: 17.95 Heterogeneous farmland: 23.74 Crops: 21.78
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1.
Purpose of data	Calculation of baseline emission
Comments	Calculate GHG emissions from deforestation

Data / Parameter	Cp

Data unit	t CO2e ha-1
Description	Average carbon stock per hectare in the carbon pool p
Source of data	Table 20.a
Value applied	Table 20.a. Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Requirements of the VM0015 sec. 6.1.2.
Purpose of data	Calculation of baseline emission
Comments	Baseline GHG emissions estimates

Data / Parameter	Ctotfcl, t
Data unit	t CO2e ha-1
Description	Average carbon stock of all accounted carbon pools in non-forest class fcl at time t;
Source of data	N.A
Value applied	N.A
Justification of choice of data or description of measurement methods and procedures applied	Leakage management activities do not decrease carbon stocks.
Purpose of data	Calculation of baseline emission
Comments	N.A

Data / Parameter	ΔCabABSLKK
Data unit	t CO2e
Description	Cumulative baseline carbon stock changes for the above-ground biomass pool in the leakage belt
Source of data	Table 21.c.1, Annex VM0015
Value applied	See Table 21.c.1, Annex VM0015

Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the leakage belt.
Purpose of data	Calculation of leakage
Comments	N.A

Data / Parameter	ΔCbbABSLKK
Data unit	t CO2e
Description	Cumulative baseline carbon stock changes for the below-ground biomass pool in the leakage belt
Source of data	Table 21.c.1 Annex VM0015
Value applied	See Table 21.c.1 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the leakage belt.
Purpose of data	Calculation of leakage
Comments	N.A

Data / Parameter	ΔCabBSLPA
Data unit	t CO2e
Description	Cumulative baseline carbon stock changes for the above-ground biomass pool in the project area
Source of data	Table 21.b.1 Annex VM0015
Value applied	See Table 21.b.1 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the project area.
Purpose of data	Calculation of baseline emissions
Comments	N.A

Data / Parameter	ΔCbbABSLPA
Data unit	t CO2e
Description	Cumulative baseline carbon stock changes for the below-ground biomass pool in the project area
Source of data	Table 21.b.1 Annex VM0015
Value applied	See Table 21.b.1 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the project area.
Purpose of data	Calculation of baseline emissions
Comments	N.A

Data / Parameter	ΔCADLK
Data unit	t CO2e
Description	Cumulative total decrease in carbon stocks due to displaced deforestation
Source of data	Table 34, 35, Annex VM0015
Value applied	See Table 34, 35, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting from displaced leakage
Purpose of data	Calculation of leakage
Comments	N.A

Data / Parameter	ΔCBSLPA
Data unit	t CO2-e
Description	Total baseline carbon stock changes in the project area
Source of data	Table 36, Annex VM0015
Value applied	See Table 36, Annex VM0015

Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the project area
Purpose of data	Calculation of leakage
Comments	N.A

Data / Parameter	ΔCPSPA
Data unit	t CO2-e
Description	Cumulative project carbon stock change within the project area at year t
Source of data	See Tables 27 and 36, Annex VM0015
Value applied	Tables 27 and 36, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculation of net GHG emissions reductions
Purpose of data	Calculation of baseline emissions
Comments	N.A

Data / Parameter	ΔCUDdPA
Data unit	t CO2-e
Description	Cumulative actual carbon stock change due to unavoided unplanned deforestation at year t in the project area
Source of data	Table 27, Annex VM0015.
Value applied	Effectiveness index: 40%
Justification of choice of data or description of measurement methods and procedures applied	Measure of project effectiveness
Purpose of data	Calculation of project emissions
Comments	N.A

Data / Parameter	ΔREDDt
Data unit	t CO2-e
Description	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t
Source of data	See Table 36, Annex VM0015
Value applied	Table 36, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	The cumulative result of applying the VM0015 methodology
Purpose of data	Calculation of project emissions
Comments	Final GHG calculations

Data / Parameter	DLF
Data unit	%
Description	Displacement leakage factor
Source of data	Table 34, Annex VM0015
Value applied	5
Justification of choice of data or description of measurement methods and procedures applied	ex-ante leakage
Purpose of data	Calculation of leakage
Comments	N.A

Data / Parameter	EI
Data unit	%
Description	ex-ante estimated Effectiveness Index
Source of data	Estimate generated by the project
Value applied	0.40

Justification of choice of data or description of measurement methods and procedures applied	Estimate generated by the project
Purpose of data	Calculation of project emissions
Comments	N.A

Data / Parameter	ELK
Data unit	t CO2-e
Description	Cumulative sum of ex-ante estimated leakage emissions at year t
Source of data	Table 35, 36 Annex VM0015
Value applied	Table 35, 36 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	The cumulative result of applying the VM0015 methodology
Purpose of data	Calculation of leakage
Comments	N.A

Data / Parameter	RFt
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	VCS Non Permanence Risk analysis
Value applied	11.75
Justification of choice of data or description of measurement methods and procedures applied	see VCS Non-Permanence Risk Analysis
Purpose of data	Calculation of project emissions
Comments	N.A

Data / Parameter	VBCt
Data unit	t CO2-e
Description	Number of Buffer Credits deposited in the VCS Buffer at time t;
Source of data	See Table 36, Annex VM0015
Value applied	Table 36, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated
Purpose of data	Buffer calculation
Comments	N.A

3.3.2 Data and Parameters Monitored

Data / Parameter	ABSLLKt
Data unit	Ha
Description	Annual area of deforestation within the leakage belt at year t
Source of data	Satellite images
Description of measurement methods and procedures to be applied	PP will be in charged for the climate monitoring according to the methodology VM0015 v1.1. Table 9c, 11c, 13c of Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N.A
Monitoring equipment	GIS software
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures will be performed by PP

Purpose of data	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Calculation method	Calculation of leakage
Comments	N.A

Data / Parameter	ABSLPA
Data unit	Ha
Description	Cumulative area of deforestation within the project area at year t
Source of data	Satellite images
Description of measurement methods and procedures to be applied	PP will be in charged for the climate monitoring according to the methodology VM0015 v1.1. Table 9b, 11b, 13b of Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N.A
Monitoring equipment	GIS software
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures will be performed by ARC
Purpose of data	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Calculation method	Calculation of project emissions
Comments	N.A

Data / Parameter	ABSLPAt
Data unit	Ha
Description	Annual area of deforestation in the project area at year t
Source of data	Satellite images
Description of measurement methods and procedures to be applied	PP will be in charged for the climate monitoring according to the methodology VM0015 v1.1. Table 9b, 11b, 13b of Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N.A
Monitoring equipment	GIS software
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures will be performed by PP
Purpose of data	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Calculation method	Calculation of project emissions
Comments	N.A

Data / Parameter	ΔCPSPAt
Data unit	t CO2-e
Description	Annual project carbon stock change within the project area at year t
Source of data	Satellite images and carbon stocks defined in 4.1
Description of measurement methods and procedures to be applied	PP will be in charged for the climate monitoring according to the methodology VM0015 v1.1. Table 27 and Table 36, Annex VM0015.

Frequency of monitoring/recording	At each verification period
Value applied	N.A
Monitoring equipment	N.A
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures will be performed by PP
Purpose of data	Calculation of project emissions
Calculation method	Activity data for calculating GHG emissions reductions.
Comments	N.A

Data / Parameter	ΔREDD
Data unit	t CO2-e
Description	Cumulative net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N.A
Monitoring equipment	N.A
QA/QC procedures to be applied	PP will assign a QA/QC coordinator

Purpose of data	Calculation of project emissions
Calculation method	Final GHG calculations
Comments	N.A

Data / Parameter	ΔREDDt
Data unit	t CO2-e
Description	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015
Frequency of monitoring/recording	At each verification period
Value applied	N.A
Monitoring equipment	N.A
QA/QC procedures to be applied	PP will assign a QA/QC coordinator
Purpose of data	Calculation of project emissions
Calculation method	Final GHG calculations
Comments	N.A

Data / Parameter	RFt
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	VCS Non Permanence Risk analysis
Description of measurement methods and procedures to be applied	AFOLU Non permanence Risk Tool v.3.2
Frequency of monitoring/recording	At each verification period
Value applied	N.A
Monitoring equipment	N.A
QA/QC procedures to be applied	N.A
Purpose of data	Calculation of project emissions
Calculation method	N.A
Comments	Buffer calculation

Data / Parameter	VBCt
Data unit	t CO2-e
Description	Number of Buffer Credits deposited in the VCS Buffer at time t;
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015

Frequency of monitoring/recording	At each verification period
Value applied	N.A
Monitoring equipment	N.A
QA/QC procedures to be applied	N.A
Purpose of data	Calculation of project emissions
Calculation method	N.A
Comments	Buffer calculation

Data / Parameter	VCUt
Data unit	t CO2-e
Description	Number of Verified Carbon Units (VCUs) to be made available for trade at time t
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015
Frequency of monitoring/recording	At each verification period
Value applied	N.A
Monitoring equipment	N.A
QA/QC procedures to be applied	N.A

Purpose of data	Calculation of project emissions
Calculation method	N.A
Comments	Buffer calculation

3.3.3 Monitoring Plan

The monitoring plan of the REDD+ Project is a combination of three components: climate, community and biodiversity. Brazil Agfor LLC is one of the proponents and implementing partners of this Project, being responsible for coordinating the monitoring processes during its life cycle. The climate aspects will be monitored directly by the Brazil Agfor LLC and the social and biodiversity aspects will be monitored by the land owners and partners hired with skills in the subject.

Monitoring Plan for Climate Impacts:

The Climate Impact Monitoring Plan will encompass key issues for the demonstration of emission reduction by deforestation and degradation due to avoided unplanned deforestation, in accordance with the applied methodology VM0015, and changes in carbon stock throughout the project life cycle due to changes in land use within the Project area and in the leakage belt.

TASK 1. Monitoring changes in carbon stocks and GHG emissions for periodic verification.

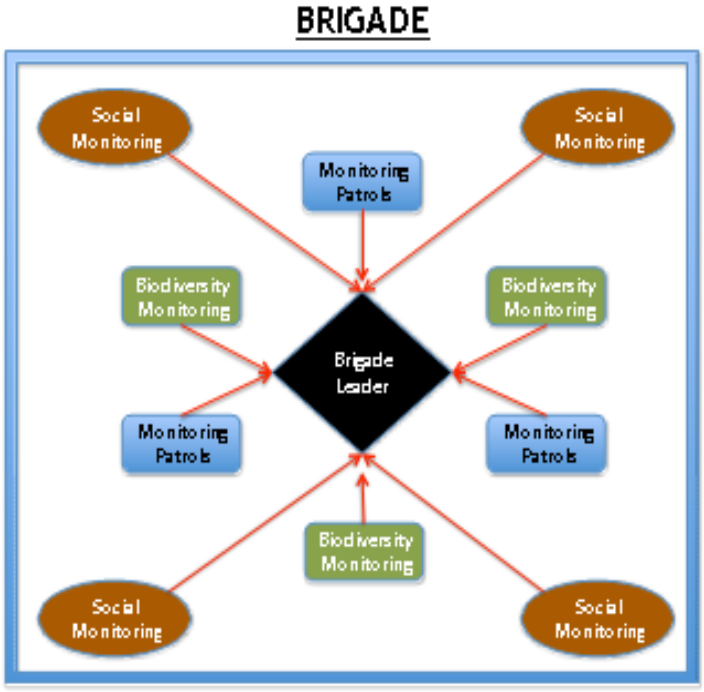
1.1 Monitoring actual changes in carbon stocks and GHG emissions in the project area;
1.2 Monitoring leakage;
1.3 Ex-post calculation of GHG emission reductions;
1.4 Monitoring the impacts of natural disturbances and other catastrophic events.

1.1 Monitoring actual changes in carbon stocks and GHG emissions in the project area.

1.1.1 Monitor the implementation of the project

This task will be the responsibility of Brazil Agfor LLC. To assure the most effective monitoring of the activities of the Project, areas will be divided in brigades to better manage the extent of the Project Area and LMA. Brigade leaders will oversee the activities and compile and analyze the results from monitoring patrols (Figure 71). Brigade leaders will report to Brazil Agfor LLC's office in Portel, which in turn will report to the office in Belem. These two offices will be responsible of informing local authorities about illegal activities happening in the Project Area and to follow up the enforcement of the required measures to remove invaders (Figure 29).

Figure 71: Activities management in the Project



The activities of the Project and their monitoring can be grouped as follows:

1. Forest monitoring:

Monitoring of forest cover was be done mainly by remote sensing imagery. The choice of imagery depended on the availability of scenes, cloud cover, and related acquisition and processing costs. Remote sensing imagery could be either satellite (i.e. Landsat) or radar (i.e. Alos Palsar) or a combination of both.

LULC-change analysis using remote sensing imagery could be conducted annually of by periods depending on the availability of scenes. Therefore, verification event could occur annually of by periods.

The fixed degradation frontier map was updated at each verification event to account for areas that may have changed their carbon stocks due to un-avoided illegal logging activities. The fixed degradation frontier was assessed based on the availability of scenes, cloud cover, and related acquisition and processing costs. Remote sensing imagery could be either satellite (i.e. Landsat) or radar (i.e. Alos Palsar) or a combination of both.

Starting in 2016, patrolling activities were scaled-up by hiring local people as forest monitoring patrols. They were responsible for each monitoring patrol who generate monthly reports unless illegal activities are spotted, in which case a report should be submitted immediately as described in the next section.

Of particular importance is the implementation of the surveillance system that allow continuous monitoring of the Project Area to prevent the entry of squatters and illegal loggers. The objective of forest patrolling is to make evident the presence of the landowner and dissuade pioneer agents (i.e. loggers, squatters) from encroaching in the Project Area. This activity functions as a complement of remote sensing-based

monitoring but does not replace it. Furthermore, the generation of carbon credits for avoided emissions do not rely on the results of patrolling,

The Project Area has been divided in patrols, based on river affluents, to facilitate monitoring such a large area. Each Patrol leader compile the information from patrolling reports into adequate digital format, all the information from the reports to keep track of the areas that are being patrolled each week and what are the findings of each patrol. Digital reports were sent to the office in Belem to be organized and stored.

Patrols identify illegal activities (invasions and timber extraction) and report them the patrol leader. If illegal activities are spotted, patrols should geo-reference the finding and make a short description of what was found. Patrols should approach squatters or loggers to let them know –in good terms- that this is private land, they cannot undertake such activities there and they should leave immediately.

With the information supplied by each patrol, patrol leader's fill-up a monitoring report that include at least the coordinates where the illegal activities are taking place, the date and a brief report of what was identified. Finally, each patrol leader submitted this information to the local police in Portel and to IBAMA in Portel and in Belem.

Monitoring reports should be numbered, filed appropriately, and be scanned to have digital copies in an archive as backup.

Once every two months, patrol leaders perform random site visits to verify that monitoring patrols are covering the assigned area and that each patrol is wearing the adequate field equipment. Patrol leaders should fill up a report that was submitted to office in Belem. A monitoring patrol that does not wear adequate field equipment or does not cover the designed monitoring route, will receive a warning. We have had no issues as these are good paying jobs in a very poor region, thus no one will risk job loss.

Maps, reports and records are available to validators at each verification event.

2.Biodiversity monitoring: monitoring will follow the guidelines described in section "B3. Biodiversity Impact Monitoring" of the associate CCB PDD.

Biodiversity activities and their indicators will be:

1. Biodiversity protection is directly related with ecosystem health, which is in turn linked to forest cover. Positive impacts on biodiversity will be estimated indirectly through remote analysis of forest cover. Preserving forest cover through avoided deforestation and degradation will allow implying that net positive impacts on biodiversity are being generated.

2. Biodiversity spotting by local people. Local people participating in the biodiversity component of the project will be in charge of reporting animal spotting at the boundaries of the LMA and the PA. Spotting frequency and animal species identified will indirectly assess net positive impacts on ecosystem health.

3. Active biodiversity monitoring. Local people will be hired to monitor ants, bats and bryophytes. Results are a good indirect indicator of ecosystem health.

All information should be properly reported following the protocols developed by Anapu-Pacaja after the fieldwork . Reports should provide geo-referenced information about biodiversity spotting and data as determined by the protocols. All data from the reports should be input into electronic format prior to the analysis. Maps, reports and records will be available to validators at each verification event.

3. Social Monitoring: will be undertaken by social monitoring squads. There will be a responsible for each monitoring squad who will generate monthly activities reports. Each squad will be in charge of specific villages and will use approved questionnaires to gather socio-economic data about the impacts of

the activities of the Project. Questionnaires will also include a section for comments to include information that is not contained in the template.

Monthly reports will be submitted to the brigade leader who will input the information into electronic format to analyze it. The results from this analysis will be used to assess the impact of each activity and to identify villages that require particular attention.

The Project management teams in Protel and Belem will held bimonthly meetings to assess the effectiveness of the activities in local villages. Based on the information supplied by the brigade leaders, the management teams will improve the proposed activities. Maps, reports and records will be available to validators at each verification event.

1.1.2 Monitoring change and land use within the project area.

This task will be the responsibility of Anapu-Pacaja . According to the categories presented in Table 35 of the VM0015 methodology (Table 51), the Project will implement MRV to identify and assess LULC-changes within the Project Area.

Table 51: Categories that require MRV (refer to Table 35 – VM0015 methodology)

ID	Type	Conditions under which monitoring is mandatory	Explanations	Applicability to the Project
I	Area of forest land converted to non-forest land	Mandatory in all AUD project activities		Applicable
II	Area of forest land undergoing carbon stock decrease	Mandatory only for AUD project activities having planned logging, fuel-wood collection and charcoal production activities above the baseline	Change in carbon stock must be significant according to ex-ante assessment, otherwise monitoring is not required	Does not apply because none of the Project activities involve planned logging, fuel-wood collection and charcoal production
III	Area of forest land undergoing carbon stock increase	Mandatory only for AUD project activities wishing to claim carbon credits for carbon stock increase	Increase must be significant according to ex-ante assessment and can only be accounted on areas that will be deforested in the baseline case	Does not apply because the project will not claim carbon credits from carbon stock increase. Carbon stock is the amount of carbon that has been sequestered from the atmosphere and is now stored within the forest ecosystem, mainly within living biomass and soil,

				and to a lesser extent also in dead wood and litter. We are not accounting all the carbon pools for claims.

Monitoring of forest cover will be done mainly by remote sensing imagery. The choice of imagery will depend on the availability of scenes, cloud cover, and related acquisition and processing costs.

Remote sensing imagery could be either satellite (i.e Landsat) or radar (i.e Alos Palsar) or a combination of both.

LULC-change analysis using remote sensing imagery could be conducted annually of by periods depending on the availability of scenes. Therefore, verification event could occur annually of by periods.

LULC-change analysis will be done for the the Reference Region, Project Area and Leakage Belt using the protocol described in detail in the excel sheet submitted to VVB. This imagery classification analysis will result in forest and non-forest classes that should be compared with the results from the deforestation model for the date of a specific verification event. The results from such analysis will be reported using the appropriate VCS" tables and formats.

1.1.3 Monitoring of carbon stock changes and non-CO2 emissions from forest fires

None of the cases presented in Section 1.1.3 of the VM0015 methodology apply to the Project (Table 52). So, the Project is not required to set sampling plots to measure carbon stocks in either the project area or leakage belt.

Table 52: Applicability criteria for monitoring non-CO2 gasses

	ID	Type	Applicability to the Project
	Within the Project Area		
Mandatory monitoring of the carbon stocks	I	Areas subject to significant carbon stock decrease in the project scenario according to ex-ante assessment	Does not apply
	II	Areas subject to unplanned and significant carbon stock decrease e.g., due to uncontrolled forest fires and other catastrophic events	Does not apply
	III	Area of forest land undergoing carbon stock increase	Does not apply
	Within Leakage Management Area		
	IV	Areas subject to planned and significant carbon stock decrease in the project scenario according to ex-ante	Does not apply

		assessment	
Option monitoring of carbon stocks	Within the Project Area		
	V	Areas subject to carbon stock increase after planned harvest activities	Does not apply
	VI	Areas recovering after disturbances	Does not apply
	Within Leakage Management Areas		
	VII	Areas subject to carbon stock increase due to leakage prevention measures	Does not apply
	Within Leakage Belt		
	VIII	Areas undergoing significant changes in carbon stock	Does not apply

1.1.4 Monitoring of the impacts of natural disturbances and other catastrophic events

Catastrophic events are not expected in the Project Area or Leakage Belt. Nevertheless, if by any chance a catastrophic event presents during the Project's lifetime, such events will be evaluated and reported if significant. Monitoring will follow VM0015 Tables 20.f, 20.g, 21.f and 21.g to report reductions by catastrophic events.

1.1.5 Total ex post estimated actual net carbon stock changes and GHG emissions in the project area

All ex-post estimations in the Project Area will be summarized using the format of Table 24 of the VM0015 methodology.

1. 2 Monitoring of leakage

The Project is not expected to generate any type of leakage. Even so, as mentioned in item 1.1.2 of this Monitoring Plan, monitoring of forest cover will be done mainly by remote sensing imagery. The choice of imagery will depend on the availability of scenes, cloud cover, and related acquisition and processing costs. Remote sensing imagery could be either satellite (i.e Landsat) or radar (i.e Alos Palsar) or a combination of both.
LULC-change analysis using remote sensing imagery could be conducted annually of by periods depending on the availability of scenes. Therefore, verification event could occur annually of by periods.

Any deforestation above the deforestation baseline found outside the Project's Boundaries will be considered to be leakage as described in the VCS" vm0015 methodology.

Carbon stocks in pre and post-deforestation classes are assumed to remain constant, as there are not significant decreases or increases of carbon stocks in the leakage belt.

1.2.1 Monitoring of carbon stock changes and GHG emissions associated to leakage prevention activities

The activities of the project won"t generate GHG emissions. Only possibility of emissions is through forest fires, efficient methods are followed in the project area for the prevention of forest fires.

1.2.2 Monitoring of carbon stock decreases and increases in GHG emissions due to activity shifting leakage.

It is not expected for the Project to generate any kind of leakage. Even so, LULC-change will be monitored periodically (annual or multi-annual depending on the frequency of the verification events) using the protocol described in detail in Annex submitted as part of the monitoring activities described in Section 1.1.2 of this monitoring plan.

For the case of the leakage belt, LULC-change analysis will be focused on assessing deforestation above baseline levels. If such deforestation is identified results will be reported in Tables 29.a, 29.b and 29.c.

If deforestation above the baseline levels occurs in the leakage belt during the project lifetime, the exceeding carbon stock loss will be accounted for, and will be deducted from the non- permanence buffer.

Monitoring of increases in GHG emissions

The parameter values used to estimate emissions will be the same used for estimating forest fires in the baseline (table 18 of VM0015 methodology), except for the initial carbon stocks (Cab, Cdw) which shall be those of the initial forest classes burned in the leakage belt area.

The results will be reported using the same table formats (Table 18 and 19 of the VM0015 methodology) used in the ex ante assessment of baseline GHG emissions from forest fires in the project area.

TASK 2 - Revisiting the projected baseline at fixed periods.

2.1 Update information on agents, drivers and underlying causes of deforestation.

Anapu-Pacaja will be responsible for monitoring these variables. The biophysical variables, agents, vectors, and the underlying causes of deforestation (Step 3). used to project future deforestation from the Reference Region will be reviewed at least every 10 years (fixed baseline period) but they can also be reviewed earlier depending on the requirements of the Project.

2.2 Adjust the component of use and land-use change of the baseline.

Anapu-Pacaja will be responsible for carrying out this part of the monitoring.

Step 4 of Part 2 of the methodology VM0015 will be repeated to consider at least the following10-year period in the Reference Region (2018-2028). However, the baseline can be modified to consider earlier10-year periods. Such changes in the baseline must be approved by Anapu-Pacaja and will require undergoing a verification process before they can be implemented.

Updating the baseline scenario will take place both in the modeling component of the system dynamics (which defines the amount of change) and the spatial component that defines the distribution of deforestation. Key variables that will be used to recalculate the baseline in the second 10-year period of the project are:

- Socio-economic information retrieved from the Project's monitoring activities
- Distance to new roads
- Average distance to selective logging activities from pioneer roads
- Distance to non-forest
- Planned infrastructure in the region

To collect this information, field visits, surveys and workshops will be held and forest cover dynamics will be assessed using available satellite and/or radar imagery.

2.3 Adjusting the carbon component of the baseline.

2.4 According to Section 1.1.3 (Section 1.1.3 of the applied methodology, page no.107) of this monitoring plan, it will not be necessary to adjust the carbon component of the baseline.

3.3.4 Dissemination of Monitoring Plan and Results (CL4.2)

It will be through the website of Brazil Agfor that the monitoring plan, as well as its results obtained will be available to the public. Statements of relevant and summary information addressed to communities and stakeholders will be transmitted through the REDD Technical Chamber and visits by Foundation technicians to rural communities in local language.

3.4 Optional Criterion: Climate Change Adaptation Benefits

Does not apply

3.4.1 Regional Climate Change Scenarios (GL1.1)

Does not apply

3.4.2 Climate Change Impacts (GL1.2)

Does not apply

3.4.3 Measures Needed and Designed for Adaptation (GL1.3)

Does not apply

4 COMMUNITY

4.1 Without-Project Community Scenario

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

Land use without the project would be different from having the project. From these analyses we can come to the following conclusions about the without project scenario:

The following points were both visualized and discovered in the community meetings with the local Riverine population and traditional rural villagers. These are from discussions that the project has had and are information provided to the project by the Riverine and traditional rural villagers are based on what the Riverine people have told the project. The Riverine people and

traditional rural villagers did not provide evidence to their thoughts, but the following are rational and logical based on what an outsider would expect from the region:

- As listed the people in the project area are Riverine people, or “river people”, they live along the banks of the river and are typically descendants of Europeans that worked as rubber tappers, and when the rubber tapping economy ended, they decided to stay in the forest. They are considered a traditional people in Brazil.
- The communities at the start of the project were more remote, they have no real communication, no internet it had not yet arrived into this region at this time, the only time they communicated with the outside world is when they travelled to the city, which was very expensive at the time as there is only one government funded boat per week and that still had a fee.
- The environment ten years ago was much more tree cover in the region, as poverty increased the communities have had to increase Cassava production to chase after miniscule profits.
- The social economic situation was still at less than 1 dollar a day, and resulted in each community opening up a few hectares each year, as they believe that the most fertile soil is right after a fire clearing a few hectares.
- The spiritual situation in the region is that everyone is devote evangelical, nearly every community has a church and the churches may only have 4 or 5 houses that belong to the church. Most churches are made the same way as their houses, but some communities may have a church that cost more than all the housed combined.
- Of the various households in the LMA, they all have the basic beliefs: The best way to survive is to grow Cassava, that no one wants to buy our products we produce as we are too remote, that God is supreme, and that trading between the other households is pointless, because if they can grow a product, we can as well.
- A few households have been able to have better conditions, they own a boat and are able to catch fish and sell in the city.
- Life was definitely better at one time, there are old satellite TV antennas on properties that are probably left over from when Georgia Pacific had a large laminate operation in the region and the entire region had thousands of employees directly and indirectly associated with this business.
- The communities ten years ago were completely sustained on the Brazilian welfare system, but today with the new president welfare has been cut by half, thus making the communities more dependent on the success of the carbon credit project.
- Woman are the head of the household, while the men are the head of land ownership. This is still the same, but it is interesting to know that woman control the family.
- The local communities are made into two primary groups, male and female, with separate benefits for the males and females.
    - Each household refers to itself as a Villa or Village with a name, but in reality, it is a house, or a collection of houses all from the same family. Thus, for purposes of the project we refer to each household as a household, as it is more logical for outsiders to understand. As a village sounds as if it is a collection of houses of various families, but that is not the case here. A household in the LMA is simply a house and other house for the grown children. Typically not more than 13 houses in total for the region, but in the case of Anapu-Pacaja , the houses are typically 1 to 3 houses.
- The community is not treated well by politicians or other groups in the region, they have restrictions on if they are allowed or not allowed to have livestock for personal use.
- The local politicians use and abuse the locals by convincing them to sign up to cutting programs, and then taking all the money for themselves.
- They have been told by local groups not to gain title and even have been told they are not allowed when clearly the law states differently.

- The illegal loggers make promises of help bring them a better life, in exchange for the right to gain access to the land behind their house. They are paid pittances and millions of dollars of wood are basically taken.
- The local population uses open fire cooking scenario with their pot of rice or beans sitting on two logs with the fire in between.
- Some houses have gas stoves, but they have no money to buy gas.
- Increase in agricultural areas use to grow mainly cassava. Thereby, it is projected substantial increase in the forest areas affected by slash and burn. Incursion of illegal loggers and illegal activities (invasions) seeking areas to extract timber. It should be remarked that this is the most common perception of the future among households.
- Increase in timber extraction in the core sections of the project areas, with a related diminishment of timber resources nearby the households.
- Decline of fish stocks in rivers and water bodies due to over-fishing by large companies coming from Portel and Breves.

4.1.2 Interactions between Communities and Community Groups (CM1.1)

There are two community groups, male and female. The households make up that one (2) community groups. There are no sub-groups, other groups that live in the land. All the people present are Riverine people and traditional rural villagers.

They are so intertwined with each other they all are related and are 1st, 2nd, 3rd, 4th cousins with each other. They are all brothers, or sisters, or sister in laws or brother in laws.

It is rarely and outsider moves to the region and marries into a riverine community and traditional rural villagers, but in the event this happened, they would enter into area that is more remote.

The interactions between the project and the community group was a well-received interaction, they were very pleased to hear about the project. They are very much desperate for everything or anything they can gain from. In all questionnaires, there is always a 93% to 97% acceptance rate, with normally the 3% to 7% believing that they already have something we are offering.

The project has been helping people gain their land tenure documents. During the interview process 3% of the population thought they already had title for the land they were on but did not. The project has focused to help better explain that they do not have title, but would help them gain title.

4.1.3 High Conservation Values (CM1.2)

High Conservation Value	Caxiuana National Forest
Qualifying Attribute	The Caxiuana National Forest is considered the oldest in the Amazon region and the second in Brazil. It is amongst the most known conservation units in north of Brazil, and it has the presence of many important researchers from Brazil and abroad

Focal Area	On the northern border of the reference region there is a national conservation unit called National Forest Caxiuanã. It was created in 1961 and today it has an area of 322,694.34 hectares. The Conservation Units are types of conservation areas that were created to allow sustainable use of the forest and its natural resources

4.1.4 Without-Project Scenario: Community (CM1.3)

1. Historical Area Characteristics, Context and Dynamics.

The project is located in a fast-changing region characterized by forests rich in valuable timber species, illegal logging, unclear land tenure laws, widespread land speculation, overall weak law enforcement and severe poverty. With these variables combined the results are no less than deforestation and destruction.

Pioneer agents open the path for deforestation agents who cut clear the forest as a measure of providing land ownership and implementing low-cost and practically self-sustained productive activities.

The predominant final land-use in the area is deforestation by cattle ranchers to implement pastures, which occurs simultaneously in two deforestation fronts.

The first is known as “consolidated frontier”, which is the area close to primary roads (federal and state highways) and already occupied mainly by cattle ranching. This frontier continues to expand due to the creation and expansion of secondary and tertiary roads that allow deforestation agents to deforest by using slash and burn.

The second front, known as a “pioneer frontier”, refers to forested areas with low deforestation but with high degradation located farm from primary roads, but easily accessible through navigable rivers. These areas are considered to be of “free access” whenever the presence of the legal landowner is not made.

The most likely land use scenario without the project has the following features, the same that have been projected by local households. From these analyses we can come to the following conclusions about the without project scenario:

- Drastic increase in people who would be settled in the project area within 5 years. The project has helped demarcate the Riverine and traditional rural village plots and this has given each family 100 hectares, this also has prevented settlers from taking this land. Either the project did this for the Riverine people and traditional rural villager or a land grabber would do it for themselves. The land grabber would have one goal and that is to deforest the land, while the riverine would preserve 95% of the area.

- Two evidences represent why the Anapu-Pacaja project would be completely invaded within 3 years if the project was to seize its security and land tenure operations: Megatown Trading Ltda. a Brazilian company owned by a person from Sao Paulo had 76,230 hectares in Portel, Para, just north of the thousands of farms in Pacaja, Para. They removed their security in 2010 and within

2 years the land was completely claimed by new farmers and now the lands are being completely dismantled.

- A second case is a group named: Agropecuaria e Industrial Rio Tuere Ltda. This is owned by a Japanese group and they have 69,696 hectares in Portel, Para, slightly south of the project area between Anapu, Para and Pacaja, Para. In 2010 they removed their security and lost all their land to invasion in 3 years. Now the land of these two entities is lost to the title holders and over 500 land claims have been made on these properties. The properties are severely dismantled in the last 9 years and thus these are the predecessor examples to the Anapu-Pacaja project. The evidence is an evidence of two example landowners that were decimated in the direct vicinity and neighbour to Anapu-Pacaja . This is the only region in Brazil that faces such aggressive land grabbing.

- Local population with no plans or hopes for other economic factors such as black pepper or honey production. Black Pepper is an expensive investment at over 15,000 dollars per hectare. There is no financing at the bank for this type of project, thus without the Anapu-Pacaja project this would never even been considered – so without the project this is not happening.
- The local Riverine population and traditional rural villager would not have access to markets for their projects as well. The project is building up a supply chain – that is in the discussion and planning stages – that has the goal to help bring the products to the market at market prices.
- The local Riverine population would not have cook stoves and thus would be cutting more wood to make the large open fire cooking scenario, causing there to be more forest degradation. As seen in the site visits the situation with their previous cook stoves was inhumane. The project brought 50 cook stoves in the PA and the LMA and is bringing 300 more cook stoves to the area outside the project area to the LMA and the Reference Region.
- Increase in agricultural areas use to grow mainly cassava. Thereby, it is projected substantial increase in the forest areas affected by slash and burn.
- Incursion of illegal loggers and illegal activities (invasions) seeking areas to extract timber. It should be remarked that this is the most common perception in each household.
- Increase in timber extraction in the core sections of the project areas, with a related diminishment of timber resources nearby the household.
- Decline of fish stocks in rivers and water bodies due to over-fishing by large companies coming from Portel and Breves.

According to the land use scenarios projected by local households, we summarized the Information in two possible outcomes:

- Cassava farming is incentivized thus occupying more and larger areas.
- The increment of Cassava plots pushes the agricultural frontier towards forest covered areas thus generating deforestation.
- Forested areas area degraded due to the dynamics of illegal logging activities.
- Fauna is even harder to find thus reducing the food options for local households
- Degraded forest due to selective logging is sold to ranchers that implement pastures.

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

Community Group	• Riverine Community • Vila Aru, Vila do Bogea, Vila Horebe, Vila Menino Deus, Vila Sao Joao, Vila Sao Jose, Vila Jerusalem and Vila Laguinho

Impact(s)	• Improved skills to have up-ward mobility due to land tenure documents. • Ability to sell the land they own, and have lateral mobility. • incapacity building of • local people participating in the monitoring activities of the project. • Improved livelihood via more stability and stability to invest back into the land they now have tenure documents. • Communities are trained to biodiversity monitor and report back any unique events.
Type of Benefit/Cost/Risk	• Actual benefit is upward mobility and wealth. Prior to the project each family owned nothing, now they have land, that is worth over 100,000 reais, which would place them into the rural middle class. • Capacity building related to the monitoring and management of the forest and biodiversity. • Very little cost, as the monitoring is done via cell phone camera when there is a unique event, such as a large carnivore enters the vicinity of the households. • Job Opportunities
Change in Well-being	• Improved livelihood – more aware of the fauna and flora.

Community Group	• Riverine Community • Vila Aru, Vila do Bogea, Vila Horebe, Vila Menino Deus, Vila Sao Joao, Vila Sao Jose, Vila Jerusalem and Vila Laguinho
Impact(s)	• Better governance • Trained to be the point person for the project to improve their level of organization, management and democratic governability • An association was set up to help the governability it is called*Associacao de Ribeirinhos e Moradores de Portel, Para Ltda.* which was set up by the landowners to facility the social activities of the carbon credit project. •
Type of Benefit/Cost/Risk	• Actual benefit is that the project will have a point of contact that is representative of the project in each section of the project area. • overall satisfaction of community feel they are actually represented.
Change in Well-being	• Better governance

Community Group	• Riverine Community • Vila Aru, Vila do Bogea, Vila Horebe, Vila Menino Deus, Vila Sao Joao, Vila Sao Jose, Vila Jerusalem and Vila

	Laguinho
Impact(s)	• People trained in agroforestry techniques • 5 Number of implemented agroforestry pilot projects • *Capacity building* for Improved agricultural practices
Type of Benefit/Cost/Risk	• Predicted benefit is that the riverine and traditional rural villagers will be able to sell their agroforestry production for a higher price than Casava, this will help improve livelihood. • overall satisfaction and food security of community
Change in Well-being	• Improvement in overall understanding that Casava, just because it is comfortable, is not the only option. • Understanding that other crops work in the region as well brings diversification.

Community Group	• Riverine Community and traditional rural villagers • Vila Aru, Vila do Bogea, Vila Horebe, Vila Menino Deus, Vila Sao Joao, Vila Sao Jose, Vila Jerusalem and Vila Laguinho
Impact(s)	• 50 received land tenure document known as CAR • Providing land ownership legal rights
Type of Benefit/Cost/Risk	• The land title undermines the illegal loggers • The land title brings stability to the local community. • It prevents land invasion by land invaders.
Change in Well-being	• Improvement in overall satisfaction and security of community

Community Group	• Women of the Riverine community and traditional rural villagers
Impact	• 50 women were trained on the efficient cook stoves. • 50 cook stoves have been provided to the riverine people. • improvement in health especially women and children • improvement in safety as the current cooking conditions were prone to house fires. • Training programs for women empowerment and women education
Type of Benefit/Cost/Risk	• Actual benefit is a better situation, easier cooking situation, time savings, better for environment as wood is not used • overall satisfaction and health of community • Improvement in the knowledge of environment and forests, which will be helpful for the better management of the natural resources
Change in Well-being	• Improvement in overall satisfaction and health of

	community

Community Group	• Riverine Community and traditional rural villagers • Vila Aru, Vila do Bogea, Vila Horebe, Vila Menino Deus, Vila Sao Joao, Vila Sao Jose, Vila Jerusalem and Vila Laguinho
Impact(s)	• Improved skills to have up-ward mobility due to education training • Ability to read and write • incapacity building of local people participating in the monitoring activities of the project. • Improved livelihood via more stability and stability to join the public discussions and take independent decisions • Communities are educated and trained to biodiversity monitor and report back any unique events. • Total of 43 people were given education, out of which 22 are females
Type of Benefit/Cost/Risk	• Actual benefit is upward mobility and knowledge. Prior to the project each family had more number of illiterates. Now they have the ability to read and write • Capacity building related to the monitoring and management of the forest and biodiversity. • Very little cost, as the monitoring is done via cell phone camera when there is a unique event, such as a large carnivore enters the vicinity of the households. • Job Opportunities
Change in Well-being	• Improved livelihood and knowledge – more aware of their surrounding environment.

4.2.2 Negative Community Impact Mitigation (CM2.2)

There are no negative community impacts and hence there is no need for mitigation.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

The REDD+ Project proposes a socioeconomic development process for the communities involved in the Project, focusing in particular on social strengthening, through the consolidation of local social organizations and the provision of a differentiated Activities of Technical Assistance and Rural Extension (ATER) with a focus on diversification, increase and production commercialization, associated to activities with social and environmental focus. To this end, training and direct training for producers will be carried out through participatory strategies with the joint construction of knowledge and the most appropriate techniques for the communities, maximizing the results to be obtained and continuously involving producers in management.

In the scenario without Project, as described in item 4.1.4 Scenario without Project: Community, the lack of public policies and the context of low income cause the communities of the Project Area to seek more favorable alternatives to increase income from increasing land use in an unplanned way. Another problem in the current scenario is inefficient and unprofitable agriculture and difficulties in market access that result in difficulties for the well-being of people living in these communities.

Net Positive community impacts are expected to be:

- A point of contact in each household for the project to be able to liaison to allow better communication for the project. Better reporting of events.
- Governance and an association were set up to help coordinate the giving and coordinate better interactions in the community. A better collective group to defend off illegal loggers and drivers of deforestation (land grabbers)
- Cook stoves to replace what appeared to be open fires, making cooking more efficient and easier.
- Land tenure inside the community group for each family.

Land title brings stability to the population, land title prevents displacements, brings security, helps incentivize the population to reinvest into the land. It also defines the riverine location and where they can do their traditional crops, without entering into the project area.

In addition to the positive impacts, the Project, working on aspects of associative strengthening, improvement of family agriculture, provision of technical assistance and improvement in energy and communication systems, is intended to influence social issues and the living conditions of communities around the Project Area, in order to reduce social vulnerability and rural exodus, providing families with an improvement in the quality of life and income stability allowing families to obtain goods and services that promote economic and social well-being. Riverine community and the traditional village community groups identified under the stakeholder will have similar benefits.

4.2.4 High Conservation Values Protected (CM2.4)

The HCVs related to community well-being are not negatively affected by the project; on the contrary, only positive impacts are expected

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

The Project is designed to generate only positive impacts to the stakeholders living in the LMA and it won't generate impacts to those living outside the 3Km buffer identified during the PRA. No other stakeholders have been identified to use or depend from the resources in the Project's Area or LMA.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

As mentioned in the previous item, there area not expected negative offsite impacts thus no mitigation strategies are required.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

As shown in 4.3.1 and 4.3.2, the project is anticipated to generate positive impacts on the other stakeholders and no negative impacts, hence leaving a net positive impact overall.

4.4 Community Impact Monitoring

4.4.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

The project proponents have designed a Social Impacts Monitoring Plan in accordance to the results obtained in the rural participatory diagnosis developed in the project area and initially considering the indicators for the products of the proposed activities based on the identification of the necessities indicated by the population and the strategies foreseen to accomplish the project goals.

The following Table (Table 53) shows a non-comprehensive list of activities and indicators that were considered during monitoring. A full and detailed list was presented in the monitoring plan that was developed and submitted within the first six months after validation.

Table 53: Some activities and indicators of the social monitoring during this monitoring period.

Activity	Product Indicator
1. Capacity building related to the monitoring and management of the forest and biodiversity. Opportunities to work as control/supervision *staff.*	• 50 heads of households have been trained on monitoring. • They were taught to identify fauna that entered the vicinity to their home • Technicians completing survey work in the project area and staying in the forest for long period of time are able to monitor biodiversity. Over the period 2015 to 2020 the project was focusing on a detailed census in each arm of each river, focusing on about 50 households per year for both census, training and delivering of cook stoves where needed.
2. Improving organizational Capacities of each *community.*	•5 people one in each section of the project was trained on better organizational capacity. •Number of local associations/organizations strengthened by the project activities such as Association of Ribeirinhos e Moradores Portel Ltda.
3.Providing land ownership legal rights versus *conservation results*	• 50 families living inside LMA and its proximities • 50 of people registered in the program to become legal land owners (inside and outside project area and LMA) • 50 of people that meet the forest conservation *agreement.*
4. Providing assistance to obtain land use rights over the forest owned by the private property landowners	• 50 people (Over 5,000 hectares) registered in the program to obtain the use from land that was titled as private property as par to the project and is shifted over to the riverine people to be their land. These 5,000 hectares will have far better management when the Riverine and traditional rural villagers know it belongs to them. The CAR documents can be found in the government website for the Environmental Ministry for the state of Para – all 50 are there. This is the evidence The reason we know 50 were done is because the project did this, reviewing each CAR, one by one, as listed above the process is tedious with visit after visit to the same location, with locations very far from the town of Portel.
5. Providing assistance and training in agroforestry Techniques and implementing *pilot cases.*	• Around 50 people have been given lessons and training in alternative crops of agroforestry such as black pepper, Acai, Cocoa, Cupuacu, Honey

6. Capacity building related to efficient and improved cooking stoves and implementation of pilot *demonstrative cases*	• 50 cook stoves distributed 50 people trained in the use of efficient improved cooking stoves • 50 of improved cooking stoves pilots implemented *in local* Families
7. Capacity building on the development of small *communitarian enterprises.*	• 5 people from the community group, trained in the development and management of a small-scale enterprise. Mostly focused on better marketing and advertising of the existing products such as cassava flour.

A Participatory Census was carried out previously to the design of the definite Monitoring Plan in the Project area. This collected information about the unsatisfied basic needs, health, education, family economy, communal organization, etc., which gave the project baseline and also represent the social indicators to be monitored throughout the project´s execution.

Likewise, in order to develop de social-environmental indicators for the results, several communitarian workshops took place as a fundamental part of the Social Communitarian Monitoring System that facilitate the follow-up and evaluation of the benefits of the project to improve the quality of life of the communities.

This system will eventually have communitarian monitors that continuously carry out the follow up activities evaluating the commitments, project activities and communities every 3 to 6 months. Also, the Communitarian Impacts Monitoring Plan carry out an exhaustive annual assessment of the indicators. Until the communication monitors are in place and competent the project has been sending technicians to the land on long term assignments to make sure the project is properly being conducted.

The Social Impacts Monitoring Plan aims at creating an association and mutual responsibility sense between the project and local communities in the management of social environmental impacts, as well as improving the perception of the social responsibility adopted by the project. Anapu-Pacaja is committed to develop a complete Social Impacts Monitoring Plan with the characteristics here mentioned in the first year from validation.

4.4.2 Monitoring Plan Dissemination (CM4.3)

All the documents/results are published in the project website and communicated in Portuguese in a simple language to the council of stakeholders for their awareness and free participation.

Apart from the survey teams the main form of communication followed was one-to-one meetings with the community in which the feedback on the benefits provided were communicated which are periodic. Further during this period, the benefits were mainly related to Skill and capacity development,

The plan was provided to local access via the project webpage and they have this.

In addition to this the technicians who travel to the land are required to carry all the most up-to-date documents and go through them with the communities at their request.

The head of each household were shown a hard copy of the results and a discussion took place to make sure that this person understood it.

4.5 Optional Criterion: Exceptional Community Benefits

The project does not seek to be validated to the Gold Level for exceptional community benefits

4.5.1 Exceptional Community Criteria (GL2.1)

Not Applicable

4.5.2 Short-term and Long-term Community Benefits (GL2.2)

Not Applicable

4.5.3 Community Participation Risks (GL2.3)

Not Applicable

4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

Not Applicable

4.5.5 Net Impacts on Women (GL2.5)

Not Applicable

4.5.6 Benefit Sharing Mechanisms (GL2.6)

Not Applicable

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

Not Applicable

4.5.8 Governance and Implementation Structures (GL2.8)

Not Applicable

4.5.9 Smallholders/Community Members Capacity Development (GL2.9)

Not Applicable

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

The Eastern Amazon, where the project is inserted, is an area that holds the biggest concentration of the timber industries (74% of timber production in Pará comes from the Eastern Amazon). The logging industry is responsible not only for feeding illegal logging schemes, but also cleaning the forest to build roads. Specifically these roads built by the loggers are determining a new pattern of occupation inside public lands (IBGE 2007). Non-authorized logging is more concentrated in the extreme east of Pará, but it is moving *towards the Xingu-Tocantins interfluvium (Veríssimo et al. 2011).*

As part from the "without project" scenario it is likely that the deforestation drivers continue to push forward, and human occupation follows this movement. Eastern Amazon is the most populated region of the Brazilian Amazon and anthropogenic actions, such as forest cleaning, are one of the many aspects affecting local biodiversity, especially mammalian diversity rates (Lopes & Ferrari 2000).

It is likely that "without project" we would at a minimum have 100% land claims on all aspects of the land within 2 to 5 years, with massive small plots opened up to make claims within this period of time as well, and 50% deforestation within 15 to 20 years. (As seen with the cases of both Agropecuaria e Industrial Rio Tuere Ltda. and the company Megatown Trading Ltda. – when they removed their security, they had complete invasion in 2 years)

Highway paving is not only intrinsically connected with anthropogenic actions but also with either the expansion of the soybean industry or cattle raising activities. These commodities have experienced a considerable growth in 2005 and the constant market demands indicate that this growth tends to continue (Nepstad et al. 2006). Under the "without the project" scenario it can be inferred that this area might be affected by this expansion, causing *biodiversity losses and soil degradation.*

Regarding to species threatened with extinction, eleven of them are listed in threatened species provided by bodies such as IBAMA and IUCN, being: six species present in the IBAMA list and eight species in the IUCN list. Table lists the endangered flora species according to the IUCN Red List of Threatened Species

Table 54: Flora species threatened according to the IUCN Red List of Threatened Species

IUCN Threat Category	Scientific Name
Critically Endangered (CR)	*Vouacpoua americana Aubl.*
Endangered (EN)	*Maniara elata (F.Allemao ex Miq.) Monach*
	Pouteria amapaenses Pires &T.D.Penn.
	Virola surinamensis (Rol.) Warb
Vulnerable (VU)	*Bertholletia excelsa H. &B.*
	Joannesia princeps Vell.
	Pouteria krukovii (A.C.Sm.) Baehni
	Pouteria oppositifolia (Ducke) Baehni

Table 55: Inventory of Flora documented in the project area: 274 different species.

Common name	*Scientific name*	
Abiu / Guajara caramurim	*Pouteria oposita* (Ducke) T.D.Penn.	1
Abiu amarelo	*Pouteria decorticans Penn*	1
Abiu arrepiado/ Abiu casca fiana/ Abiu nambuquiça	*Pouteria decorticans Penn*	1
Abiu casca grossa	*Planchonella pachycarpa*	1
Abiu goiaba / Abiu Goiabinha	*Pouteria decorticans* Penn	1
Abiu vermelho	*Pouteria torta* (mart) Radlk subsp. Glabra Penn	1
Abiurana / Abiurana Vermelha	*Franchetella anibifolia*	1
Abiurana Branca	*Pouteria reticulata* (Engl.) Eyma subsp. reticulata	1
Abiurana Preta	*Pouteria krukovii*	1
Acapu	*Vouacapoua americana*	1
Acapurana	*Campisiandra laurifolia* bBenth.	1
Acariquara	*Minquartia guianensis*	1
Acariquarana/ Araruta	*Rinorea paniculata* (Mart.) Kuntze	1
Achua/ Axixá/ Capoteiro	*Sterculia speciosa* K. Schum.	1
Amapa / Amapa doce	*Brosimum potabile*	1
Amapa amargoso	*Parahancornia fasciculata* (Poir.) Benoist	1
Amaparana	*Batocarpus amazonicus* (Ducke)	1
Amarelao / Garapeira	*Apuleia leiocarpa*	1
Ananim	*Simphonia globulifera* L.	1
Andiroba	*Carapa guianensis*	1
Angelim	*Copaifera multijuga* Hayne	1
Angelim amargoso	*Vatairea sericea* Ducke	1
Angelim pedra	*Hymenolobium excelsum* Ducke	1
Angelim Rajado	*Zygia racemosa* (Ducke) Barneby & J.W.Grimes	1
Angelim vermelho	*Dinizia excelsa*	1
Anuera	*Anaueria brasiliensis* Kosterm	1

Arapari	*Macrolobium multijugum* (DC.) Benth. var. multijugum	1
Araracanga	*Aspidosperma araracanga* Marc.-Ferr	1
Arataciu	*Anomalocalyx uleanus* (Pax & K.Hoffm.) Ducke	1
Bacuri	*Platonia insignis* Mart.	1
Bacuri pari	*Rheedia macrophylla* (Mart) Planch. & Triana	1
Barbatimão	*Stryphnodendron pulcherrimum* (Willd.) Hochr.	1
Breu amescla / Amesclao	*Trattinnickia mensalis* Daly	1
Breu barrote	*Tetragastris panamensis*	1
Breu branco	*Protium palidum* Cuatrec.	1
Breu sucuruba	*Trattinickia rhoifolia*	1
Breu vermelho	*Tetragastris altissima* (Aubl.) Swart	1
Buiuçu / Olho de boi	*Ormosia coutinhoi* Ducke.	1
Burra Leiteira / Sorva	*Sapium marginatum* M. Arg	1
Cacauba	*Theobroma* sp.	1
Cacaui	*Theobroma sylvestre* Mart.	1
Caferana	*Pera eiteniorum* Bigio & Secco	1
Cajuaçu / Cajui	*Anacardium giganteum* W.Hancock ex Engl	1
Canela de jacamim	*Rinorea riana*	1
Canela de Velho / Muuba vermelha	Miconia sp. Embrapa	1
Caniceira	Pseudoxandra cuspidata Maas	1
Carapanauba	Aspidosperma carapanauba Pichon	1
Caripe	Licania octandra (Hoffmanns. Ex. Roem & Schult.) Kuntze	1
Cariperana	Licania apetala (E.Mex.) Fritsch	1
Cariperana	Licania apetala (E.Mex.) Fritsch	1
Casca seca	Sagotia brachysepala (Müll.Arg.) Secco	1
Castanha do Para / Castanheira	Bertholletia excelsa Bonpl	1
Catuaba / Limorana	Secondatia floribunda A.DC	1
Cedro vermelho	Cedrela odorata L	1
Cedrorana	Cedrelinga cateniformis (Ducke) Ducke	1
Ceru	Allantoma lineata (Mart. & O.	1
Cipo	Araujia sericifera Brot	1
	NI	1
Cipo apui / Atraca	Martinella obovata (Kunth) Bureau & K.Schum.	1
Cipo cebola Braba / Cebolao	Clusia grandiflora Spligz.	1
Cipo cravo	Tynanthus elegans Miers	1
Cipo de fogo	Doliocarpus dentatus	1
Cipo escada de jabuti	Bauhinia guianensis Aubl.	1
Cipo Macaco	Combretum fruticosum (Loefl.) Stuntz	1
Cipo mereteteca	NI	1

Cipo unha de gato	NI	1
Cipo vermelho	Combretum mellifluum Eichler	1
Coco pau	Couepia robusta	1
Copaiba	Copaifera duckei Dwyer	1
	Copaifera multijuga Hayne,	1
Coração de Negro	Swartzia	1
Cumaru / Cumaru amarelo	Dipteryx odorata (Aubl.) Willd.	1
Cumaru preto	Dipteryx sp.	1
Cumaru vermelho	Dipteryx sp.	1
Cumaruí	Dipteryx sp.	1
Cupiuba	Goupia glabra Aubl	1
Cupui	Theobroma subicanum Mart.	1
Curupixa	Micropholis acutangula (Ducke)	1
Embauba / Embauba branca	Cecropiapalmata	1
Embauba vermelha	Cecropia glaziovii Snethl	1
Embaubão / Embaubarana / Torém.	Cecropia sciadophylla Mart	1
Envira	Annona sp.	1
Envira amarela	Duguetia echinophora R.E.Fr	1
Envira branca	Duguetia quitarensis Benth	1
Envira preta / conduru	Annona exsucca DC	1
Envira quiabo	NI	1
Envira taia	Annona ambotay Aubl.	1
Envirão	Onychopetalum amazonicum	1
Escorrega macaco	Peltogyne panicula	1
Fava amarela	Vatairea guianensis Aubl.	1
Fava amargosa / Impingenta	Vataireopsis speciosa Ducke	1
Fava atana	Parkia gigantocarpa Ducke	1
Fava bolacha	Vatairea guianensis Aubl	1
Fava Bolota / Visgueiro	Parkia pendula (Willd.) Walp.	1
Fava Branca	Parkia paraensis Ducke	1
Fava carocinho	NI	1
Fava core	Parkia oppositifolia	1
Fava japu	NI	1
Fava orelha de macaco	Enterolobium schomburgkii Benth.	1
Fava paramaça	NI	1
Fava paricá/ paricá	Schizolobiun Amazonico	1
Fava tamanquare	NI	1
Fava tamboril	Enterolobium maximum Ducke	1
Fava timborana	Pseudopiptadenia suaveolans	1
Faveira Branca	Parkia multijuga Benth.	1
Freijo branco	Cordia bicolor A.DC.	1

Freijo cinza/ Freijo	Cordia Goeldiana	1
Goiaba da Mata / Goiabinha / Goiaba de anta / Muuba	Bellucia grossularioides (L.) Triana	1
Goiabão	Pouteria pachycarpa	1
Guajara	Chrysophyllum sp.	1
Guajara Bolacha	Syzygiopsis oppositifolia Ducke	1
Guajara cinza	Chrysophyllum sp.	1
Guajara de leite / Branco	Pouteria ambelaniifolia (Sandwith)	1
Guajara pedra	Neoxythece elegans (A.DC.) Aubret	1
Guajara preto	NI	1
Guariuba / Oiticica	Clarisia racemosa Ruiz & Pav.	1
Inga	Inga alba (Sw.) Willd	1
Inga	Inga alba (Sw.) Willd	1
Inga branco	Inga capitata Desv	1
	Inga gracifolia Ducke.	1
Inga peludo	Inga edulis	1
Inga vermelho	Inga calantha Ducke	1
Inga Xixica	Inga sellowiana Benth	1
Ingarana	Abarema jupumba (Willd.) Briton & Killip var. Jupumba.	1
Inhare	Brosimum guianensis	1
Ioizeiro	Xylopia nitida Dunal	1
Ipe	Tabebuia sp.	1
Ipe	Tabebuia sp.	1
Ipê Amarelo	Tabebuia serratifolia (Vahl) Nicols,	1
Ipeuba / ipé vermelho	Macrolobium bifolium (Aubl) Pers.	1
Itauba / Itauba amarela	Mezilaurus itauba (Meissn.)Taubert ex Mez.	1
Itauba Branca	Mezilaurus sp.	1
Itaubarana	Guarea cinnamomea Harms	1
	Mezilaurus sp.	1
Jacareuba	Calophyllum brasilense Cambess	1
Jarana	Lecythis lurida (Miers) S.A.Mori	1
Jarana branca	Lecythis sp.	1
Jarana vermelha	Lecythis sp.	1
Jatoba	Hymenaea courbaril L.	1
João mole	Neea floribunda	1
Jutai	Hymenaea Parviflora Huber.	1
Jutai miri / Pororoca	Hymenaea sp.	1
Lacre / Lacre vermelho	Visnia latifolia	1
Louro	Ocotea sp.	1
Louro abacate	Aniba williamsii O. C. Schmidt	1

Louro canela	Ocotea fragrantissima Ducke	1
Louro cuminho	Ocotea longifolia H.B.K.	1
Louro faia	Euplassa pinnata (Lam.) I.M. Johnst.	1
Louro jandauba	Aiouea sp	1
Louro pimento	Mezilaurus synandra (Mez) Kosterm	1
Louro preto	Ocotea sp.	1
Louro Rosa	Aniba terminalis Ducke.	1
Louro tamanquare / Tanaquare	Caraipa grandifolia Mart.	1
Louro Vermelho	Nectandra rubra	1
Macacauba	Platymiscium trinitatis Benth	1
Maçaranduba	Manilkara huberi	1
Macucu/ Macucu de sangue	Couepia elata Ducke	1
Mamorana / Manguirana	Eriotheca globosa (Aubl.) A.Robyns	1
Mamorana vermelha	Eriotheca sp.	1
Mamui	Jacaratia sp.	1
Mandioqueira / Mandioqueiro liso	Pouteria decorticans Penn	1
	Qualea paraensis Ducke.	1
Manexico	NI	1
Maparajuba	Manilkara Bidentada (A.DC) A.Chev.	1
Marapuama	Ptychopetalum olacoides Benth.	1
Maria Preta	Terminalia glabrescens Mart	1
Marupa	Simarouba amara Aubl.	1
Maruparana	Zanthoxylum huberi P.G.Waterman	1
Matamata branco	Eschweilera grandiflora (Aubl.) Sandwith	1
Matamata preto	Eschweilera blanchetiana	1
	Eschweilera coriacea (DC.) S.A Mori	1
Matamata vermelho / Jibóia	Eschweilera sp.	1
Melancieira	Alexa grandiflora	1
Meraquati	NI	1
Merauba	Mouriri callocarpa Ducke	1
Miri / Umiri	Humiria balsamifera (Aubl.) St. Hill	1
Molongo	Molongum laxum (Benth.) Pichon	1
Morototo	Schefflera morototoni	1
Morta	NI	1
Muiracatiara	Astronium lecointei Ducke	1
Muirapinima	NI	1
Muiratinga	Naucleopsis glabra Spruce ex Pittier	1
Mundurucu	NI	1
Murtinha / Murta	Pouteria cuspidata (A. DC.) Baehni	1
Muruci/ Murici da mata	Byrsonima crassifólia	1
Murupita	Sapium hippomane	1

Quaruba	Vochysia maxima Ducke	1
Quaruba cedro	Vochysia vismiifolia Spruce ex. Warm	1
Quaruba goiaba	Erisma uncinatum Warm	1
Quarubarana	Erisma uncinatum Warm	1
Quarubatinga	Vochysia guianensis Aubl	1
Quinarana	Geissospermum sericeum Benth. & Hook. f. ex Miers	1
Rajadinho	NI	1
Sapucaia	Lecythis ollaria	1
Seringa Preta	Hevea sp.	1
Seringarana / Seringa vermelha	Hevea guianensis Aubl	1
Seringueira / Seringa branca / Seringa amarela	Hevea brasiliensis (Willd. ex A.Juss.) Müll.Arg	1
Sororoca erva	Stromanthe stromanthoides (J.F.Macbr.) L.Andersson	1
Sucupira	Bowdichia nitida	1
Sucupira amarela	Sweetia fruticosa Spreng	1
Sucupira babona / Pele de sapo / Sucupira tento	Diplotropis purpurea (Rich.) Amshoff	1
Sucupira Branca	Ormosia sp.	1
Sucupira preta	Diplotropis peruviana J.F.Macbr	1
Sucuuba	Himatanthus articulatus (Vahl) Woodson	1
Sumauma	Eriotheca longitubulosa A.Robyns	1
Tachi branco	Macrosamanea pubiramea (Steud.) Barneby & J.W.Grimes	1
Tachi preto	Tachigalia paniculata	1
Tachi vermelho	Tachigali myrmecophila (Ducke) Ducke	1
Tamanqueira	Stryphnodendron pulcherrimum (Willd.) Hochr	1
Tanibuca / Tanibuca amarela / Cinzeiro	Buchenavia grandis Ducke	1
	Buchenavia parvifolia Ducke	1
Tanibuca branca	Buchenavia sp.	1
Tapereba / Cajá	Antrocaryon amazonicum (Ducke) B.L.Burtt & A.W.Hill	1
Taperebarana	Touroulia guianensis Aubl	1
Taquari	Alchornea discolor Poepp	1
Taquarirana	Mabea piriri Aubl	1
Tatajuba	Maclura tinctoria (L.) D.Don ex Steud. subsp. tinctoria	1
Tatapiririca	Tapirira guianensis Aubl.	1
Tauari	Couratari atrovinosa Prance	1
Tauari branco	Couratari multiflora (Sm.) Eyma	1
Tento / Tento vermelho	Ormosia micrantha Ducke	1
Tento branco	Diplotropis nitida Benth.	1

Tento preto	Ormosia sp.	1
Tinteiro	Avicennia germinans (L.) L	1
Tucandedeira	NI	1
Uchirana / Tachirana	Vantanea parviflora	1
Ucubarana / Ucuuba do gapó	Iryanthera laevis Markgr	1
Ucuuba	Virola surinamensis	1
Ucuuba da terra firme	Iryanthera juruensis Warb	1
Urucurana	Bixa excelsa Gleason & Krukoff	1
Urucurana	Bixa excelsa Gleason & Krukoff	1
Uxi / Uchizeiro	Endopleura uchi	1
Virola / Virola terra firme / Casca de vidro	Virola albidiflora Ducke	1
Virola branca / Varzea / Igapó	Iryanthera ulei Warb.	1
Virola vermelha	Virola sebifera Aubl.	1
Total		**274**

The inventory of Flora within the project area, has resulted in a priority to conserve the flora on the below mentioned Table 56, which are targeted by illegal loggers.

Table 56: Inventory flora within the project area

Family	Species
Sterculiaceae	*Sterculia excels Mart.*
Leguminosae-Mimosoideae	*Anadenathera colubrine (Vell.) Brenan*
Vochysiaceae	*Callisthene major Mart.*
Caryocareaceae	*Caryocar microcarpum Ducke*
Sapotaceae	*Chrysophyllum lucentifolium*
Lecythidaceae	*Couratari oblongifolia Ducke et R.Knuth*
Leguminosae-Papilionideae (Fabaceae)	*Diplotropis purpurea*
Lauraceae	*Endlicheria paniculata (Spreng) J.F.Macbr*
Leguminosae-Mimosoideae	*Enterolobium schomburgkii (Benth.) Benth*
Sapotaceae	*Pouteria oblanceolata Pires*
Burseraceae	*Protium puncticulatun Macbr.*
Sterculianceae	*Sterculia excelsa Mart.*
Leguminosae-Mimosoideae	*Zygia selloi*
Sapotaceae	*Manikara huberi (Ducke) Cheval.*
Burseraceae	*Protium heptaphyllum (Aubl.) March*

Table 57: Endangered: Species of avifauna for monitoring and Conservation

Species	Popular Name
Penelope pileata	jacupiranga
Psophia viridis obscura	jacamim-de-costas-verdes
Guaruba guarouba	ararajuba
Pyrrhura lepida	tiriba-pérola
Pteroglossus bitorquatus bitorquatus	araçari-de-pescoço-vermelho

Synallaxis rutilans omissa	João-teneném-castanho
Phlegopsis nigromaculata paraensis	mãe-de-taoca

Table 58: Endangered, At Risk or state priorities for conservation - Species of Mastofauna for monitoring and Conservation

Taxom Popular Name	
Dasypodidae	
Priodontes maximus	*tatu-canastra*
Cebidae	
Saguinus niger	*sagui-una*
Cebus paella	*macaco-precgo*
Saimiri sciureus	*macaco-de-cheiro*
Aotidae	
Aotus azarae	*macaco-da-noite*
Atelidae	
Alouatta beizebul	*guariba-pteto*
Felidae	
Leopardus pardalis	*jaguatirica*
Leopardus tigrinus	*gato-do-mato-pequeno*
Puma concolor	*onca-parda*
Panthera onca	*onca-pintada*
Canidae	
Cerdocyon thous	*graxaim*
Familia Tapiridae	
Tapirus terrestris	*anta*
Tayassuidae	
Tayassu pecari	*queixada*
Cervidae	
Mazama Americana	*veado-mateiro*

In the IUCN list, there are a total of nineteen species in the three categories preached by the organization, being a species of mammal in category EN (endangered), seventeen species of animals (seven species of birds, six species of mammals, two species of amphibians and two reptile species) in the VU category (vulnerable) and one mammal species in category CR (critically endangered) (Table 59). No species of endangered or CITES-listed fish were recorded.

Table 59: Species of wildlife endangered according to the IUCN Red Lists of Threatened Species:

Birds		
IUCN Threat Catagories	**Popular Name**	**Scientific Name**
Vulnerable (VU)	Pomba-Botafogo	*Patqgioenas subvinacea*

	Mutum-Poranga	*Crax alector*
	Formigueiro-liso	*Myrmborus lugubris*
	Choquinha-Estriada	*Mymotherula surinamensis*
	Tucano-grande-de Papobranco	*Ramphastos tucanus*
	Tucano-de-bico-preto	*Ramphastos vitellinus*
	Azulona	*Tinamus tao*

Mammals		
IUCN Threat Catagories	**Popular Name**	**Scientific Name**
Vulnerable (VU)	Queixada	*Tayassu pecari*
	Gato-do-mato-pequeno	*Leopardus tigrinus*
	Anta	*Tapirus terrestris*
	Macao-aranha-preto	*Ateles paniscus*
	Tamandua-bandeira	*Myrmecophaga tridactyla*
	Tatu-canastra	*Priodontes maximus*
Endangered (EN)	Ariranha	*Pteronura brasiliensis*
Critically Endangered (CR)	Macaco-Preto	*Chiropotas satanas*

Amphibians

IUCN Threat Catagories	**Popular Name**	**Scientific Name**
Vulnerable (VU)	Sapinho	*Anomaloglossus beebei*
	Sapo	*Atelopus spumarius*

Reptiles		
IUCN Threat Catagories	**Popular Name**	**Scientific Name**
Vulnerable (VU)	Tracaja	*Podocnemis unifilis*
	Jabuti, jabutitinga	*Chelonoidis denticulatus*

According to the analysis of biodiversity survey carried out in 2016, in view of the panorama of the original forest cover of the area, which historically can be defined as composed of Amazonian terra firm forest, it is possible to highlight the predominance of forest birds registered in the remaining samples, which occupy the dark understory of the forests as well as large frugivorous growers of the upper canopy areas (60% of species). The predominance of these species was expected, taking into account the high wealth that the forest areas present, as well as the predominance of these environments in the sampled regions.

Only a small fraction of these fragments remains with visible signs of anthropogenic disturbance. Considering the alteration of the original forest cover, the avifauna was also replaced by colonizing elements characterized by generalist species that commonly inhabit regions of capoeiras or even drastically recharacterized places (WILLIS & ONIKI 1988). In this sense, it is important to highlight the transitional areas, constituted by capoeiras as the second most representative environment in terms of use by birds (30% of species).

As a result of avifauna monitoring in 2016, in view of the panorama of the original forest cover of the area, which historically can be defined as composed of Amazon Forest can be highlighted the predominance of forest birds registered in the remaining sampled birds that occupy the dark forest understory as well as large frugivorous growers from the upper canopy forest (60% of species). The predominance of these species was expected, taking into account the high species richness of the forest areas as well as the predominance of these environments in the sampled regions.

In the considerations presented on the mastofauna in 2016, the study presents several species that indicate the quality of the environment. Although no sampled fragment has original characteristics of its landscape, it can be affirmed that these still represent areas of great importance for the maintenance of the local fauna.

Despite the strong recharacterization of the environment, the number of endangered species recorded was significant, according to the International Union for the Conservation of Nature (IUCN 2014) of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 2014), Ministry of Environment Machado et al., 2008. Rev. Bras. Zootec., 37 (6): 1121-1128) and List of endangered species of flora and fauna in the State of Pará. The vast majority of registered species are included in the Vulnerable Category (VU) or CITES Appendix I or II.

5.1.2 High Conservation Values (B1.2)

High Conservation Value	Caxiuana National Forest
Qualifying Attribute	The Caxiuana National Forest is considered the oldest in the Amazon region and the second in Brazil. It is amongst the most known conservation units in north of Brazil, and it has the presence of many important researchers from Brazil and abroad
Focal Area	On the northern border of the reference region there is a national conservation unit called National Forest Caxiuanã. It was created in 1961 and today it has an area of 322,694.34 hectares. The Conservation Units are types of conservation areas that were created to allow sustainable use of the forest and its natural resources

5.1.3 Without-project Scenario: Biodiversity (B1.3)

According to UNEP, the impacts of agriculture on ecosystem functions can be grouped into five areas: 1) soil structure; 2) nutrients and microorganisms; 3) water cycle; 4) complexity of the landscape; 5) atmospheric properties. Agriculture affects soil structure and biota primarily through the reduction of organic material incorporated above the soil and roots, by ploughing the soil due to tillage and compaction livestock. In particular, in the high mountain areas, intensive soil management carried out in the clean crops have caused, among other adverse effects, lower carbon content and soil nitrogen.

The scenario in the absence of the REDD+ Project would be for the occupation of land squatters and small farmers, who would be impacting the forest areas through the opening of the forest by the cutting and burning system. These areas are cultivated for a short period of time, one or two years, and then abandoned due to the fact that the soil becomes unproductive, with the opening of new areas to raise subsistence agriculture.

In short, given the current conditions of the territory, it requires a type of sustainable productive activities with the environment and viable for producers. In the absence of the project, the municipalities selected for the project may affect biodiversity conditions, around the following effects:

Table 60: Impact on Bio-diversity in the Scenario without the project.

Scenario without Project	Environmental Impact	Impact on Bio-diversity
Expansion of the agricultural frontier and livestock areas	Deforestation, forest fragmentation and reduction of biological corridors	Loss of habitats for birds and mammals, endemic and migratory species threatened. Timber threat of low frequency and high commercial value
	Simplification of the vertical structure of vegetation	Destruction of climatic shelters and predators for wildlife and sites for feeding and reproduction
Lack of technical assistance and education, which leads to continued poor agricultural practices	Degradation and soil compaction and even in areas of grazing stubbles	Extinction of native species intolerant to intensive livestock
		Loss of habitat quality and capacity of natural forest regeneration
	Low productivity and increased use of fertilizers	Threat to soil organisms that play important roles as predators, decomposers and parasitoids. Reduction microfauna

	Pollution of water sources and wildlife due to the use of agrochemicals	Threat to aquatic wildlife and incidence

The permanence of natural environments in the Project Area is of extreme conservationist importance, since, in addition to promoting the conservation of biodiversity, it guarantees the maintenance of ecosystem services, such as pest and disease control, pollination, water quality, climate regulation and obtaining of resources for traditional communities. According to Silva et al. (2005) (Da Silva, José Maria & Rylands, Anthony & Fonseca, Gustavo. (2005). The Fate of the Amazonian Areas of Endemism. Conservation Biology. 19. 689 - 694), the connectivity between the fragments constitutes a large and resilient conservation system to mitigate future global changes, make significant improvements in the living standards of local populations, and provide global communities with ecological services. In addition, the REDD+ Project seeks to protect the High Conservation Value Areas (HCVA), stimulate and improve knowledge about local biodiversity through studies, for example, long-term monitoring, since knowledge about the flora and, more specifically, of the fauna of the region can still be considered scarce.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

Biodiversity conservation objectives

Through the long-term preservation of the amazon forest cover, the Project is expected to generate positive impacts on biodiversity by preserving habitats and floristic and fauna species that would otherwise be threatened by deforestation. Moreover, the protection of the forest by the status of REDD Area will lead to the elaboration of a management plan which will aim to guarantee the durability of local uses of forest: collection of NTFP, forest exploitation for local construction and hunting. The Project presents specific objectives for biodiversity conservation in the project zone:

- Maintain forest cover and reduce habitat fragmentation;
- Maintain the integrity of the animal corridor
- Conserve habitats and native species of Amazon
- Ensure the conservation of threatened animal and plant species;
- Reduce human activities that do not comply with the conservation of biodiversity;
- Improved the natural resources management by local communities and facilitate their sustainable
- use;
- Raise awareness of environmental-related issues in local communities;

- Promote scientific research and monitoring of natural resources;

- Prevent and control the spread of invasive exotic species.

Expected positive impacts of project on biodiversity

In the without-project scenario, biodiversity is affected by progressive decrease of forest cover due to slash and burn agriculture, extension of cattle pasture and the maintenance or increase of animal poaching. On the contrary project activities are expected to generate biodiversity benefits by the long-term protection of forest landscape, which contributes to the preservation and enhancement of the faunal and floristic populations. The expected positive impacts of project on biodiversity can be evaluated through defined biodiversity indicators that will be monitored and can be summarized as follows:

Biodiversity Element	Monitor vegetation cover / land use patterns via satellites from both Google Earth, and the Brazilian Space Agency which has more up to date maps and fire situations. Monitor INCRA the federal land agency and ITERPA the state land agency for land claims in the project area which may show in very short order where someone plans to enter and start deforesting. http://terrabrasilis.dpi.inpe.br/app/map/deforestation?hl=pt-br This shows all the deforestation in the area, with the project area are able to contain most deforestation to very small “planned plots”. So most tree cover and animal corridors stay intact. Just south of the project area is pure destruction in the same time period.
Estimated Change	Maintenance or improvement of carbon stocks
Justification of Change	Periodic analysis of satellite imagery and GIS analysis

Biodiversity Element	Monitor area-limited species: species that require large patches to maintain viable populations, such as large carnivores. That have indicated potential habitat losses and prey availability
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling
Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling

Biodiversity Element	Monitor resource-limited species: species requiring specific resources, such as frugivorous species, nectar species, snags etc. Bats can be great bio indicators as they have different feeding habits, such as insects, fruits, nectar/pollen, blood etc. They are also abundant through the region and its taxonomy has been well documented
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling
Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling

Biodiversity Element	Monitor "special interest" species, critically endangered species, endangered species, and threatened species (IUCN, IBAMA) The local riverine people all have cell phones that they use primarily for pictures and since 2016 have been requested to monitor all animals of interest and take pictures of those animals. 20 MP cameras are planned to be handed out to 5 locations that have high instances of bio-diversity so that the 5 designated monitors can take pictures. In addition to this all-security personal have cameras.
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling
Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling

5.2.2 Mitigation Measures (B2.3)

Although the Project activities are not fully implemented, monitoring and reporting activities to prevent and remove land grabbers and illegal logging activities (thus stopping the first stages of the deforestation process) have been happening on the ground since January 2nd 2009 These activities help ensuring that local biodiversity is protected and that their ecosystems are not fragmented even when we still do not have an implemented *biodiversity inventory.*

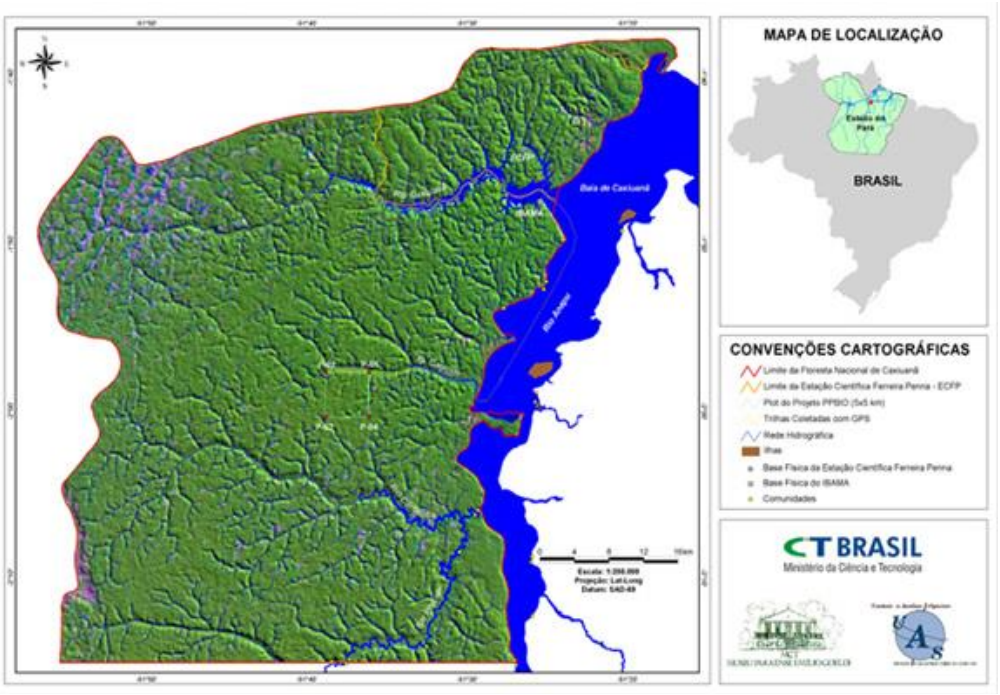
5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

Net impacts on biodiversity resulting from the project activity are expected to be positive, as outlined in the baseline scenario. Net positive impacts on biodiversity were demonstrated over time through periodic monitoring and reporting of biodiversity indicators as per the Biodiversity Monitoring Plan.

5.2.4 High Conservation Values Protected (B2.4)

The project area is 36 partially non-contiguous sections. A small section of a few thousand hectares borders the Reserve Caxiuna, thus with the connection of the reserve and the project area, an animal corridor is created. This is a high bio-diversity impact next to the project area.

Figure 72: Caxiuna Reserve



High Conservation Value	Caxiuana National Forest
Qualifying Attribute	The Caxiuana National Forest is considered the oldest in the Amazon region and the second in Brazil. It is amongst the most known conservation units in north of Brazil, and it has the presence of many important researchers from Brazil and abroad
Focal Area	On the northern border of the reference region there is a national conservation unit called National Forest Caxiuanã. It was created in 1961 and today it has an area of 322,694.34 hectares. The Conservation Units are types of conservation areas that were created to allow sustainable use of the forest and its natural resources

5.2.5 Species Used (B2.5)

An important role in the region's economy is filled by vegetable extraction and forestry, mainly as a source of subsistence for families. The vegetal extraction of the municipalities mainly counts on the management of non-timber forest products (NWFP) of native species of the region, such as brazil nuts and açai berry.

In addition, the rural communities living in the Project Area are mainly engaged in the production of cassava, flour and cassava, according to the Family Diagnosis of the REDD+ Project. Crops of corn, banana, orange, cabbage, cupuaçu, eucalyptus and cacao are also employed by some local communities but in smaller scales than the others already mentioned.

5.2.6 Invasive Species (B2.5)

None of the Project's activities introduce invasive species or genetically modified organisms. The Project's developer only approves agroforestry activities that use native species commonly known to occur in the Para region and are not in the Global Invasive Species Database before approving the utilization of particular species.

5.2.7 Impacts of Non-native Species (B2.6)

Not applicable

5.2.8 GMO Exclusion (B2.7)

5.2.9 Inputs Justification (B2.8)

Not applicable

5.2.10 Waste Products (B2.9)

Not applicable

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

The conservation itself as the aim of the project is already a mitigation strategy. The entire area benefits since there is no activity involving any kind of human disturbance. Furthermore, conservation of the project area increases landscape integrity and adaptation, avoiding edge effect, as described in the "with project" scenario, benefiting biodiversity (Wunder 2008).

A representative conservation area in which biodiversity can persist guarantees the maintenance of ecological processes and contributes to avoid fragmentation of the ecosystem, both through timber extraction and agricultural activities. The project help landscapes enhancing its ecological health, including its adaptability to climate change and consequently reducing offsite greenhouse gas emissions (Wunder 2008). Moreover, the conservation of this area maintain microclimate, avoiding wildfires (Soares-Filho *2006).*

Hence as there are no offsite negative biodiversity impacts, there are no planned mitigation measures.

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

The Project is expected to generate positive leakage on biodiversity by avoiding ecosystem fragmentation through voluntary engagement of neighbour communities in the Project's activities. As described above, the project focusses exclusively on conservation measures within the project boundaries and its buffer, which makes negative offsite effects unlikely to happen. Besides, monitoring of flora and fauna assures that any minimal offsite negative effect was taken care of immediately. The Project's activities do not involve the introduction of non-native species. Therefore, considering these activities and "with project" scenario, the effects of the project on biodiversity is positive

5.4 Biodiversity Impact Monitoring

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

Biodiversity Element	Monitor vegetation cover / land use patterns
Estimated Change	Maintenance or improvement of carbon stocks
Justification of Change	Periodic analysis of satellite imagery and GIS analysis

Biodiversity Element	Monitor area-limited species: species that require large patches to maintain viable populations, such as large carnivores. That indicate potential habitat losses and prey availability
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling
Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling

Biodiversity Element	Monitor resource-limited species: species requiring specific resources, such as frugivorous species, nectar species, snags etc. Bats can be great bio indicators as they have different feeding habits, such as insects, fruits, nectar/pollen, blood etc. They are also abundant through the region and its taxonomy has been well documented
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling
Justification of Change	Increase in number of specific category species as the project

	area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling

Biodiversity Element	Monitor “special interest” species, critically endangered species, endangered species, and threatened species (IUCN, IBAMA)
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling
Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

All the documents/results are published in the project website and communicated in Portuguese in a simple language to the council of stakeholders for their awareness and free participation. All Riverine people and traditional rural villagers know where the office is and there are staff in the project area that pass by their houses once in a while. In addition, the Riverine are able to contact as needed.

Apart from the survey teams the main form of communication followed was one-to-one meetings with the community in which the feedback on the benefits provided were communicated which are periodic. Further during this period, the benefits were mainly related to Skill and capacity development.

Any information the Riverine need is available to them, upon request or the website.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

Not Applicable

5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

Not Applicable