MARAJÓ REDD+ PROJECT

Project Title	Marajó REDD+ Project
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Project Location	Brazil, State of Pará
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Project Lifetime	23-October-2021 – 22-October-2061; 40-year lifetime
GHG Accounting Period	23-October-2021 – 22-October-2061; 40-year lifetime
History of CCB Status	Not applicable

Gold Level Criteria	**GL.1 - Climate Gold** The climate change and climate variability scenarios indicate that mean temperature anomaly increases from 1.92 to 3.3 degrees C, and precipitation decreases by up to 123.91mm. High temperatures, prolonged aridity and drought in regions of the Amazon, combined with drivers such as deforestation and degradation, will alter existing ecosystems and the area's unique biodiversity. Reduced rainfall trends will continue to threaten forest resources while excessive heat and dryness have increased tree mortality along forest edges, contributing to both more invasive species and a rise in forest fires. The analysis was performed using multi-ensemble models developed using CMIP5 supported the IPCC's Fifth Assessment Report implemented by the World Bank. **GL.2 - Community Gold** The smallholders/community members or communities have rights to claim that their activities will or did generate or cause the project's climate, community and biodiversity benefits. The project activities are designed to generate short-term, and long-term net positive well-being benefits for smallholders/community members. The Marajó REDD+ Project through a participatory process has identified the risk and measures to manage the risks. The project activities are designed to generate net positive impacts on the well-being of the women and that women participate, whilst simultaneously influencing the decision-making process and implementation. **GL.3 - Biodiversity Gold** The project area is a rich biodiverse area supporting several ecologically important species. Thus, the Marajó REDD+ Project has an important role in conserving biodiversity. These species play a vital role in ecosystem service maintenance. According to criteria described by the CCB the project qualifies for gold level due to the presence of several threatened and endemic species. The project will generate exceptional biodiversity benefits by protecting the conserving the landscape which enhance the ecosystem services during and beyond the project lifetime. Marajó project area also overlaps with the Important Bird Area (IBA) Caxiuanã / Portel and the Xingu area of endemism in which several threatened birds find their habitat, such as Golden conure (*Guaruba guarouba*), the scaled ground cuckoo (*Neomorphus squamiger*), the Olive-winged trumpeter (*Psophia dextralis*), white-crested guan (*Penelope pileata*) and the Pearly Parakeet (*Pyrrhura lepida*) as well as the threatened primates Red-handed howler monkey (*Alouatta belzebul*) and Uta Hick's bearded saki (*Chiropotes utahicki*).
Expected Verification Schedule	Annually

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1 SUMMARY OF PROJECT BENEFITS

The Marajó REDD+ Project has been designed for the protection of forests and rich biodiversity in the Amazon. It is part of the Agriculture, Forestry and Other Land Use (AFOLU) sector under the Reducing Emissions from Deforestation and Degradation (REDD) project category. Specifically, the project is of the "Avoided Unplanned Deforestation & Degradation" (AUDD) project category.

1.1 Unique Project Benefits

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) Permanent protection and conservation of more than 130,000 hectares of regenerating forest.	2, 3, 5
2) Avoided unplanned deforestation and degradation and thus enhanced ecosystem functionality by allowing patched areas to regenerate, thus reducing ecosystem fragmentation.	2, 3, 5
3) The project will avoid the emission of circa 11,936,377 tons of CO2e into the atmosphere by mitigation of deforestation and degradation in the project's area and removals by afforestation.	2, 3
4) Development of self-sustaining community through capacity building and local employment. Develop capacity to reap the benefits beyond the lifetime of the project.	2, 4
5) Protection of high conservation areas to allow native flora and fauna to thrive	2, 5

1.2 Standardized Benefit Metrics

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the project area, measured against the without-project scenario	1,295,017	2, 3
	Net estimated emission reductions in the project area, measured against the without-project scenario	10,641,360	2, 3
Forest[1] cover	For REDD[2] projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	138,285	2, 3
	For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	1000	2, 3
Improved land management	Number of hectares of existing production forest land in which IFM[4] practices are expected to occurred as a result of project activities, measured against the without-project scenario	Not applicable	--
	Number of hectares of non-forest land in which improved land management practices are expected to occur as a result of project activities, measured against the without-project scenario	Not applicable	--
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	1200	2, 4
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	600	2, 4

[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]	200	2, 4
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	100	2, 4
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities	1200	2, 4
	Number of women expected to have improved livelihoods or income generated as a result of project activities	600	2, 4
Health	Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	1200	2, 4
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	600	2, 4
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	1200	2, 4
	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	600	2, 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 scenario	470	2, 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
	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	290	2, 4
Well-being	Total number of community members whose well-being[8] is expected to improve as a result of project activities	1749	2, 4
	Number of women whose well-being is expected to improve as a result of project activities	1214	2, 4
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,[9] measured against the without-project scenario	138,285	2, 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	36	2, 5

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

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

The Marajó REDD+ Project is located in the State of Pará, Brazil and it comprises 138,285 hectares of Amazonian lowland forest up to 40 meters of elevation, in mostly flat or slightly undulating terrain near the Amazon river delta. The area is near mid-size cities (Portel) and is made up of disturbed *terra-firme* (non-flooded) with only small areas in *várzea* (seasonally flooded) forests. Although the area is far removed (80+ km north) from the Trans-Amazonian Highway (*Rodovia Transamazônica*, BR-230), river and sea access has facilitated extraction of most precious woods, and most forest areas are heavily intervened; settlement by *ribeirinhos* (river-margin dwellers) is also spreading westward from the Atlantic. There are also a few logging concessions authorized by the Brazilian government operating in the area. Mining operations do not seem to be a problem in the territories.

Most riverside people (*comunidades ribeirinhas extrativistas*) subsist by a mix of fishing, hunting, and especially by harvesting açaí palm fruits and by cultivating cassava from which flour is made, as the latter two are the main staple foods of the people in the state of Pará. Agriculture is practiced in small-scale slash-and-burn plots for the cassava; the açaí palms, which thrive and naturally occur in seasonal floodplain areas near the river (*várzea* forest), are harvested from the wild and fostered/planted near settlements and homesteads.

The Marajo REDD+ Project has a significant amount of forest and is home to several ecologically important flora and fauna in a strategic region of the Amazon where there is high deforestation risk caused by illegal logging and expanding slash-and-burn agriculture. The project has implemented via REDDA Projetos Ambientais Sociedade Unipesoal Ltda. (REDDA) a number of activities that seek to reduce forest degradation and deforestation in the project area. These activities include:

- Patrolling.

  Members of the local communities (*comunidades ribeirinhas extrativistas*) are being employed by the project to perform regular patrol through the project area, with a focus on high-risk degradation/deforestation areas. The patrol units cooperate with the local authorities to prevent illegal encroachment in the project area. This activity deters the main drivers of Avoided Unplanned Deforestation and Degradation (AUDD) such as illegal timber extraction and slash-and-burn agriculture.

- Alternative Sources of Income.

  In order to reduce forest degradation, it is important that the riverside communities can reduce their dependency on unsustainable harvesting of forest resources. To achieve this, the Marajo REDD+ project is already implementing and will continue to implement a number of activities that will provide the community members with alternative sources of income. These activities include but are not limited to:

  - Access to training and education:
    Many people within these communities have little to no access to proper schooling. The project will build several schools throughout the project area, which will allow children to receive an education and increase their opportunities in the job market. This as well as other training offers will also create a framework for learning about sustainable practices and forest conservation.

- Eco-jewellery:
  The project will stimulate the sustainable use of socio-bioeconomy products by its inhabitants. An example of this is the creation of eco-jewellery, which in turn can be sold to generate additional income. The project has facilitated workshops, mainly aimed at women, to increase their proficiency in these skills and in doing so broaden their opportunities of income generation.

- Strategic partnerships with local sustainable companies:
  In cooperation with the local communities, the project has established partnerships to promote the sustainable use of non-timber forest products. These partnerships encourage income generation of hundreds of riverside families. Specifically, the following two partnerships have been established up until now:

  (i) Amazon Forest People
  The Marajo REDD+ Project has partnered with Amazon Forest People, a local cosmetics company. Under this partnership, oilseeds will be extracted by participating communities and sold to AFM to be used in their cosmetic products.

  (ii) Amazon Oil
  Additionally, the Marajo REDD+ Project has established a partnership with Amazon Oil, a Brazilian-Amazonian oil-chemical company active in the segment of cold extraction of oils from Amazonian oilseeds. The extracted oils are used in the cosmetic, pharmaceutical, food and textile industries.

  Both partnerships operate in a similar fashion where the local communities will be responsible for the collection, storage, drying and boiling of the seeds to subsequently extract the oil. Participation of women is strongly encouraged under these partnerships, and this was reflected in the opening meetings. More opportunities for future partnerships are being explored in cooperation with the communities.

- Installation of biodigesters in local communities.

  To meet the communities' thermal energy needs, mostly for the preparation of food, the use of fuelwood and charcoal is still commonplace for the riverside communities. The extraction of fuelwood from the forest contributes to forest degradation. To mitigate this driver of degradation, the project is deploying biodigesters in the riverside communities, allowing them to convert their organic waste into biogas. In addition to a reduction in fuelwood collection, this also creates a net health benefit: the combustion of fuelwood, especially in enclosed spaces, can lead to a variety of respiratory and cardiovascular diseases, besides combustion of (bio)gas creates much less pollution.

- Installation of water filtration systems in local communities.

  Besides the preparation of food, fuelwood is often used to boil water, making it safe for consumption. Water filtration systems have been installed in strategic places within the project area. This will provide people with free access to clean water and further reduce dependence on fuelwood.

The main driver of deforestation within the project area is slash-and-burn agriculture. Subsistence-based farming is expected to remain to some extent throughout the crediting period.

Besides the activities described above, a number of activities have been implemented to improve the health and well-being within the communities, such as periodical medical examinations, access

to dental care and other medical care as well as workshops on oral hygiene, and general hygiene and sanitation, especially for women.

The project estimates emission reductions of 266,034 tCO2e per annum and 10,641,360 tCO2e during the project's lifetime for the REDD+ component. There will be a 1000 hectares ARR (afforestation) component which will include at least 25 hectares of planting per year and which will amount to 32,375 tCO2e of removals per annum on average for a total of 1,295,017 tCO2e during the project's lifetime. Combined, the NER resulting from the REDD+ and ARR components of the project amount to 11,936,377 tCO2e of reductions and removals.

2.1.2 Project Scale

Project Scale	
Project	✓
Large project	

2.1.3 Project Proponent (G1.1)

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2.1.4 Other Entities Involved in the Project

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2.1.5 Physical Parameters (G1.3)

The project is located in Brazil and currently comprises three PEAEX (*projetos de assentamentos agroextrativistas*) territories and one TEQ(*Território Estadual Quilombola*) within the State of Pará in the municipality of Portel: Ilha Grande de Pacajaí, Acangatá, Alto Camarapí and the TEQ Tauçú. Coordinates for corners of the projects are also listed in Table 1, and a KML file is submitted with this document. Total area of the territories is 172,858.54 hectares, with 138,285.00 of them covered by lowland Amazonian forest, comprising the project area.

Table 1. Coordinates of the project's corners

X	Y
-50.2807536000	-2.4991354861
-51.1457999000	-1.83882695
-51.0865064350	-1.8185066830
-50.6192256900	-1.9638608879
-50.6678122715	-2.4985894745

Topography and geology
The Marajó REDD+ Project is located in the morphotectonic compartment of Marajoara, formations of Tucunaré (sedimentary), Barreiras (sedimentary) and Alter do Chão[12].

The Alter do Chao formation consists of fine to medium sandstone, clayey, unconsolidated and eventually conglomeratic, positioned discordantly on older units (Tapajos and Trombetas groups) and covered by quaternary deposits. In general, the sediments of this stratigraphic unit form intercalary and discontinuous layers, which are superficially altered to a latossolic mantle, eventually with concretionary levels.

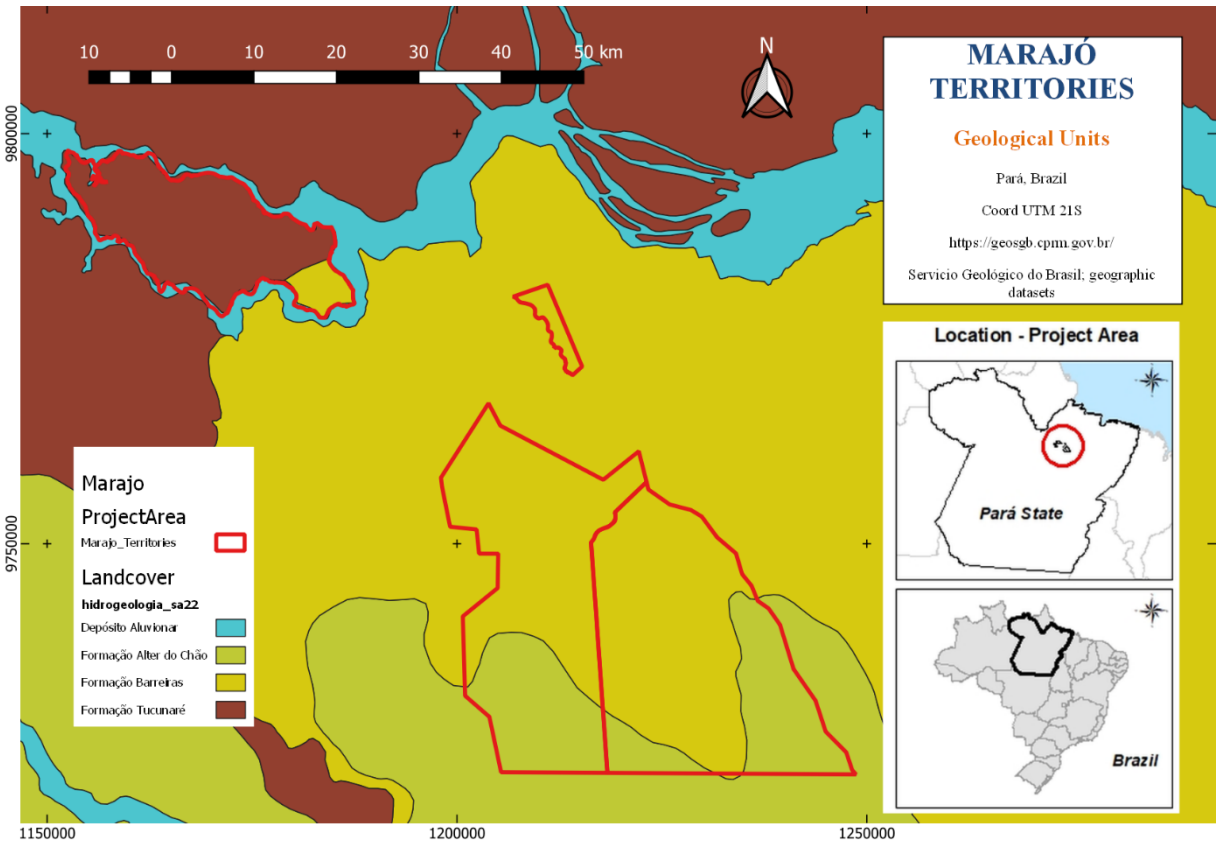
The Barreiras formation consists of cross-stratified conglomerates and sandstones, compound cross-stratified sandstones, and heterolithic beddings.

The Tucunaré formation consists of coarse sandstones of fluvial origin, grading to fine coastal sandstones, peat and terrigenous carbonates.

Topography of the territories is mostly flat, with elevations ranging from 0-50 m above sea level.

[12] https://geosgb.cprm.gov.br/ Servicio Geológico do Brasil; geographic datasets

Figure 1. Geological formations in the project areas[13]



Source: ClearBlue Markets

Soil

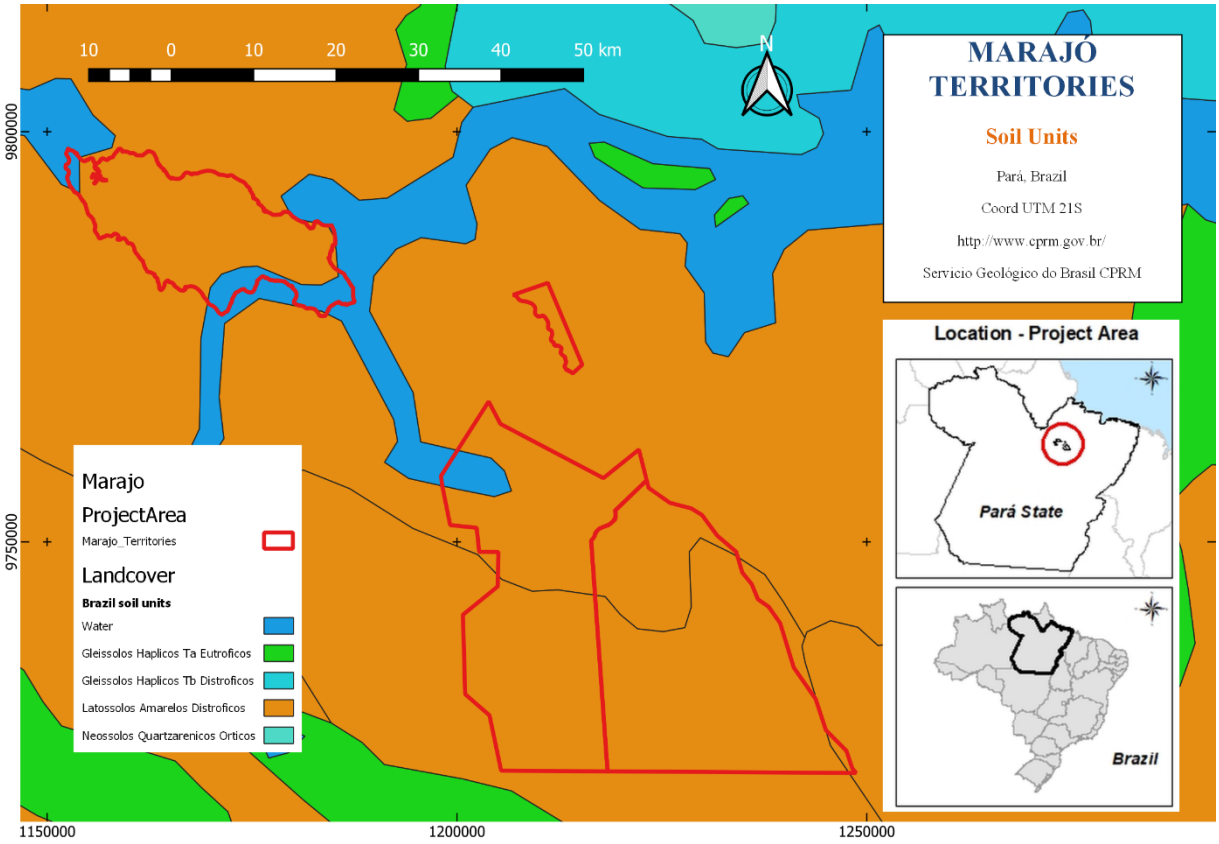
Soils in the project area appear to be mostly *Latossolos Amarelos* (heavy yellow clay latossols), according to the Brazilian System of Soil Classification[14]. Soils in the project area and its surroundings can be seen in Figure 2.

Latossolo Amarelos contain a clay B-horizon with a range from 15% to over 60%. With reference to land use possibilities, these oxisols, due to their chemical characteristics, are usually unfavorable for traditional agricultural activities, requiring the application of soil amendments, especially in relation to high acidity and high aluminum content. The application of lime and chemical and organic fertilizers easily correct these limiting characteristics to increase the concentration and retention capacity of soil nutrients.

[13] http://www.cprm.gov.br/ Servicio Geológico do Brasil CPRM

[14] Dos Santos, H.G., Jacomine, P.T., Dos Anjos, L.H.C., De Oliveira, V.A., Lumbreras, J.F., Coelho, M.R., De Almeida, J.A., de Araujo Filho, J.C., De Oliveira, J.B. and Cunha, T.J.F., 2018. Brazilian Soil Classification System.

Figure 2. Soils in the Marajó area



Source: ClearBlue Markets

Climate and hydrology

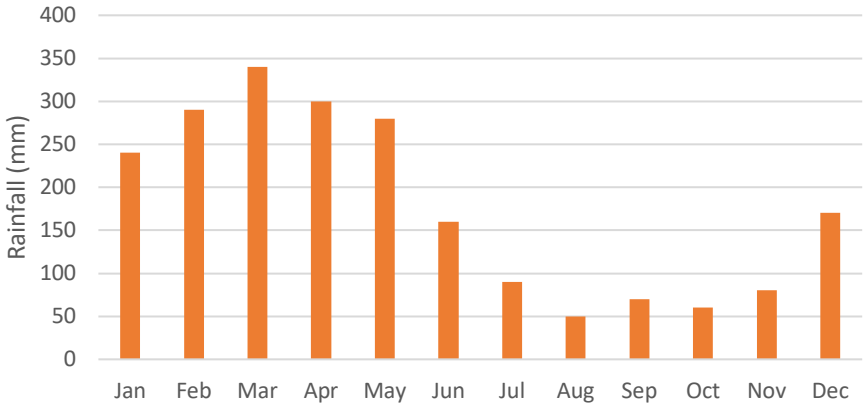
Rainfall is highly seasonal in the region, with the rainy season taking place between January and June, with 75% of the year's total. Average rainfall is around 2100 mm per year (Figure 3).

Average yearly temperature is 25.9°C; higher temperatures occur in the dry season, rarely going above 35°C; likewise, in the rainy season temperatures are lower on average, rarely dipping below 20°C.

According to the Köppen climate classification system, and with data from weather monitoring stations from the municipality of Portel, the weather is of the type **Am**, similar to a monsoon climate with a long rainy season and a short dry season[15].

[15] Alvares, C.A., Stape, J.L., Sentelhas, P.C., Gonçalves, J.D.M. and Sparovek, G., 2013. Köppen's climate classification map for Brazil. *Meteorologische Zeitschrift*, *22*(6), pp.711-728.

Figure 3. Variation in annual rainfall in the Marajó region[16]



The main rivers are the Camarapí, which runs south to north through the Acangatá and Alto Camarapí territories, and the Pacajá and Anapú rivers around the Ilha Grande territory. The River Acutí Pereira borders the western border of the Tauçú Quilombo.

Vegetation

The project area is within the Xingu-Tocantins-Araguaia Moist Forests ecoregion of the Amazon basin. The forests are generally evergreen (omprophilous) tropical rain forest on *terra firme* (non-flooded land). This ecoregion is one of the most deforested and degraded regions in the Amazon, second only to the Tocantins-Araguaia-Maranhão Moist Forest ecoregion to the East. Urban development radiates from the cities of Belém, Portel and Santarem. The map in Figure 4 summarizes vegetation types in the region.

Because of selective logging practices being widespread in the territories, and because of slash-and-burn agricultural practices near the rivers, most of the forests are not intact but intervened, and secondary vegetation is commonplace. Table 2 lists some of the tree species preliminary inventories have found in the region.

Table 2. Common tree species in the Marajó territories

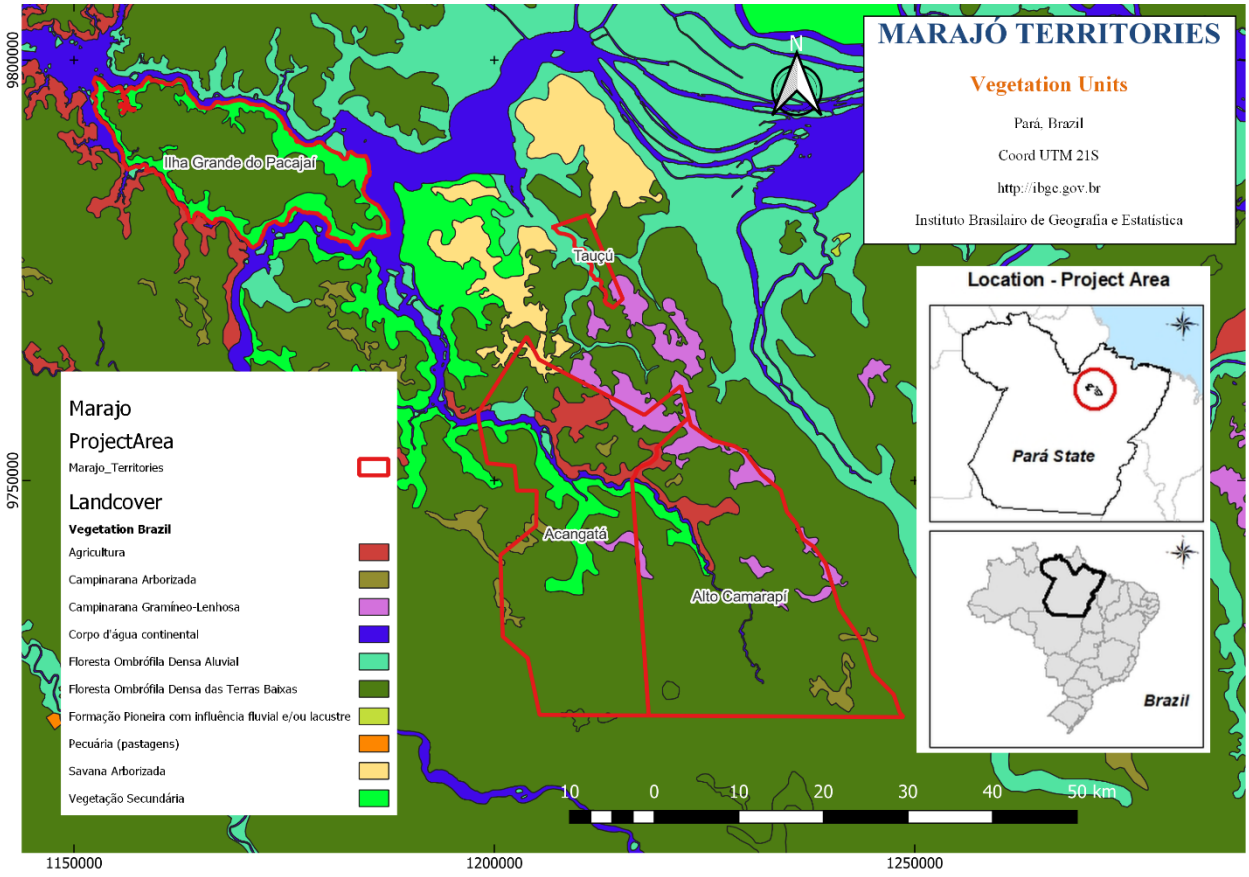
Local name	Botanical name	Family
Abiurana	*Pouteria sp.*	SAPOTACEAE
Abiurana-seca	*Diploon venezuelana* Aubrév.	SAPOTACEAE
Abiu-vermelho	*Pouteria caimito* (Ruiz & Pav.) Radlk.	SAPOTACEAE
Achuá	*Sacoglottis amazonica* Mart.	HUMIRIACEAE
Amapá-amargoso	*Parahancornia amapa* (Huber) Ducke	MORACEAE
Angelim-pedra	*Hymenolobium petraeum* Ducke	PAPILIONOIDEAE
Angelim-vermelho	*Dinizia excelsa* Ducke	MIMOSOIDEAE
Ata-do-mato	*Annona sp.*	ANONACEAE
Bacaba	*Oenocarpus bacaba* Mart.	PALMACEAE
Barrote	*Tetragastris panamensis (*Engl.*)* Kuntze	BURSERACEAE
Breu-vermelho	*Protium macrophyllum* Engl.	BURSERACEAE
Capitiú	*Siparuna guianensis* Aubl.	SIPARUNACEAE

[16] CEMAL, 2015. Plano de Manejo Florestal Sustentável -PMFS- Pracupi, UMF III, Flona Caxiunã, Portel, Pará. CEMAL Comércio Ecológico de Madeiras- Ltda EPP 122 P.

Local name	Botanical name	Family
Caraipé	*Licania kunthiana* Hook.*f.*	CHRYSOBALANACEAE
Casca-seca	*Licania tomentosa (*Benth.*)* Fritsch.	CHRYSOBALANACEAE
Castaneira	*Bertholletia excelsa* Bonpl.	LECYTHIDACEAE
Catuaba	*Anemopaegma sp.*	BIGNONIACEAE
Coração-de-negro	*Swartzia corrugata* Benth.	PAPILIONOIDEAE
Cramuri	*Chrysophyllum sp.*	SAPOTACEAE
Cumarú	*Dipteryx odorata (*Aubl.*)* Willd.	PAPILIONOIDEAE
Cupiúba	*Goupia glabra* Aubl.	CELASTRACEAE
Envira-cana	*Xylopia nitida* Dunal	ANONACEAE
Envira-preta	*Guatteria poeppigiana* Mart.	ANONACEAE
Escorrega-macaco	*Capirona huberiana* Ducke	RUBIACEAE
Fava-arapari	*Parkia sp.*	FABACEAE
Freijo-branco	*Cordia bicolor* A.DC.	BORAGINACEAE
Guajara-bolacha	*Chrysophyllum sp.*	SAPOTACEAE
Inajá	*Attalea dubia (Mart.)* Burret	PALMACEAE
Ingá-branco	*Inga laurina* Willd.	FABACEAE
Ingarana	*Inga paraensis* Ducke	MIMOSOIDEAE
Ingá-vermelho	*Inga paraensis* Ducke	FABACEAE
Inga-xixica	*Inga heterophylla* Willd.	MIMOSOIDEAE
Inharé	*Helicostylis podogyne* Ducke	MORACEAE
Janitá	*Brosimum alicastrum* Sw.	MORACEAE
Jatereua	*Lecythis idatimon* Aubl.	LECYTHIDACEAE
Lacre	*Vismia baccifera* (L.) Triana & Planch.	EUPHORBIACEAE
Louro-amarelo	*Endlicheria longicaudata* (Ducke) Kosterm.	LAURACEAE
Louro-preto	*Ocotea baturitensis* Vattimo	LAURACEAE
Maçaranduba	*Manilkara huberi (*Ducke) Chevalier	SAPOTACEAE
Macucu-branco	*Licania oblongifolia* Standl.	CHRYSOBALANACEAE
Macucú-de-sangue	*Licania heteromorpha* Benth.	CHRYSOBALANACEAE
Mandioqueiro	*Qualea sp.*	MIMOSOIDEAE
Maparajuba	*Manilkara paraensis (*Huber) Standl.	SAPOTACEAE
Mapatirana	*Pourouma guianensis* Aubl.	MORACEAE
Matamata-preto	*Eschweilera ovata* (Cambess.) Miers	LECYTHIDACEAE
Muirauba	*Mouriri brevipes* Gardner & Hook.	MELASTOMATACEAE
Murta	*Eugenia floribunda* West	MYRTACEAE
Muruci-da-mata	*Byrsonima crispa* A.Juss.	MALPIGHIACEAE
Papaterra	*Bellucia dichotama* Cogn.	MELASTOMATACEAE
Papo-de-mutun	*Lacunaria jenmani (*Oliv.) Ducke	QUIINACEA
Parapará	*Jacaranda copaia (*Aubl.) D.Don	BIGNONIACEAE
Pau-de-espeto	*Casearia gossypiosperma* Briq.	SALICACEAE
Pau-de-mastro	*Qualea paraensis* Ducke	SALICACEAE
Pau-pra-tudo	*Simaba cedron* Planch.	SIMAROUBACEAE
Pitaica	*Swartzia acuminata* Willd. ex Vogel	PAPILIONOIDEAE

Local name	Botanical name	Family
Quaruba-cedro	*Vochysia maxima* Ducke	VOCHYSIACEAE
Quarubarana	*Erisma uncinatum* Warm.	VOCHYSIACEAE
Seringarana	*Micrandra rossiana* R.E.Schult.	EUPHORBIACEAE
Sucupira-babona	*Ormosia excelsa* (Spruce ex Benth.) Rudd	PAPILIONOIDEAE
Sucupira-preta	*Bowdichia nitida* Spruce	PAPILIONOIDEAE
Tachi-branco	*Sclerolobium paniculatum* Vogel	CAESALPINIACEAE
Tachi-preto	*Tachigali myrmecophila* Ducke	CAESALPINIACEAE
Tatapiririca-vermelha	*Tapirira guianensis* Aubl.	ANACARDIACEAE
Tauari	*Couratari guianensis* Aubl.	LECYTHIDACEAE
Tento	*Ormosia sp.*	FABACEAE
Timbó-da-mata	*Piptadenia recurva* Ducke	FABACEAE
Tucumã	*Bactris riparia* Mart.	PALMACEAE
Uchirana-paruru	*Sacoglottis guianensis* Benth.	HUMIRIACEAE
Urucurana	*Sloanea dentata* L.	ELAECARPACEAE

Figure 4. Vegetation in the Marajó Territories



Source: ClearBlue Markets

2.1.6 Social Parameters (G1.3)

The Marajó REDD+ Project is in one of the oldest inhabited communities in the northern region of Brazil, in the Marajó archipelago, municipality of Portel, state of Pará, Brazil. The Marajó archipelago is one of the mesoregions of the state of Pará with territorial extension estimated at 104,140.00 km², occupying 8% of the territory of Pará, being considered the largest river-marine island in the world.

The archipelago is subdivided into three microregions, namely: Arari microregion (comprising the municipalities of Chaves, Santa Cruz do Arari, Soure, Salvaterra, Cachoeira Arari, Ponta de Pedras and Muaná); micro-region of Furo de Breves (municipalities of Afuá, Anajás, São Sebastião da Boa Vista, Breves and Curralinho); and the Portel microregion (municipalities of Gurupá, Melgaço, Bagre and Portel).

REDDA Projetos Ambientais (REDDA) implements the Marajó REDD+ Project for the generation of carbon credits in the Portel microregion, focusing on the aforementioned municipalities, located at latitude 01º56'08" south and longitude 50º49'16" west, being at an altitude of 19 meters. It has an area of 25,384,865 km², demographic density of 2.06 inhabitants/km² and its population, according to the Brazilian Institute of Geography and Statistics (IBGE), was estimated at 63,831 inhabitants for 2021.

The Marajó REDD+ Project is under development in four territories that form part of the municipality of Portel and whose territorial extensions vary between 2,568 hectares and 70,471 hectares – the smallest and largest geographic area respectively. The four territories are PEAEX[17] Acangatá, PEAEX Alto Camarapi, PAE[18] Ilha Grande, and TEQ[19] São Tomé Taucú, the latter being a quilombola (maroon) area.

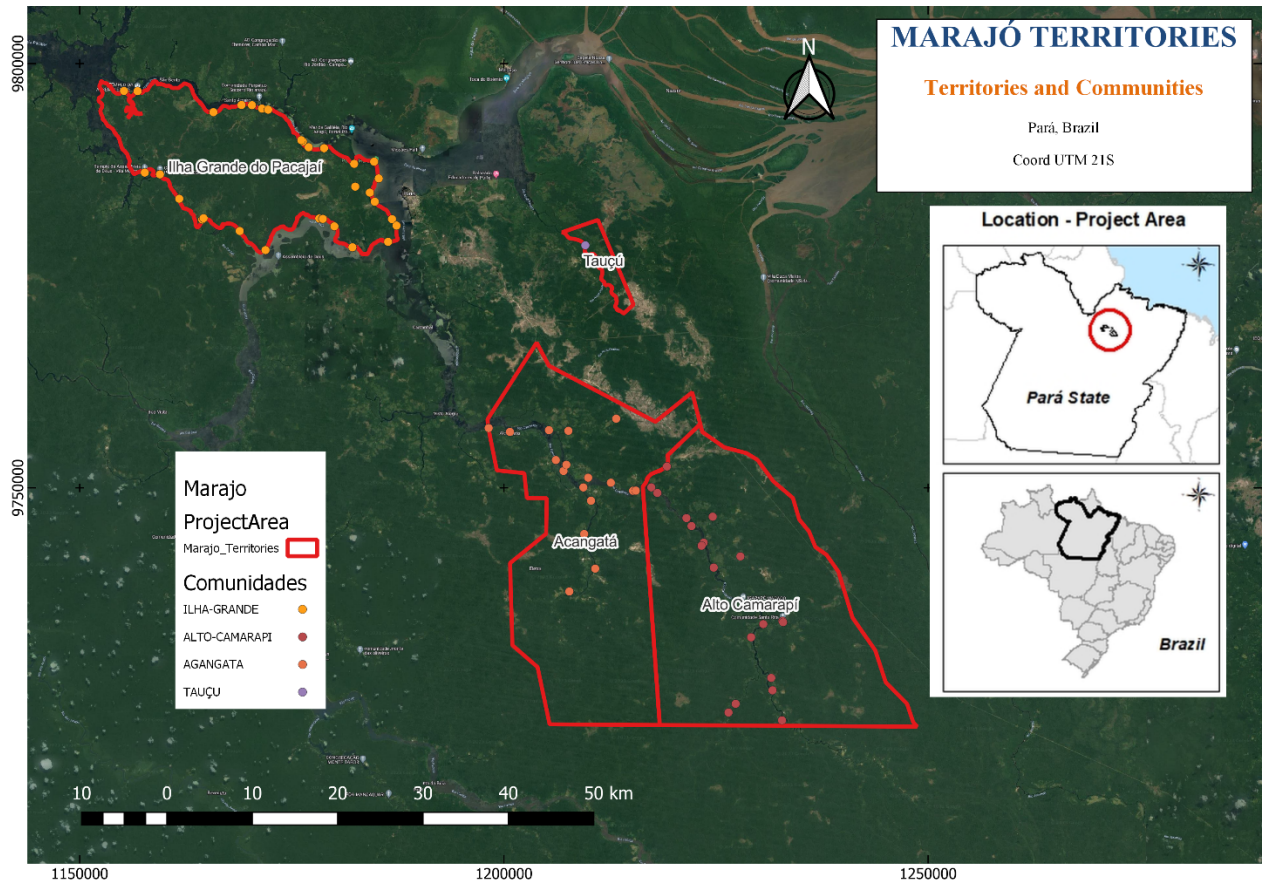
The population settled in these territories served by REDDA are predominantly riverside people (*ribeirinhos*), whose defining characteristics are "[...] *population living on the banks of rivers, living, especially, from hunting, fishing, and plant extraction. The management of floodplain areas, production techniques and social organization are knowledge inherited from the indigenous people who lived in these areas in the pre-colonial period. The riverside territoriality is established, mainly, from the river. The water environment has a lot of influence on riverside life, whether in the construction of houses, in choosing the time for fishing practices, among others. Therefore, the river has a high symbolic and representative power*" [20]. Among the communities served by the Marajó REDD+ Project, there is one of Quilombos. This community was founded in 1972, with a particular way of life, like those of the traditional riverside people (descendants of the indigenous culture of the Amazon) yet building symbolic and cultural bonds with their black ancestry. The communities on each territory in the project can be seen in Figure 5.

In Marajó[21], 75% of the areas are defined as landowner territories, an unusual situation in the Amazon where the lack of legally recognized ownership of the land is recurrent. In 2012, the government of Pará issued Decree no. 579/2012 destined for sustainable use by the traditional communities of the municipality of Portel. 514,924 hectares of land divided into five plots, including Acangatá and Alto Camarapi. The quilombos community that forms part of the project has been legally recognized by the Instituto of Lands of Pará - ITERPA with the Title of Collective Domain of the land, published in DOE nº 33.576, of 03/13/2018, on behalf of the Community Quilombo Remaining Association of São Tomé Taucú – ARQUICOSTT.

[17] *Projeto Estadual de Assentamento Agroextrativista*
[18] *Projeto de Assentamento Agroextrativista*
[19] *Território Estadual Quilombola*
[20] Fernandes, J.S.N. and Moser, L., 2021. Comunidades tradicionais: a formação socio-histórica na Amazônia e o (não) lugar das comunidades ribeirinhas. *Revista Katálysis*, *24*, pp.532-541.
[21] MIRANDA, K. et al. Embarca Marajó: estratégias locais de inovação, fortalecimento institucional e desenvolvimento sustentável. 1º edição. IEB Mil Folhas, 2017.

While the Marajó region has a strategic and important potential to boost social, productive and environmental development, the territory has been historically neglected and is marked by a great inadequacy and infrastructure precariousness in key segments including, amongst others, energy, transportation, telecommunications and water supply as well as measures to promote socio-territorial development[22]. In fact, it can be observed that even today, the region continues to be neglected by the public sector, which is reflected in the prevailing quality of life and work in the region. The large and profitable economic projects that have been attracted to the Amazon territory due to its abundance of opportunities for the extraction of local natural wealth and the amount of available, low-cost labor with limited training and/or professional qualification do not incite significant improvements in quality of life. Looking at the Human Development Index (HDI) for the mesoregion of Marajó, the Portel micro-region has the worst HDI[23], corresponding to 0.47 in 2010 based on 200 indicators covering demography, education, income, work, housing and vulnerability and others.

Figure 5. The Marajó REDD+ Project within the State of Pará – Brazil



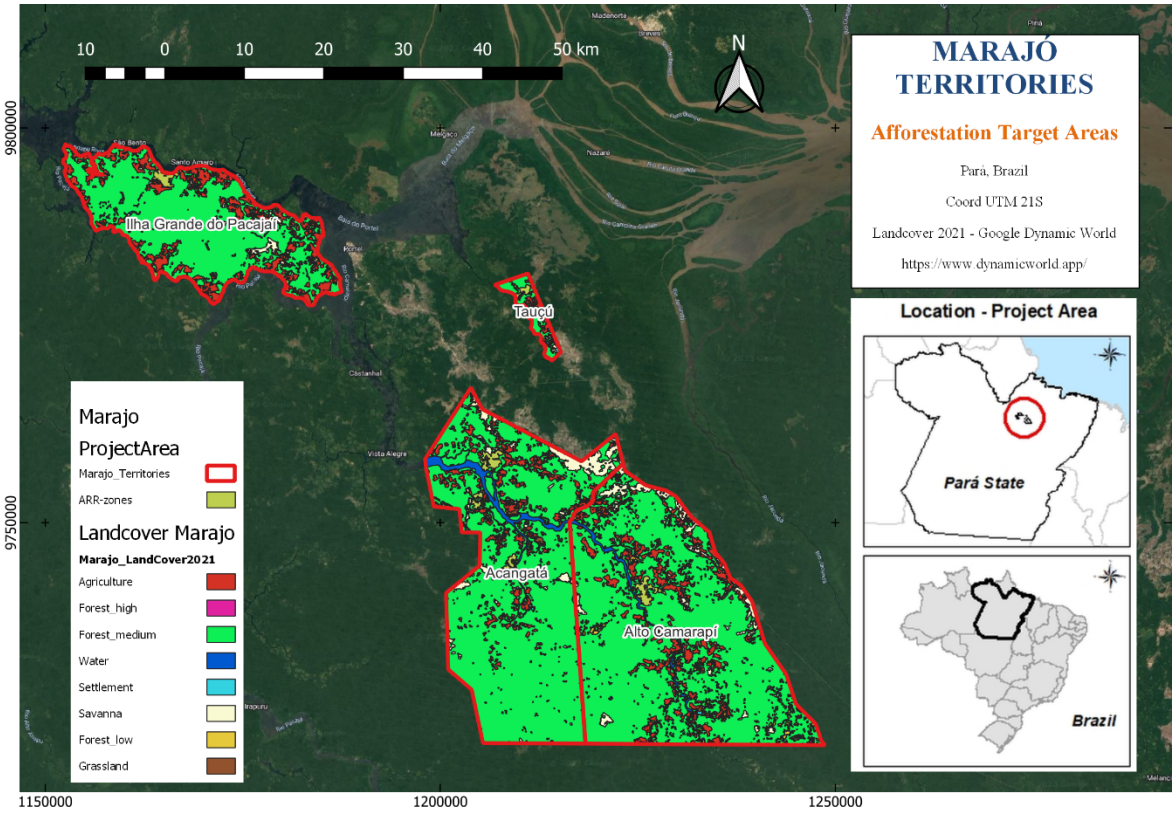
Source: ClearBlue Markets

[22] UNIVERSIDADE FEDERAL DO PARÁ (UFPA). Relatório Analítico do Território do Marajó, 2012.
[23] PROGRAMA DAS NAÇÕES UNIDAS PARA O DESENVOLVIMENTO (PNUD). Atlas do Desenvolvimento Humano no Brasil. 2013. Disponível em: <http://atlasbrasil.org.br/2013/pt/o_atlas/o_atlas>. Acesso em: 30 jul. 2017.

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

The project currently comprises four territories: Ilha Grande de Pacajaí, Acangatá, Alto Camarapí and Tauçú (**Error! Reference source not found.**). The zones destined for ARR activities are now deforested areas outside the REDD+ project as delineated in Figure 6.

Figure 6. The ARR zones for the Marajó project



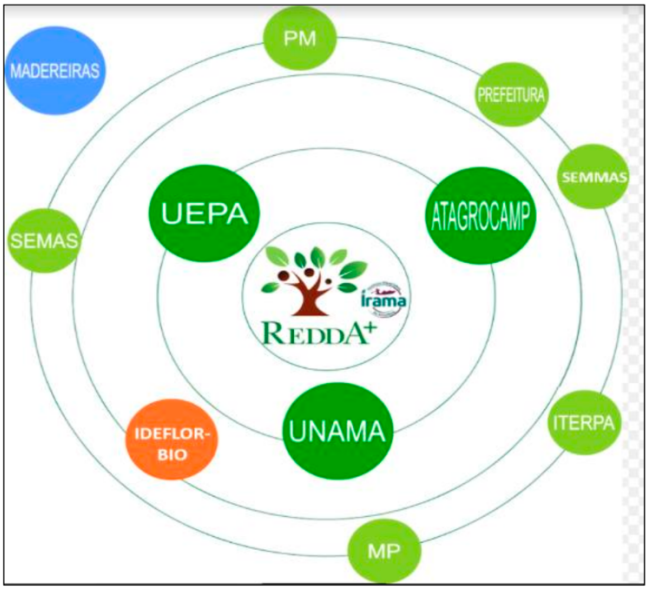
Source: ClearBlue Markets

2.1.8 Stakeholder Identification (G1.5)

The initial identification of stakeholders was carried out through a strategic articulation with the support of IRAMA[24]. Specifically, this articulation process considered a support network and partnerships on the basis that relationships, between individuals and/or institutions, are not homogeneous, but have points of convergence, that is, all contribute, in some way, to the same objective, with regards to new opportunities, optimization of resources and cooperation. The identification of stakeholders, that is, government institutions, universities, and the social organization – ATAGROCAMP (Figure 7), which occurred in 2020 and up to mid-2021, during the preliminary strategic articulation stage, were fundamental to foster the associations' interest in the Marajó REDD+ Project. The preliminary strategic articulations resulted in the municipality of Portel recognizing and forming a support network and partnership that helped to attract different stakeholders. The first plenary with local leaders of Portel and Gurupá was also held, led by IRAMA and REDDA.

[24] IRAMA - Instituto Ribeirinhos da Amazonia https://redda.com.br/mulheres-amazonidas/

Figure 7. Overview of stakeholders identified during premilitary strategic articulation



Fonte: REDDA+

REDDA understands the need to empower the collective of agro-extractivist families for the different stages and decision-making processes that occur in the scope of the operationalization and implementation of the Marajó REDD+ Project. Therefore, the field activities involving the communities and the REDDA team addressed the concept of participatory methodologies with the objective of promoting a flow of information, active communication, cooperation, and learning in a didactic way. During the mobilization and sensitization stages, active learning and participatory rural extension methodologies, using tools from the Participatory Rural Diagnosis (DRP), were initially aggregated.

Specifically, REDDA follows a structured protocol of consultation prior to signing any contract with communities. The following steps were implemented in all four territories:

1. Institutional strategic articulation stage (social actors)

This is the first stage of the project cycle. Potential partnerships and a support network to identify possible territories were built, local leaders, and associations, among others, identified. The goal is to initiate contact with the communities in a safe environment, involving the possible partners and establishing an open flow of information that ensures transparent communication and aids decision-making with regard to the proposed project. The process occurs throughout the entire cycle of the project cycle, based on the idea of continuous construction in a network.

2. Stage of mobilization of the association boards and councils (community leaders)

After the identification and articulation of the social actors (institutions), there is a focus on the mobilization of community leaders, boards, and councils (thought leaders).

3. Stage of community mobilization by territory

In a next step, communications channels are established to set up meetings for providing detailed explanations on the activities proposed by REDDA for the territory. Such meetings are held for community groups (strategic anchors) to assure that the Marajó REDD+ Project proposal will be presented to the group(s) most directly affected.

4. Community sensitization stage

Community sensitization is the stage in which the project is presented to the identified agroextractivist / quilombola families, sometimes with the presence of facilitating governmental institutions, such as IDEFLOR-Bio[25]. At this stage, the project is presented in a didactic and participatory manner. The methodological instrument used for these interactions comes from the toolbox used to carry out Participatory Rural Appraisals and is called Problem Tree and/or Opportunity Tree. A problem tree starts with the identification of the key, locally present constraint(s). By identifying the problem(s), it is possible to find solutions that the Marajó REDD+ Project can support.

With regards to Free, Prior and Informed Consent (FPIC), the following process was adhered to: First, it is established whether there is an existing protocol for FPIC, if yes, it is followed. If there is no protocol available, the decision-making process will be agreed in a participatory manner. REDDA proposes to sign contracts only after obtaining the consent of the community collective (leaders and families), consent and/or endorsement of the deliberative environmental bodies, as well as in a general meeting with all the parties involved. On occasion, there may be a need for pre-signature meetings and FPIC to align actions as well as financial structures. The here outlined process takes place in each territory.

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

There are 68 communities (Table 3,
Table 4) have been listed in the four territories of the Marajó REDD+ project.

Table 3. List of the communities in the Marajó project territories

Territory	Community name
Ilha Grande do Pacajaí	Boa semente
Ilha Grande do Pacajaí	Boas novas
Ilha Grande do Pacajaí	Calice de fogo
Ilha Grande do Pacajaí	Ext areia
Ilha Grande do Pacajaí	Jesus e fiel
Ilha Grande do Pacajaí	Maranata
Ilha Grande do Pacajaí	Menino deus
Ilha Grande do Pacajaí	Mensageiro paz
Ilha Grande do Pacajaí	Missões paut
Ilha Grande do Pacajaí	Monte Geresim
Ilha Grande do Pacajaí	Monte Horebe
Ilha Grande do Pacajaí	Monte Peniel
Ilha Grande do Pacajaí	Monte Sião
Ilha Grande do Pacajaí	N s conseição
Ilha Grande do Pacajaí	Nova aliança
Ilha Grande do Pacajaí	Nova canã
Ilha Grande do Pacajaí	Nova Jerusalém

[25] The Instituto de Desenvolvimento Florestal e da Biodiversidade do Estado do Pará - IDEFLOR-Bio https://ideflorbio.pa.gov.br

Territory	Community name
Ilha Grande do Pacajaí	Novo horizonte
Ilha Grande do Pacajaí	Porta formosa
Ilha Grande do Pacajaí	São benedito
Ilha Grande do Pacajaí	São João
Ilha Grande do Pacajaí	São Mateus
Ilha Grande do Pacajaí	São Miguel
Ilha Grande do Pacajaí	São Santiago
Ilha Grande do Pacajaí	São Tomé
Ilha Grande do Pacajaí	Santa Helena
Ilha Grande do Pacajaí	Santa Luzia
Ilha Grande do Pacajaí	Santo Agostinho
Ilha Grande do Pacajaí	Vila Matadouro
Alto Camarapí	Santa Rita
Alto Camarapí	Congregação Ebenezer
Alto Camarapí	Congrega
Alto Camarapí	Rocha eterna
Alto Camarapí	São Sebastião
Alto Camarapí	Santa rita
Alto Camarapí	Com sio francisco
Alto Camarapí	Nova alianza
Alto Camarapí	São Bento
Alto Camarapí	Perpetuo socorro
Alto Camarapí	Com. Soo benedito
Alto Camarapí	Pro-ribeirnho
Alto Camarapí	Cong. Betell
Alto Camarapí	Cong. Útima trombeta
Alto Camarapí	Com. Aparecida
Alto Camarapí	Sao pedro
Alto Camarapí	Sagrado coração
Alto Camarapí	N.s. Bom remedio
Alto Camarapí	São José
Alto Camarapí	São Raimundo
Acangatá	Boas novas
Acangatá	Novo manancial
Acangatá	São j amparo
Acangatá	São benedito
Acangatá	D esp santo
Acangatá	Menino deus
Acangatá	São pedro
Acangatá	São benedito
Acangatá	N sra aparecida
Acangatá	Acangatá

Territory	Community name
Acangatá	Palavra da vida
Acangatá	Betel
Acangatá	Esp santo
Acangatá	Sao sebastião
Acangatá	Santa Rita
Acangatá	Nova Jerusalém
Acangatá	Santa ana
Taucú	São Tomé Taucú
Taucú	Com. Pentecostal da Paz

Table 4. Description of the territories in the Marajó project

Region	Territory	Association representing the territory	Number of families	Number of communities
Micro region Portel (Gurupá, Melgaço, Bagre and Portel municipalities)	PEAEX Alto Camarapí – Portel/PA	Associação dos Trabalhadores Agroextrativistas do Alto Camarapí (ATAGROCAMP)	281	21
	TEQ São Tomé Taucú -Acutipereira – Portel/PA	Associação dos Remanescentes de Quilombos da Comunidade São Tomé do Tauçu (ARQCSTT)	45	1
	Acangatá – Portel/PA PEAEX	Associação dos Moradores Agroextrativistas do Assentamento PEAEX Acangatá (ASMOGAC)	485	18
	PAE Ilha Grande – Portel/PA	Associacao Dos Trabalhadores Agroextrativista Da Ilha Grande Do Pacajai Assentamento Pai Do Governo Federal ATAIG	541	26

Moreover, the following actors were identified:

Stakeholder	Description	Role
SEMAS PORTEL	Environmental Secretary of Portel	Environmental Secretary
IEB	IEB stands out on the national scene for being dedicated to training and capacitating people and strengthening organizations in the various aspects and themes related to the environment, development and sustainability	Registration and socio-environmental diagnosis of the project area.
IFT	The IFT is a Civil Society Organization of Public Interest (OSCIP), focused on forestry issues, which has been operating in the Amazon for over 20 years. From this perspective, it has adopted effective practices of financial resource control, achieving a high level of transparency. It is supported by several donors who receive and approve projects that aim to promote good forest management practices for multiple use in the Amazon.	Support in training and forest inventory.
IDEFLOR	IDEFLOR-Bio is a public law entity, constituted as an autarchy, with technical, administrative, and financial autonomy; it seeks to manage public forests for the sustainable production and preservation of biodiversity, including among its functions the management of the state policy for production and development of the forest chain; and the execution of policies for the preservation, conservation, and sustainable use of biodiversity, terrestrial and aquatic fauna and flora in the state.	Support in articulation with communities and some partnerships in workshops
EMATER - PA	EMATER-PARÁ is the official agency of the State of Pará that provides specialized services in the areas of agricultural sciences and humanities, disseminating knowledge and technological information in the rural environment.	Partnerships in workshops
UNAMA	University	Technical support. Partnership with professors specialized in themes focused on traditional peoples and communities.
IFPA - CAMPUS DE BREVES	University	Technical support. Partnership with professors specialized in themes focused on traditional peoples and communities.
UEPA	University	Technical support. Partnership with professors specialized in themes focused on traditional peoples and communities.
SECULT (SECRETÁRIA DE ESPORTE E CULTURA)	Governmental institution in the field of culture and sport	Technical support. Partnership with activities in the communities

SEMED (SECRETÁRIA DE EDUCAÇÃO)	Governmental institution in the field of education	Technical support. Partnership with activities in the communities
FAEPA	The Agriculture and Livestock Federation of Pará (Faepa) represents the interests of rural producers, the sustainable development of agribusiness and the strengthening of institutional relations.	The institution collaborates with REDDA by making available courses that train the communities to better use the land and generate income, according to the demand of the communities.
Policia Militar	Police	Support in case of denunciation
Corpo de bombeiros	Fireman	Support in case of accidents and fire. Partnership in training the community
CENSIPAM	Manager and Operational Center of the Amazon Protection System (CENSIPAM in Portuguese)- Censipam is linked to the administrative structure of the Ministry of Defense. Through Censipam, joint actions are promoted by government agencies that work with socio-environmental policies in the Amazon, such as the Armed Forces, civil institutions, such as Ibama and the Chico Mendes Institute (ICMBio), Environment Secretariats, Federal and State Police, Civil Defense, and other agencies of this nature. Censipam was created to promote the protection of the Legal Amazon through the synergy of government actions, coordination, planning, information integration and knowledge generation	This partnership is about delivering official monitoring reports of various types such as deforestation, fires, floods, logging, and others. The reports are official and used also by Brazilian government

2.1.10 Sectoral Scope and Project Type

The project falls under

- Sectoral scope: 14: Agriculture, forestry, and other land use (AFOLU)
- Project category: Reducing Emissions from Deforestation and Degradation (REDD)
- Activity type: Avoiding Unplanned Deforestation and/or Degradation (AUDD).

The project follows Climate, Community and Biodiversity (CCB - Version 3) and the reference methodology is VM0037: Methodology for the implementation of REDD+ Activities in Landscapes Affected by Mosaic Deforestation and Degradation.

This project is not a grouped project.

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

The project aims to reduce degradation and deforestation in order to limit greenhouse gas emissions. As such it is targeting a range of activities centered around

1) The forest and its conservation. Activities relate to the analysis of flora and fauna and the monitoring of

climate change;

2) Awareness-raising and skills enhancement. Activities relate to capacity building for local development and education; this prevents the further expansion of slash and burn subsistence agriculture from locals and minimizes encroachment from outsiders (loggers, poachers). This will prevent deforestation, forest degradation and biodiversity loss.

3) Enhancement of livelihoods. Activities relate to the creation of jobs and infrastructure, the enhancement of income, means of subsistence and use of land, the quality of life and health, water quality as well as well-being and innovation. Generating alternative sources of income will lessen human pressure on the forest. This will prevent deforestation, forest degradation and biodiversity loss.

Table 5. General description of activities and impacts of the Marajó REDD project

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Reducing GHG emissions from AUDD due to the Project Activities	Identify conflicts and overlaps of land-use rights within the project area and collect sociological information. Implementation of regular patrols by the community members.	Patrolling activity in cooperation with the local authorities will reduce illegal encroachment (e.g. illegal timber harvests, land grabbing).	Preventing illegal encroachment in the project will reduce deforestation and degradation caused by illegal timber extraction and slash-and-burn agriculture.	This activity will directly reduce emission from AUDD.
Generation of alternative income sources	Participation of members of the local communities in the project's patrolling and monitoring activities. Providing education and training for children and adults within the project area.	Access to schooling will stimulate diversity in the community's income stream and will have a positive impact on the average income.	Less reliance on forest resources will reduce emissions from AUDD as the settlers will not completely depend on slash-and burn subsistence agriculture only.	Climate: Reducing the dependence on forest resources will lead to a reduction of deforestation and forest degradation in the project area, reducing overall emissions. Community: Providing the community with alternative sources of

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
				income will increase their self-sustainability and their quality of life.
Accessibility to alternative energy sources	Installation of biodigesters in the riverside communities. Providing trainings to the communities in the use and maintenance of the biodigesters.	Availability of biogas will reduce the need to extract fuelwood from the forest.	Long term, reduced fuelwood extraction will lead to less cutting of trees, therefore less forest degradation and the subsequent GHG emissions.	Climate: Reducing the communities' dependency on fuelwood will lead to a reduction of deforestation and forest degradation in the project area, reducing overall emissions. Community: Having access to a free, clean source of energy is not only of great economic value, but will also improve the communities' health as combustion of biogas is less polluting than fuelwood or fossil fuels.

Table 6. Territories, activities and problems addressed with the Marajó REDD+ project

PROBLEM AND OPPORTUNITY TREE RESULTS						
N°	**Territories**	**Associations**	**Main Problems identified**	**Drivers and activities considered**	**Deforestation or Degradation**	**Activities related to the drivers**
1	PAE Ilha Grande do Pacajaí	ATAIGPA	Low income	Lack of alternatives for subsistence compelling the population to make unsustainable use of the forest	Degradation	Eco-jewellery Workshop; Workshop on the Use of Forest Residue; Seedling Production of Native Species for Forest Restoration/Recuperation; Seed Collection Techniques
			River pollution	Lack of sewage disposal system; de-oxygenation and pollution of waterways deplete and drive away fish populations particularly of bigger species, which are important tree dispersers of seeds	Degradation	Installation of rainwater catchment system; Microbiological and physical-chemical analysis of water samples; Environmental education on selective garbage collection; Installation of the biogas system
			Logging	Unplanned timber harvesting by outsiders and occasionally by locals	Degradation	Technical assistance and elaboration of rural projects for alternate sources of income; Installation of cameras for monitoring; Installation of the biogas system
			Slash-and-burn and subsistence farming	Expansion of subsistence agriculture by conversion of forest lands	Deforestation	Sustainable nutrition workshop; Laboratory analysis of soil; Technical assistance and elaboration of rural projects for alternate sources of income; Seedling production of native species for forest restoration/recuperation

PROBLEM AND OPPORTUNITY TREE RESULTS						
N°	**Territories**	**Associations**	**Main Problems identified**	**Drivers and activities considered**	**Deforestation or Degradation**	**Activities related to the drivers**
2	PEAEX Acangatá	ASMOGAC	Low income	Lack of alternatives for subsistence compelling the population to make unsustainable use of the forest	Degradation	Eco-jewellery Workshop; Workshop on the Use of Forest Residues; Seedling Production of Native Species for Forest Restoration/Recuperation; Seed Collection Techniques
			Slash-and-burn and subsistence farming	Expansion of subsistence agriculture by conversion of forest lands	Deforestation	Sustainable nutrition workshop; Laboratory analysis of soil; Technical assistance and elaboration of rural projects for alternate sources of income; Seedling production of native species for forest restoration/recuperation
			Logging	Unplanned timber harvesting by outsiders and occasionally by locals	Degradation	Technical assistance and elaboration of rural projects for alternate sources of income; Installation of cameras for monitoring; Installation of the biogas system
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PROBLEM AND OPPORTUNITY TREE RESULTS						
N°	**Territories**	**Associations**	**Main Problems identified**	**Drivers and activities considered**	**Deforestation or Degradation**	**Activities related to the drivers**
3	PEAEX Alto Camarpí	ATAGROCAMP	Low income	Lack of alternatives for subsistence compelling the population to make unsustainable use of the forest	Degradation	Eco-jewellery Workshop; Workshop on the Use of Forest Residue; Seedling Production of Native Species for Forest Restoration/Recuperation; Seed Collection Techniques
			Logging	Unplanned timber harvesting by outsiders and occasionally by locals	Degradation	Technical assistance and elaboration of rural projects for alternate sources of income; Installation of cameras for monitoring; Installation of the biogas system
			Slash-and-burn and subsistence farming	Expansion of subsistence agriculture by conversion of forest lands	Deforestation	Sustainable nutrition workshop; Laboratory analysis of soil; Technical assistance and elaboration of rural projects for alternate sources of income; Seedling production of native species for forest restoration/recuperation
			River pollution	Lack of sewage disposal system; de-oxygenation and pollution of waterways deplete and drive away fish populations particularly of bigger species, which are important tree dispersers of seeds	Degradation	Installation of rainwater catchment system; Microbiological and physical-chemical analysis of water samples; Environmental education on selective garbage collection; Installation of the biogas system
4	TEQ Taucú	ARQUICOSTT	Low income	Lack of alternatives for subsistence compelling the population to make unsustainable use of the forest	Degradation	Eco-jewellery Workshop; Workshop on the Use of Forest Residue; Seedling Production of Native Species for Forest Restoration/Recuperation; Seed Collection Techniques

PROBLEM AND OPPORTUNITY TREE RESULTS						
N°	**Territories**	**Associations**	**Main Problems identified**	**Drivers and activities considered**	**Deforestation or Degradation**	**Activities related to the drivers**
			River pollution	Lack of sewage disposal system; De-oxygenation and pollution of waterways deplete and drive away fish populations particularly of bigger species, which are important tree dispersers of seeds	Degradation	Installation of rainwater catchment system; Microbiological and physical-chemical analysis of water samples; Environmental education on selective garbage collection; Installation of the biogas system
			Slash-and-burn and subsistence farming	Expansion of subsistence agriculture by conversion of forest lands	Deforestation	Sustainable nutrition workshop; Laboratory analysis of soil; Technical assistance and elaboration of rural projects for alternate sources of income; Seedling production of native species for forest restoration/recuperation

2.1.12 Sustainable Development

The Marajó REDD+ Project activities also take into account the sustainable development goals. All the activities held in the field can be linked to one or more goal.

SDG	Sustainable Development Goals	Application in the Marajó REDD+ Project
	SDG 1 – End poverty in all its forms	Activities related to the Enhancement of livelihoods.
	SDG 2 – End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Activities related to the Enhancement of livelihoods.
	SDG 5 – Achieve gender equality and empower all women and girls	Activities related to Awareness-raising and skills enhancement and to the Enhancement of livelihoods.
	SDG 6 – Ensure access to water and sanitation for all	Activities related to the Enhancement of livelihoods.
	SDG 7 – Ensure access to affordable, reliable, sustainable and modern energy for all	Activities related to the Enhancement of livelihoods.

SDG	Sustainable Development Goals	Application in the Marajó REDD+ Project
	SDG 10 – Reduce inequality withing and among countries	Activities related to Awareness-raising and skills enhancement and to the Enhancement of livelihoods.
	SDG 12 – Ensure sustainable consumption and production patterns	Activities related to the Forest and its conservation and to the Enhancement of livelihoods.
	SDG 13 – Take urgent action to combat climate change and its impacts	Activities related to the Forest and its conservation, to Awareness-raising and skills enhancement and to the Enhancement of livelihoods.
	SDG 15 – Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss	Activities related to the Forest and its conservation and to Awareness-raising and skills enhancement.
	SDG 17 – Revitalize the global partnership for sustainable development	Activities related to the Enhancement of livelihoods.

2.1.13 Implementation Schedule (G1.9)

Date	Milestone(s) in the project's development and implementation
August – October 2020	Identification of the project area, relevant institutions (association) and initiation of discussions.

Date	Milestone(s) in the project's development and implementation
July 2021	Meetings in the field with presidents of associations to continue discussions and raise awareness on climate change and REDD+ followed by meetings with individual communities.
October 23, 2021	Signing of contracts with five associations (project proponents).
November 2021	Baseline study as well as PD development initiated.
November 10, 2021	Initiation of activities related to the forest and its conservation; here specifically: patrolling of the areas.
December 8, 2021	Initiation of activities related to awareness-raising and skills enhancement; here specifically: preparation for workshop on the basics of soil quality.
August 2, 2022	Signing of contract for PD preparation.
August 22, 2022	Initiation of activities related to enhancement of livelihoods; here specifically: start of operation of 1 biogas digester each for the associations of ASMOGAC and ATAIGPA.
February 2023	Submission to Verra for listing as 'Under Validation'.
Mid-2023	First ARR areas planted

2.1.14 Project Start Date

The project start date has been determined to be 23 October 2021 as this is the date on which the agreements with the involved local communities represented via the four respective associations were formalized. The ARR component of the project will begin in 2023.

2.1.15 Benefits Assessment and Crediting Period (G1.9)

The crediting period is expected to run from 23 October 2021 to 22 October 2061, for a total of 40 years.

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

Not applicable

2.1.17 Estimated GHG Emission Reductions or Removals

Year	REDD+ Estimated GHG emission reductions (tCO_2e)	ARR -Estimated GHG emission removals (tCO_2e)	Total Estimated GHG emission reductions and removals (tCO_2e)
2021	51,020	0	51,020
2022	266,034	0	266,034
2023	266,034	25	266,059
2024	266,034	58	266,092

Year	REDD+ Estimated GHG emission reductions (tCO_2e)	ARR -Estimated GHG emission removals (tCO_2e)	Total Estimated GHG emission reductions and removals (tCO_2e)
2025	266,034	365	266,399
2026	266,034	1,571	267,605
2027	266,034	2,966	269,000
2028	266,034	5,263	271,297
2029	266,034	5,317	271,351
2030	266,034	8,225	274,259
2031	266,034	12,140	278,174
2032	266,034	13,202	279,236
2033	266,034	17,327	283,361
2034	266,034	21,026	287,060
2035	266,034	25,172	291,206
2036	266,034	29,773	295,807
2037	266,034	33,780	299,814
2038	266,034	26,890	292,924
2039	266,034	30,206	296,240
2040	266,034	33,730	299,764
2041	266,034	26,293	292,327
2042	266,034	28,995	295,029
2043	266,034	31,841	297,875
2044	266,034	34,898	300,932
2045	266,034	37,940	303,974
2046	266,034	40,736	306,770
2047	266,034	41,906	307,940
2048	266,034	43,023	309,057
2049	266,034	42,896	308,930
2050	266,034	49,264	315,298
2051	266,034	50,301	316,335
2052	266,034	50,891	316,925
2053	266,034	51,023	317,057
2054	266,034	50,801	316,835
2055	266,034	52,222	318,256

Year	REDD+ Estimated GHG emission reductions (tCO_2e)	ARR -Estimated GHG emission removals (tCO_2e)	Total Estimated GHG emission reductions and removals (tCO_2e)
2056	266,034	53,551	319,585
2057	266,034	54,903	320,938
2058	266,034	56,172	322,207
2059	266,034	79,705	345,740
2060	266,034	83,297	349,331
2061	215,014	67,323	281,337
Total estimated ERs	10,641,360	1,295,017	11,936,377
Total number of crediting years	40 years	40 years	40 years
Average annual ERs	266,034	32,375	298,409

2.1.18 Risks to the Project (G1.10)

The project proponent conducted the project risk analysis using the guidelines set out in the Non-Permanence Risk Tool. The risk ratings were based on an assessment of the risk factors that are added together to determine the total risk rating.

Risks to the project were categorized as follows: 1) Human-induced risks, 2) Natural risks, 3) Political risks, and 4) Policy risks.

1) Human-induced risks

The project identified following human induced risk in the project area:

i) Expanding Agriculture: Due to increases in the population pressure, the project area is susceptible to the expansion of the agriculture areas. This poses a primary risk to the project and its activities. The mitigation for this risk is through the implementation of the project activities, mainly in the form of increased protection of the project area and the creation of better livelihoods for the communities. Moreover, the project frequently monitors and patrols the project area with the community support to prevent any expansion of the agriculture land by possible encroachers.

ii) Illegal Extraction of Natural Resources: The project areas are vulnerable to extractive activities by outsiders. As the project intends to limit such threats primarily through patrolling by community members and the project team, the risks imposed here are considered manageable. Active monitoring of the effectiveness of the imposed measures and activities assures that any limitations are quickly identified and addressed.

2) Natural risks

The region in which the project is located is not generally susceptible to severe or destructive natural events. The primary types of natural events that could occur would be geologic events, pests or disease, flooding, or fire. The area is not prone to any geologic activity, and this poses little to no risk to the project. As the project area is a native and biodiverse ecosystem, the risk from pests or disease that result in significant emissions reversal is low. The primary mitigation for this

risk is to maintain the forest and ensure through monitoring that the trees and ecosystem remain healthy and intact. There can be minor seasonal flooding. However, the species of this area are all adapted to the hydrological cycles and are not liable to flooding. The project has an active exchange with the local fire brigade in order to assure that this risk is minimized.

3) Political risks

Generally, as in most countries, there exists a possible risk of shifting legislation or new policies that could potentially affect natural resource management and/or land tenure. This could also be the case in Brazil. However, it is expected that any potential change in legislation will have minimal effect on the project, since this is a community-based and community driven project activity in a relatively remote area.

4) Policy risks

Policy risks are mainly related to the voluntary carbon market (VCM). Due to volatilities of this market related to shifts in economic policy as well as the regulatory framework applicable to the VCM, there is a risk to obtaining a recurring, sustainable income flow. If credits are not sold, there will be no revenue, and thus no monetary support for the project. The project proponent thus intends to use initial project income for the implementation of activities and to attract sufficient buyers to assure a continuous flow of revenue.

2.1.19 Benefit Permanence (G1.11)

The project activities aim to shift the cost/opportunity of the land use from extensive agriculture and informal logging to activities with a less negative impact on the land that allow for the protection of the natural environment and connectivity between forest cover and wildlife. With respect to the financial and opportunity cost risks, the project hopes to ensure the permanence of the project activities through the establishment of a robust management system that assures the allocation of economic resources to the project activities drawing upon the income from the generation of carbon credits as well as donations from other institutions. The project will also ensure the permanence of the activities and their associated benefits by mitigating possible conflicts over land tenure, training, and the implementation of strategic activities. Throughout the crediting period, the project will maintain active processes of socialization, consultation, and adaptive management with stakeholders with an aim to disseminate project information, especially any decisions made by steering and technical committees, through agreed communication channels. In addition, there will be mechanisms for grievance redress to assure that any issues arising are resolved appropriately and the long-term benefits are not jeopardized.

2.1.20 Financial Sustainability (G1.12)

The project's activities are designed to pursue long-term objectives that become sustainable over time. REDDA's operational and management capacity to coordinate financial resources received from revenues from the sale of carbon credits as well as third party donations aims to assure that these goals are met. With an initial investment by the main project proponent, it is possible to start with the roll-out of the project activities prior to the receipt of carbon revenues. Moreover, since the legal statutes and relevant contracts determine that funds raised by REDDA are earmarked for re-investment in project activities, the long-term success of project implementation and thus carbon revenue generation is ensured. It is expected that a flow of funds will be generated that allows for the extension and intensification of activities over time, increasing the climate, community and biodiversity benefits.

2.1.21 Grouped Projects

Not applicable.

2.2 Without-project Land Use Scenario and Additionality

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

Please refer to Section 3.1.4 for the description of the baseline scenario which denotes the conditions existing prior to project initiation.

2.2.2 Most-Likely Scenario Justification (G2.1)

Please refer to Section 3.1.4 for the description of the baseline scenario which denotes the conditions existing prior to project initiation.

2.2.3 Community and Biodiversity Additionality (G2.2)

In the without-project scenario, the proposed project areas would be subject to continued degradation due to illegal logging and the expansion of agricultural activities, also increasing the incidence of forest fires. The local communities are highly dependent on such activities for their subsistence as well as income. As the areas are not receiving any (financial) government support, in the absence of the project, land use would thus focus on optimizing economic returns from productive activities. Through the project, the landowners together with REDDA, are assuming responsibility for the protection and maintenance of the project areas, including the associated economic costs. It is through the development of technical and administrative capacity for the control and inspection of the area, where local people have an important role as forest watchers, that trees will be protected, including from both natural and anthropogenic fires. As for the socio-educational program, training and workshops will be given to strengthen the local communities in topics such as monitoring and reporting on fauna and flora, water-harvesting system as well as capacities for implementing alternative income generation streams such as e.g., bio-jewelry making courses. All these actions support the permanence of the forest, protect biodiversity, and maintain the ecosystem services in Marajó, while also generating jobs and economic alternatives to improve the quality of life in the area. Moreover, the project allows aims to contribute to governance structures in the area, reducing conflicts and overlaps of land use.

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

The project does not intend to generate distinct community and biodiversity benefits intended to be used as offsets.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

Any and all documents related to the Marajó REDD+ Project will be made available in pdf format to the communities via email as well as in hard copy, whenever requested. Since the large majority of the riverside community members do not master the English language, all project documentation will be translated into Portuguese. In addition to making documentation available, annual meetings

are held to present the annual work plan, address any issues that have arisen and review monitoring actions, which have a direct impact on the planning of activities for the Marajó REDD+ Project.

2.3.2 Dissemination of Summary Project Documents (G3.1)

REDDA follows the guidelines within the scope of the International Labor Organization (ILO), which promulgated Convention 169, and in reference to which the Brazilian government edited a single decree in 2019 that consolidated all ILO conventions (Federal Decree no.: 10,088/2019). Therefore, any activity before being implemented will be presented to the community and from then on, it will be carried out in the territory.

2.3.3 Informational Meetings with Stakeholders (G3.1)

REDDA seeks support from community leaders within the process of disseminating information, which is divided into four stages: Initial articulation, community mobilization and community awareness. The first stage is based on strategic meetings at the level of municipal, state and federal organizations and local leaders, together with the documentary survey of the territory to find out if it has a statute, plan for the use of the territory, consultation protocol and others. Next, it is divided into two stages: 1) mobilization and sensitization with institutions and leaders and 2) mobilization and sensitization with families/community. It is a process of identifying focal points at different times to ensure the participation of institutions and local leaders with a diversified approach considering the particularity of the territory, always aiming to bring information to as many people as possible. After the approval of the community leaders, the team enters the territory to present the project, which will be developed after adjustments and confirmation of the dates, which are made official after the letter is sent to the associations with a general framework and the specific dates of the meeting in each association, and thus, mobilization and awareness in each territory begins. Note: It can take place over several stages, depending on the characteristics of the territory. In the third instance, the company's commitment is signed with the community to follow the recommendations established by Convention 169 ILO - Consolidated in Federal Decree nº 10.088/2019. This decision-making process was adhered to for the territories that were considered for the Marajó REDD+ Project.

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

Information on potential costs, risks and benefits to communities has been shared by REDDA directly with the respective association (legal representative of the territory) for further dissemination in the communities. For future communication – if so wished for by the respective association – wi-fi and information boards are installed at the associations' headquarters to strengthen the channels of communication. It is worth noting that any decision made by REDDA requires the approval of the respective association.

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

REDDA will engage with the associations in order to inform the communities of the validation and verification process. The measures taken and communication methods to be used are still in the process of being defined.

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

The auditor's site visit will be communicated to the stakeholders normally at least one week before the visit. This is to enable stakeholders to plan ahead and be available during this visit. The community interviews are done via direct and independent communication between the community members or other stakeholders and the auditor depending upon the local situation.

2.3.7 Stakeholder Consultations (G3.4)

The auditor's site visit will be communicated to the stakeholders normally at least one week before the visit. This is to enable stakeholders to plan ahead and be available during this visit. The community interviews are done via direct and independent communication between the community members or other stakeholders and the auditor depending upon the local situation.

2.3.8 Continued Consultation and Adaptive Management (G3.4)

The project has ongoing communication channels between the project proponent and the stakeholders and communities. The communication mechanism was defined according to the capabilities of the interested parties and tools that are easily accessible to them. The first channel is direct contact with the project team, both in the field and in the main office in Belem. The other two channels are via telephone calls and emails. Depending on the type of concern raised by the communities and / or other stakeholders, it will be addressed and incorporated via an adaptive management process in the development of the project activities and project operation. The project will establish the tele-centers with internet facilities to facilitate continues consultation leading to effective management.

2.3.9 Stakeholder Consultation Channels (G3.5)

Stakeholder consultations have been undertaken under the guidance of the associations, who are the legitimate representatives of the communities. Various meetings were held to raise awareness on the project as well as plenary meetings to attain consensus on important decisions. Information was shared with the heads of associations for further dissemination.

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

The stakeholders and communities, as well as community groups, were directly invited to participate in the consultation process. Several consultation meetings were conducted in the respective project areas to make sure all the stakeholders had the chance to attend the meetings. In order to enable the effective participation of the communities in these consultation events, explanatory meetings are held employing various methods such as dynamic participation approaches. These are undertaken in a culture- and gender-sensitive manner to assure that they are inclusive, and no view is left unconsidered.

Presentation of the project to the families

Community participation: Problem tree

Results: Problems and Opportunities

2.3.11 Anti-Discrimination Assurance (G3.7)

REDDA is an institution that adheres to principles of legality, impersonality, and morality, which enshrines the principles of anti-discrimination. It has a “Code of Ethics” that guarantees all measures of equality and without any form of discrimination based on gender, race, color, religion, sexual orientation, and other habits and which is strictly implemented. It is applicable to all employees and subcontracted workers and awareness is raised through regular campaigns. Implementation reports are used to ensure transparency and to avoid any form of discrimination. Communication channels were also presented during the stakeholder meetings and should be used for any grievances from any stakeholder to assure that the project is not involved, or complicit to, any form of discrimination or sexual harassment.

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

REDDA strives to minimize the possibility of conflicts and grievances by maintaining close linkages between and working proactively with communities and stakeholders throughout the project areas. Additionally, the Marajó REDD+ Project has an open-door policy, encouraging community members, stakeholders, and employees to contact the project team anytime to discuss any issues or feedback directly with project staff. REDDA maintains a so-called “Ethics Channel”, where any

stakeholder affected by the project can send their complaint via email or cellphone (WhatsApp) and it will be treated confidentially. All conflicts and grievances received, if any, will be attended to within a maximum two-week timeframe by discussing with the relevant parties/people. All efforts are made to resolve the conflict/grievances peacefully without legal action. In case of extreme circumstances, the community can also contact nationally available conflict resolution mechanisms.

Besides this more formal channel, there is also a protocol in place for communication with project partners via a dedicated email address. Hereby official documents are disseminated and demands received. Any demand received is to be resolved within 7 working days of initial contact made.

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

The feedback and grievance redress procedure has been made public and accessible to the associations during the stakeholder meetings. Also, during the meetings with the communities, the project team made themselves available at any time in case the community members had any feedback, grievances or complaints. In the future it is also foreseen that direct access is facilitated via the REDDA website. A general report (without disclosing details) is issued detailing the number of cases received.

2.3.14 Worker Training (G3.9)

All personnel involved in the Marajo REDD+ Project receive orientation and training to help build local skills and knowledge. In fact, one of the project's foci is on capacity building, specifically awareness-raising and skills enhancement, in order to increase and sustain local participation in project implementation.

2.3.15 Community Employment Opportunities (G3.10)

Procedures to assure that members of the communities are given an equal opportunity to fill all work positions (including management) if the job requirements are met are currently being developed. Such procedures will detail how workers are selected for positions and, where relevant, will describe the measures needed and designed to ensure community members, including women and vulnerable and/or marginalized people, are given a fair chance to fill positions for which they can be trained.

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

The Brazilian consolidation of labor laws, known in Brazil as "Consolidação das Leis do Trabalho" [CLT], is the major legislation regulating labor activities in the country. This law seeks to guarantee a series of safeguards and regulations in the relationship between employers and employees. Since its inception, the CLT has undergone a series of modifications and improvements. The following are the main Brazilian labor laws and regulations: Decree-Law No. 5,452 of May 1,1943: approves the CLT and Law No. 6,514 of December 22, 1977: amendments to Chapter V of Title II of CLT, on occupational safety, health and other measures. REDDA complies with all laws and regulations that cover workers' rights and there are no claims upheld against them.

Relevant laws and regulations at the federal state levels:

Regulatory framework of labor laws in Brazil	**Description**
Federal Decree-Law No. 5,452 of May 1, 1943, approves the CLT.	Labor legislation is the set of rules that govern individual and collective labor relations and these rules are established by the CLT, by the Federal Constitution and other laws of the Labor Court.

Federal Law No. 13,467, of November 11, 2017	It is in the labor legislation that the rights and duties of employees and employers are established, such as, for example, working hours, remuneration, vacations, prior notice, licenses, termination of employment contracts, work safety standards and other fundamental rules for work relationships. The objective was to simplify processes, bring more legal certainty and make labor laws more current to the work models of the 26th century. This Law made working hours more flexible, allowing it to be 12 hours a day with 36 hours of rest, respecting the establishment of 44 weekly hours and 220 monthly hours. Defined new rest rules where the break can be negotiated, as long as it has at least 30 minutes. The time "saved" in the break will be discounted, allowing the employee to leave work earlier. The holiday regime has also been changed.
Federal Decree no. 6,514 of December 22, 1977	Provides for infractions and administrative sanctions to the environment, establishes the federal administrative process for the investigation of these infractions, and makes other provisions. Amendments to Chapter V of Title II of CLT, on occupational safety, medicine, and other measures.
Provisional Measure no. 1,108, of March 25, 2022. Provides for the payment of food allowance referred to in Paragraph 2 of art. 457 of the Consolidation of Labor Laws, approved by Federal Decree-Law No. 5,452, of May 1, 1943, and amends Federal Law No. 6,321, of April 14, 1976, and the Consolidation of Labor Laws, approved by Decree -Federal Law No. 5,452, of 1943.	In Brazil there is the institute of Provisional Measures (MPVs) are norms with force of law edited by the President of the Republic in situations of relevance and urgency. Despite producing immediate legal effects, the MPV needs further consideration by the Houses of the National Congress (Chamber and Senate) to definitively become ordinary law. The initial term of validity of an MPV is 60 days and is automatically extended for an equal period if the vote is not completed in both Houses of the National Congress. If it is not appreciated within 45 days, counted from its publication, it enters into an emergency regime, suspending all other legislative deliberations of the House in which it is being processed. Art. 62 of the Federal Constitution sets out the general rules for editing and evaluating MPVs, including defining the subjects and themes on which they cannot comment. On the other hand, the internal discipline of the procedure given by the Resolution of the National Congress No. 1 of 2002 requires, for example, on amendments, the formation of the mixed commission and processing deadlines.
Amendment to article 75-B of the CLT.	Article 75-B. was changed, which now considers telework or remote work to be the provision of services outside the employer's premises, predominantly or not, with the use of information and communication technologies, which, by their nature, do not constitute work external.

2.3.17 Occupational Safety Assessment (G3.12)

REDDA has a dedicated health and safety team formed by an HSE engineer, HSE technical staff and a fireman with the objective of identifying occupational hazards and managing risk within the work environment for each activity, establishing relevant control measures and ensuring their implementation through the Brazilian Regulative Norms (Normas Regulamentadors, NR in Portuguese) as stated by the Brazilian Labor Ministry. With regards to the project, the key NRs are the following:

The following are the main NR regulations for the project:

- NR 4- Specialized Services in Occupational Safety and Health. (Last update: MTPS Ordinance no. 510 of April 29th, 2016)
- NR 5 - Internal Commission On Accident Prevention. (Last update: SIT Ordinance no. 247 of July 12th, 2011)
- NR6: Personal Protective Equipment – PPE
- NR23: Fire Protection
- NR31: Safety and Health at Work in Agriculture, livestock forestry, forestry and aquaculture

On this basis, a Risk Management Program (RMP) was developed, with monthly monitoring of the measures recommended by an Action Plan and its execution. Preventive measures to reduce or control existing risks are adopted. Moreover, in accordance with NR-9, the Environmental Risk Prevention Program (PPRA) was carried out, which aims to assess the exposure of workers to environmental risks existing in their jobs, including the identification, recording and assessment of physical, chemical and biological risks in the execution of one's activities, as well as the description of the control measures to be adopted, including a description of applicable PPE (personal protection equipment) and EPC (collective protection equipment). Project staff has been equipped with such safety gear as well as first aid kits and emergency contact lists. The elaboration and implementation of the Medical Control and Occupational Health Program (PCMSO in Portuguese) foreseen in NR-7, has the objective of preserving the health of all collaborators exposed to the aforementioned identified risks. REDDA has also prepared the Environmental and Occupational Conditions Technical Report (LTCAT in Portuguese), which is a document setting the legal exigences as per law 8.213/91 and pertinent modifications through the INSS normative instructions to verify the environmental conditions to which every collaborator is exposed. The LTCAT has also the objective of leading to the completion of the Providential Professional Profile (PPP), stipulated in the Brazilian law.

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

The Marajo REDD+ Project embodies a governance structure based on three pillars. The first is an Executive Committee that involves all the partners – REDDA as well as each of the associations involved. This body meets on a regular basis to discuss the work plan as well as any related decisions with regards to financials, personnel, logistics and social-environmental issues. It makes decisions about project activities and funds. The second is the technical committee, a body of REDDA, which is in charge of coordinating the activities, implementing the activities as well as grievance monitoring and resolution with the local community. The third pillar is a non-executive committee that provides logistical support. An accounting firm has also been put at the disposition of the associations to help the communities with the necessary preparation of statements and audits.

2.4.2 Required Technical Skills (G4.2)

The key technical skills required to implement the Marajó REDD+ Project is an understanding of the science of climate change, LULCF, VCS, CCB, REDD+, biomass sampling, and conservation biology, experience implementing community and livelihood development programs, effective forest protection enforcement through monitoring and overall project management. The team that constitutes REDDA has extensive experience in managing such activities over several years.

2.4.3 Management Team Experience (G4.2)

The REDDA team has a range of expertise in order to attend to the complexity of executing VCS + CCB standards projects:

- Human resources sector with HR and people, culture and communication experts;
- Financial sector with accountants and administrators;
- Socio-environmental sector with forestry engineers, agronomist, social assistants, and remote sensing experts;
- Project team sector with forestry engineer, geographer, and administrator of processes and organizational mapping;
- Supply chain sector with logistic and occupational safety expertise;
- Technology sector with information technology expert and data automation;
- IRAMA (Amazon Riparian Institute) team with education and social projects specialists.

The team includes Ph.D. and Master's degree workers in social and environmental fields. Besides, REDDA has workers with years of experience in the Amazon region and an understanding of public issues, a critical factor in decision-making processes regarding local policies. Detailed information can be provided directly to the VVB.

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

REDDA in close cooperation with the other project partners and the project proponent carries out all the project and monitoring activities. REDDA has engaged experts having relevant experience and as such does not plan any additional recruitments at the moment. However, future recruitment planning will be considered as part of the annual work plans. In addition, specific project activities and technical documentation will enlist the support of (external) experts in order to review and provide feedback as necessary.

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

REDDA is in a financially healthy position to carry out the proposed project.

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

REDDA has a 'Code of Conduct' in place to assure that there is no involvement with corruption or other unethical behavior.

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

No commercially sensitive information has been excluded from the public version of the project description.

2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

The rural land rights are governed by the Constitution, the Land Statute, and the Civil Code of 2002 (Law No. 10.406), dealing with family rights, inheritance, possession, and property rights. In Brazil, land can be acquired through purchase, transfer of ownership (e.g., through inheritance), and through government allocations. The right to acquire land through long occupation has existed in rural Brazil since 1916. Adverse possession in the current law allows legal transfer of land to the occupant gained after uninterrupted and undisputed occupation for a specified number of years (Constitution1988, Art. 191; Civil Code 1916, Art. 1240). Each territory participating in the Marajó REDD+ Project has a contract with the government granting use of their lands as PAEX, PAE or TEQ, as detailed in Table 8. In addition, the main project proponent has entered an agreement with each of the four associations, owners of the land on the basis of the legal title bestowed upon them, for 40 years for the purposed of the Marajó REDD+ Project.

2.5.2 Recognition of Property Rights (G5.1)

The project proponent recognizes and respects all property rights for each area. Properties involved in the project either have property titles or equivalent documents to certify and assure rights over the land. Additionally, the project area has all documentation included in the agreements that have been entered with each of the four associations.

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

Considering the information presented in Sections 2.5.1 and 2.5.2, the project will not affect third-party property rights, community property, or government property. Interested parties have been consulted and duly informed about the impact of the project regarding their rights. Moreover, the project proponent has been authorized through consultative meetings (see Sections 2.3.3 and 2.3.7) to engage in the project.

2.5.4 Property Rights Protection (G5.3)

The implementation and development of the project shall not lead to the involuntary removal or relocation of any stakeholder. The agreements freely signed by all the partners in the project area are the result of previous familiarization workshops and the commitment of both parties to identify and define the activities that will be developed in each one of the territories. This ensures that the communities have not been forced to relocate activities important to their culture and livelihood.

2.5.5 Illegal Activity Identification (G5.4)

In the baseline scenario, illegal logging and speculation on land tenure creates problems that the project aims to address. To reduce these activities, the project will implement programs for environmental monitoring and environmental control and inspection, generating first a diagnosis of the current state of the ecosystems, and building technical, administrative, and institutional capacities to promote the strengthening of the community forest-tenure rights. Moreover, socio-educational actions, including environmental education and awareness, will be carried out with the community to reduce any impact on the forests.

2.5.6 Ongoing Disputes (G5.5)

In the project area, there are no conflicts, current or unresolved disputes over land rights, use of real estate or access to natural resources, nor disputes with traditional third parties or illegal settlers that can revoke the right to property by REDDA, as detailed above.

2.5.7 National and Local Laws (G5.6)

Brazil is one of the most advanced countries in the world in REDD+ planning. In the Brazilian Amazon, conversion to pasture and cropland, road building, fires, and timber and mineral extraction have historically been the main causes of forest loss and degradation, resulting in various environmental and social problems that significantly affect the loss of biodiversity, greenhouse gas emissions, and the decline of traditional cultures, which generate concern and awareness about the need for conservation of natural resources and the creation of public policies to reverse four decades of environmental problems. In this way, the national government created The Amazon Fund in 2008 with Decree Nº 6.527, responsible for raising funds, contracting and monitoring the financed projects that determine the guidelines for projects that enable the reduction of emissions from illegal deforestation in the Amazon forest. In 2009, the National Policy on Climate Change was instituted by Law nº 12.187, seeking to ensure that economic and social development contribute to the protection of the global climate system.

Below, relevant laws and regulations at the federal and state levels are listed and detailed.

Table 7. List of laws, decrees, normative instructions and resolutions in the Brazilian Amazon, ordered in increasing year

Regulation instrument	Description	Government Level
Law no. 6,938, of 31/08/1981.	Its Art. 2 aims to preserve, improve and recover the environmental quality in Brazil. CONAMA and SISNAMA - National System of the Environment (Sistema Nacional do Meio Ambiente) were created from this law.	Federal
Law no. 7,347, of 24/07/1985.	Created instruments to enable the recovery of degraded areas based on a bidding system through a specific fund.	Federal
Resolution no. 001, of 23/01/1986.	CONAMA Resolution, which establishes criteria and guidelines for the Environmental Impact Study (Estudo de Impacto Ambiental - EIA) and Environmental Impact Report (Relatório de Impacto Ambiental - RIMA).	Federal
Brazilian Constitution of 1988.	Its Art. 225: Everyone has the right to an ecologically balanced environment. Par. 1 - It is incumbent upon the Government to: I - preserve and restore essential ecological processes and provide for the ecological management of species and ecosystems; Par. 2 - Anyone who exploits mineral resources is obligated to recover the degraded environment.	Federal
Decree no. 97,632, of 10/04/1989.	Regulated the law no. 6,938/81, forcing the recovery of a degraded area as part of the Environmental Impact Report. It instituted the Plan for the Recovery of Degraded Areas (Plano de Recuperação de Áreas Degradadas - PRAD).	Federal
Law no. 8,171, of 17/01/1991	Chapter VI - Protection of the Environment and Conservation of Natural Resources. The Government shall: (iv) promote and/or stimulate the recovery of areas in the process of desertification	Federal

Regulation instrument	Description	Government Level
Law no. 9,605, of 12/02/1998.	Provides criminal and administrative sanctions derived from harmful activities to the environment. Via art. 23, II, obliges the offender to restore the degraded environment.	Federal
Decree no. 3,420, of 20/04/2000.	Provides the creation of the National Forest Program (NFP). In its art. 2: [...] II - Foster reforestation activities, especially in small rural properties; III - Recover forests of permanent preservation, legal reserves and altered areas.	Federal
Law no. 9,985, of 18/07/2000.	In its Art. 2, it distinguishes for its purposes a "recovered" ecosystem versus a "restored" ecosystem, as follows: [...] XIII - Recovery: restitution of a degraded ecosystem or wild population to a non-degraded condition, which may be different from its original condition; XIV - Restoration: restitution of a degraded ecosystem or wild population as close as possible to its original condition.	Federal
Resolution no. 302, of 20/03/2002.	Art. 2: III - Environmental Conservation Plan and Use of the Artificial Reservoir Environment: set of guidelines and propositions with the objective of disciplining conservation, recovery, use and occupation of the surroundings of artificial reservoirs.	Federal
Resolution no. 310, of 5/07/2002.	Art. 10: Sustainable Forest Management Plan, will only be approved: I - the proper registration, maintenance and recovery of the Legal Reserve; II - maintenance and recovery of Permanent Preservation Areas and other protected areas.	Federal
Decree no. 4,339, of 22/08/2002.	Establishes principles and guidelines for implementing the National Biodiversity Policy, with incentive mechanisms for the recovery and protection of PPA (APP) and legal reserves provided by Law.	Federal
Law no. 11,284, of 2/03/2006.	Provides for the management of public forests for sustainable production; and in its art. 31, it is incumbent upon the entrepreneur: IV - to recover the degraded areas, when their actions or omissions are identified.	Federal
Resolution no. 369, of 28/03/2006.	CONAMA Resolution, in its art. Paragraph 2 considers the legal duty of the owner or proprietor to recover irregularly suppressed or occupied PPAs (APPs). In Paragraph 8, those entitled with the activities of research and extraction of mineral substances in a PPA are also obliged to recover the degraded environment.	Federal
Resolution no. 387, of 27/12/2006.	CONAMA, provides for environmental recovery actions, through elaboration of the Settlement Recovery Plan, with recovery of legal reserve areas and permanent preservation.	Federal
Decree no. 6,514, of 22/07/2008.	Provides for infractions and administrative sanctions to the environment. In art. 2, any action or omission that violates the legal rules of use,	Federal

Regulation instrument	Description	Government Level
	enjoyment, promotion, protection and recovery of the environment is considered an environmental administrative infraction; and in art. 108, provides the embargo of work or irregular activity.	
Decree no. 6,686, of 10/12/2008.	In its Art. 17, the embargo of irregularly exploited areas and the objective of the Sustainable Forest Management Plan, does not exempt its holder of the execution of maintenance activities or forest recovery.	Federal
Law no. 12.187, of 2008.	The National Plan on Climate Change, created in 2008 National Policy on Climate Change (Law n. 12.187), approved in 2009 and regulated by Decree n. 7.390/2010 Forest Code, Law n. 4.771/1965.	Federal
IN ICMBio no. 06 of 01/122009.	In its Art. 3, according to this Normative Instruction (IN), a precautionary administrative measure capable of preventing the occurrence of new illicit acts may be applied. In art. 39, the embargo of work or activity and their respective areas. Art. 80, to verify the existence of damages to be repaired, forcing the violator to present the recovery project. Art. 88, charging of a fine by ICMBio. Article 112, provides requests for conversion of fines in preservation services.	Federal
Resolution no. 429, of 28/02/2011.	Provides for the methodology of recovering Permanent Preservation Areas - PPAs (APPs).	Federal
IN IBAMA no. 4, of 13/04/2011.	Establishes procedures for the elaboration of a Degraded Area Recovery Project (Projeto de Recuperação de Área Degradada – PRAD).	Federal
Law no. 12,651, of 25/05/2012.	Provides for the protection of native vegetation and replaces the Forest Code, outlined by several articles (1-A, 7, 17, 41, 44, 46, 51, 54, 58, 61-A, 64, 65 and 66) with organized actions between the public sector and civil society.	Federal
IN ICMBio no. 11, of 11/12/2014.	Establishes procedures for the elaboration, analysis, approval and follow-up of the implementation of a Degraded Area Recovery Project, for the purpose of complying with environmental legislation.	Federal
Decree no. 9,179, of 23/10/2017.	In its art. 140, considers the services of preservation, improvement and reestablishment of the environment, and recovery actions: a) degraded areas for biodiversity conservation; (b) essential ecological processes; c) native vegetation for protection; and d) recharge water supply areas.	Federal
IN ICMBio no. 2, of 02/19/2018.	Provides the procedures related to the conversion of simple fines into services of preservation, improvement and recovery of the environment quality within the Chico Mendes Institute.	Federal
Decree 11.075, of May 19, 2022	Establishes the procedures for the elaboration of Sectoral Plans for the Mitigation of Climate	Federal

Regulation instrument	Description	Government Level
	Change, which institutes the National System for the Reduction of Greenhouse Gas Emissions. N.B. As this is a Decret, it is a tool to the existent legislation and hence many specialists do not consider it as a significative change to the status quo for now. PL n° 412 de 2022 - regulates the Brazilian Emissions Reduction Market (not yet approved, and it is under a lot of controversies related to the content, mainly because of the differentiation between voluntary or regulatory/compulsory markets.	
Decreto no 10.144, de 28 de November 2019	Establishes the National Commission for the Reduction of Greenhouse Gas Emissions from Deforestation and Forest Degradation, Conservation of Forest Carbon Stocks, Sustainable Management of Forests and Increase of Forest Carbon Stocks - REDD+.	Federal
Constitution of the State of Pará	Contains determinations on the recovery of degraded areas in the chapters: III - Agricultural, Agrarian and Land Property Policy, IV - Science and Technology and VI - Environment. Promulgated on October 5, 1989 and updated until the edition of Constitutional Amendment No. 51 of December 14, 2011.	State (Pará)

2.5.8 Approvals (G5.7)

REDDA has achieved recognition and approval of project implementation through meetings between employees, communities around the project consultation, as well as consultation with other stakeholders. The project proponent is present in federal and state government discussion forums to contribute to the formulation of policies and regulations, being promptly available to adapt the project to any new officially established law, decrees or rules.

2.5.9 Project Ownership (G5.8)

The project contains 4 territories in the same region, each represented by a legally recognized association. The table below specifies legally each territory and the legal reference that created it, along with the right-of-use contract each territory has with the state of Pará. Moreover, REDDA owns legal and recognized documents that can prove meetings occurred before contract signature as well as that a dialogue with government entities was carried out to during contract formulation.

Table 8. PEAEX-PAE-TEQ associations and territories

Territory	Association name	Legal representative	Legal instrument	Contract Date with REDDA
PEAEX Alto Camarapi	Associação dos Trabalhadores Agroextrativistas do Alto	Francisco Rodrigues de Melo	Decreto Estadual N° 257 (9/08/2019)	23.10.2021

Territory	Association name	Legal representative	Legal instrument	Contract Date with REDDA
– Portel/PA	Camarapi (ATAGROCAMP)			
TEQ São Tomé Taucú - Acutipereira – Portel/PA	Associação dos Remanescentes de Quilombos da Comunidade São Tomé do Tauçu (ARQCSTT)	Adilson do Nascimento Andrade	Título de reconhecimento de domínio coletivo - ITERPA (12/03/2018)	23.10.2021
PEAEX Acangatá – Portel/PA	Associação dos Moradores Agroextrativistas do Assentamento PEAEX Acangatá (ASMOGAC)	Maria Santana Ferreira Gonçalves	Decreto Estadual N° 1.893, (10/11/2017)	23.10.2021
PAE Ilha Grande – Portel/PA	Associacao Dos Trabalhadores Agroexrativista Da Ilha Grande Do Pacajai - Assentamento Pai Do Governo Federal (ATAIG-PA)	Francisco Rodrigues Calixto Neto	Matrícula INCRA CD 0313000	23.10.2021

2.5.10 Management of Double Counting Risk (G5.9)

The project has not received any environmental or social credit, including certificates related to GHG emissions reductions or renewable energy. The reduction or removal of emissions resulting from the implementation of these project activities will not be used to meet the emission reduction targets of any other REDD+ program or mechanism. For information on strategies to eliminate double-counting in the project crediting period, see Section 2.5.15.

2.5.11 Emissions Trading Programs and Other Binding Limits

Not applicable. The emissions reductions achieved as a result of this project will not be used for compliance under any other trading program or mechanism. The current VCS and CCB project is entirely independent of any other carbon project or payment of ecosystem service scheme being developed in the state of Pará, Brazil.

2.5.12 Other Forms of Environmental Credit

The project has not sought nor received any other form of GHG-related environmental credit.

2.5.13 Participation under Other GHG Programs

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

2.5.14 Projects Rejected by Other GHG Programs

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

2.5.15 Double Counting (G5.9)

The project does not attempt to generate nor has it received any other form of environmental or social credit, including any tradable climate, community, or biodiversity unit. To avoid possible double-counting of mitigation results at the national level, particularly for credits sold as offsets in the voluntary market and those generated for commercialization, the project proponent will take the necessary actions to register and share information of the initiative to the National Commission for Reducing Emissions of Greenhouse Gases from Deforestation and Forest Degradation (CONAREDD).

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

The project is developed using the guidelines/standards published by the 1) Verified Carbon Standard, 2) Climate Community and Biodiversity Standards and the 3) HCV network:

1). Verified Carbon Standard (VCS):
1.1 –VCS Program Guide v4.3
1.2 – VCS Standard v4.4
1.3 – VCS Methodology Requirement v4.3
1.4 – AFOLU Non-Permanence Risk Tool v4.0
1.5 –VM0037 Methodology for Implementation of REDD+ Activities in Landscapes Affected by Mosaic Deforestation and Degradation, v1.0
1.6 - VT0001 - Tool for the Demonstration and Assessment of Additionality in VCS AFOLU Project Activities.
1.7 - VT0006 Tool for Calculating LULC Transitions and Deforestation Rates Using Incomplete Remote Sensing Images
1.8 AR-TOOL-14 V4.2, Methodological tool for Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities.

2). Climate, Community, and Biodiversity:
2.1 – Climate, Community and Biodiversity Standard v3.1
2.2 – Climate, Community and Biodiversity Program Rules v3.1

3) HCV – High Conservation Value network
3.1 High Conservation Value (HCV) Screening[26]
3.2 Common guidance for the identification of High Conservation Values[27]
3.3. HCV Assessment Manual 20121 ALS_02_D[28]

3.1.2 Applicability of Methodology

The following describes the compliance with the applicability conditions for the use of VCS VM0037.

[26] https://www.hcvnetwork.org/library/hcv-screening-guide
[27] https://www.hcvnetwork.org/library/common-guidance-for-the-identification-of-hcv-english-indonesian-french-portuguese
[28] https://www.hcvnetwork.org/library/hcv-assessment-manual-2021

Table 9. Criteria for the applicability of the Marajó REDD+ Project to VCS VM0037 methodology

Applicability criteria	Description of how the project meets the criteria
• The methodology has no geographical restrictions.	The methodology, though developed in India, has no geographical restrictions, so it can be applied globally, including in Brazil.
• The project activities include AUDD* or a combination of AUDD and ARR.	The Marajó REDD+ Project targets activities that include a combination of AUDD and ARR. This criterion is thus met.
• The project area must meet the definition of forest land for at least 10 years prior to the start date of any REDD activities.	As per analysis of landcover imagery over the last 12 years, the project areas have been forested for decades and possibly many centuries. They comply with the definition of Forest by the Brazilian designated agency, also used by PRODES – INPE (National Institute of Space research). This criterion is thus met.
• The project area must not be forest land for at least 10 years prior to the start date of any ARR activities and must not convert native ecosystems.	ARR activities will only be carried out in lands that have been deforested for at least 10 years prior to the project start data. This criterion is thus met.
• Biofuel crop production is allowed in ARR activities.	Though allowed, this is currently not envisioned. This criterion is thus met.
• The project activities cannot include APDD.	The Marajó REDD+ Project targets activities that include a combination of AUDD and ARR. APDD is not targeted. This criterion is thus met.
• The project activities cannot only include ARR.	The Marajó REDD+ Project targets activities that include a combination of AUDD and ARR and not only ARR is targeted. This criterion is thus met.
• ARR activities cannot displace more than 50% of agricultural lands from the project area.	Very limited ARR activities are planned (max. 1000 ha), displacement of agricultural lands is hence below 50%. This criterion is thus met.
• The project activities cannot take place on wetlands and peatlands.	The project area does not encompass wetlands and peatlands. This criterion is thus met.
• The project activities cannot include ACoGS.	The Marajó REDD+ Project does not target avoiding the conversion of grasslands and shrublands. This criterion is thus met.

*Also referred to as REDD in the methodology.

3.1.3 Project Boundary

The project is in the state of Pará, in Brazil. The project boundary including reference region RR, project area PA and Leakage Management Zone (LMZ) encompasses 530,348 ha.

Figure 8. Inclusion or exclusion of GHG

Source		Gas	Included?	Justification/Explanation
Baseline	Baseline Deforestation and Forest Degradation	CO_2	Yes	Emissions are related to changes in carbon pools.
		CH_4	Yes	As cookstove and fuel efficiency activities (CFE) are involved.

Source		Gas	Included?	Justification/Explanation
		N_2O	Yes	As cookstove and fuel efficiency activities (CFE) are involved.
	Baseline ARR	CO_2	Yes	Emissions are related to changes in carbon pools.
		CH_4	No	Emissions are expected to be negligible and are therefore excluded.
		N_2O	No	Emissions are expected to be negligible and are therefore excluded.
Project	Biomass burning from unplanned large and small scale fires	CO_2	No	Emissions are excluded as they are part of the changes in carbon pools.
		CH_4	Yes	CH4 emissions of burning woody biomass from unplanned fires are included.
		N_2O	Yes	N2O emissions of burning woody biomass from unplanned fires are included.
	Fossil fuel used during operations	CO_2	No	Emissions from fossil fuel combustion is considered de minimis for REDD and ARR, and is therefore excluded.
		CH_4	No	Insignificant.
		N_2O	No	Insignificant.
	Removal of woody biomass during assisted natural regeneration (ANR and ARR) activities	CO_2	Yes	Emissions related to changes in carbon pools are considered
		CH_4	No	CH4 emissions from removal of woody biomass are significant when fire is used in preparing the land for ANR activities. As there are no ANR activities, these have been excluded.
		N_2O	No	N2O emissions from burning woody biomass during ANR activities are assumed negligible and are therefore conservatively excluded.
	Fertilizer used during enrichment planting for assisting natural regeneration and ARR	CO_2	No	Assumed negligible.
		CH_4	No	Assumed negligible.
		N_2O	No	Assumed negligible.
	Increased fertilizer use	CO_2	No	Not applicable.
		CH_4	No	Not applicable.
		N_2O	No	N2O emissions related to increased fertilizer use are *de minimis*.

The RR (236,579 ha) is the spatial boundary where rates, agents, drivers, and patterns of land use and land-cover are analyzed, forecasted, and monitored. The Marajó PA (138,285 ha) and LMZ (175,370 ha, some area overlapping the RR) are close to the RR and can be seen in Figure 9. There are several REDD projects in the region; neither the RR nor the LMZ overlap with them (Figure 13).

Reference Region

The RR (which overlaps with the LMZ)) covers 236,530 hectares, which is 1.71 times larger than the PA. According to PRODES data from INPE, it presents a historical deforestation rate (between 2009 and 2021) of 1267 ha per year (0.6% per year - in relation to the remaining forest area in 2009). In defining the spatial boundary of the RR, environmental characteristics (river basin boundaries), deforestation drivers, elevation, landscape as well as type and land tenure situation were considered. The boundary of the Reference Region followed the guidelines described on page 10 of the VM0037 methodology. The characteristics of the Reference Region meet the similarity requirements with the Project Area determined by the methodology VM0037, presenting the following characteristics:

1. FOREST TYPES AND LANDSCAPE FACTORS. Forest in the area, as detailed in Figure 4, and Table 11 is terra-firme forest (Lowland Dense Ombrophilous Forest, as detailed by the IBGE - Instituto Brasileiro de Geografia e Estatística). In the Reference Region this is also the dominant land cover. Elevation, as seen on Figure 12, is also similar in both the project area and the reference region averaging 40 m, at most, with prevalence of flat areas.

2. DEFORESTATION AND DEGRADATION AGENTS. Agents of degradation and deforestation are:

    a. **Illegal loggers which perform scattered interventions of selective cutting of trees**. The main ingress of the people performing the deforestation and degradation is performed through the navigable stretches of the rivers Camarapí, Pacajaí and Guajará and their smaller tributaries. These loggers are not community members and usually come and go from the municipality of Portel township itself. No significant roads exist within the Project Area itself, although a road (rodovia Trascametá, BR-422) exist to the east of the RR, but as it borders a lot of (natural) savanna vegetation, and is a somewhat protected area, as it is within a RESEX[29], see below, has not generated significant deforestation in the RR, where most of the observed deforestation as per DETER-DEGRAD is in the shape of mosaic scattered deforestation (Figure 11). These loggers are often armed, and they do not hesitate to shoot the opposition or competition, as they operate in remote areas without witnesses and with little fear of persecution.

    b. **Squatters and settlers who perform and subsistence agriculture by slash-and-burn of the forest**. Forested areas near the Portel and Melgaço townships experience a slow but steady ingress of new settlers, as old homesteads expand with the descendants of the original settlers and the families of their spouses. Furthermore, some of these choose to migrate upstream to open new fields in between settlements if they can claim land not being used by anyone else and if it is far enough from other settlements as to make a de facto claim on the land. They then build their houses and clear enough land without entering in open conflict with established communities.

3. DEFORESTATION AND DEGRADATION DRIVERS. The drivers themselves are not independent of each other but compounded as follows:

    a. **The demand for precious woods,** which grow naturally within the project boundaries. Despite the large scale of forest degradation of the last decades in the State of Pará and the municipality of Portel itself, there remain thousands of cubic meters of valuable timber still standing. Most of

[29]Reserva Extrativista

the timber grown in Brazil in plantations corresponds to eucalyptus for pulpwood, which does not meet the requirements of structural and construction lumber for the domestic market and the ever-growing demand for precious hardwoods from abroad.

b. **The lack of government oversight**. The environmental agencies in Brazil, which were never very strong to begin with have been deliberately weakened over the last few years[30]. This and corruption facilitate the work of illegal loggers which go into territories not of their own and perform selective logging and hauling on the sly, which is much easier as they are unlikely to be stopped or prosecuted.

c. **Demand for new areas for agriculture**. Population growth, slow but steady migration into the area and lack of technical expertise make cleared areas unproductive or insufficient to meet local demand within a few years, therefore requiring the clearing of new forest areas or the reuse of some that were left fallow years ago.

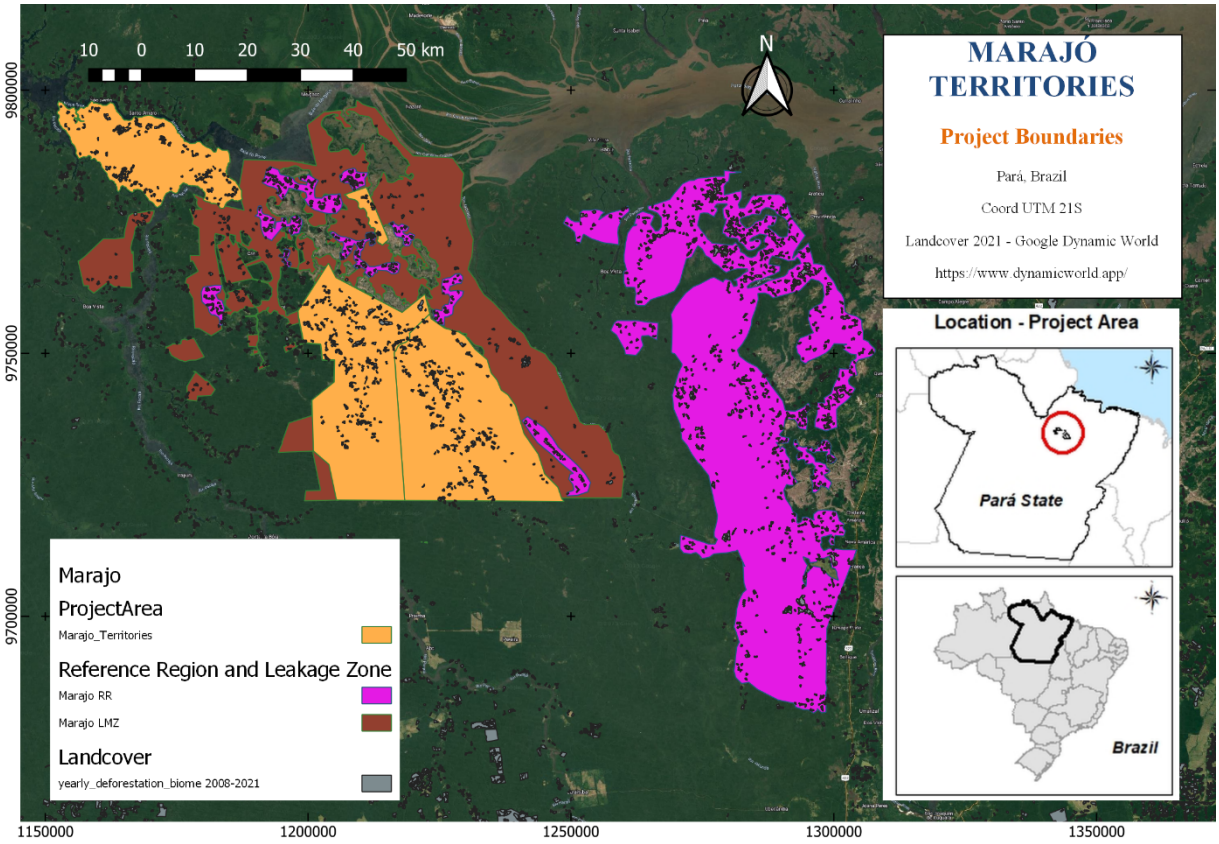
4. LAND TENURE AND MANAGEMENT PRACTICES. Land tenure in the project area is, as detailed in Table 8, of a right-to-use granted by the government of the state of Pará as PEAEX or TEQ. The reference region and the project share the same riverside people culture of forest use. Figure 11 also shows the borders of the RESEX (*Reserva Extrativista*) Arióca Pruanã, a territory created in 2005[31], where an extractive reserve (Portuguese: Reserva Extrativista or RESEX) is a type of sustainable use protected area in Brazil, and where the land is publicly owned, but the people who live there have the right to traditional extractive practices, such as hunting, fishing and harvesting wild plants[32], in an analogous way to the PEAEX and TEQ. The RESEX Arióca Pruanã significantly overlaps with the RR as can be seen in Figure 11.

5. POLICIES AND REGULATIONS. Both the reference region and the project region are in the state of Pará, so they both share the same regulatory framework.

6. POPULATION FACTORS AND TRANSPORTATION INFRASTRUCTURE. Transportation in both the reference and project regions takes place mainly by boat in the riverways of the region and a few minor roads in disrepair. The PA is closer to the township of Portel by distance, while the RR is closer to the Trascametá BR-422 roadway (mostly unpaved), which skirts the RESEX from South to North, never closer than 11 km, and which goes through the town of Cametá, 47 km away. Some minor settlements are along this road. To travel to the interior of the RESEX, the more expedient way is through the riverways.

[30] https://www.reuters.com/article/us-brazil-environment-ibama-exclusive-idUSKCN1VI14I
[31] https://www.gov.br/icmbio/pt-br/assuntos/biodiversidade/unidade-de-conservacao/unidades-de-biomas/amazonia/lista-de-ucs/resex-arioca-pruana
[32] https://en.wikipedia.org/wiki/Extractive_reserve

Figure 9. Reference Region, Project Area, Leakage Management Zone



Source: ClearBlue Markets

Table 10. Vegetation classes in reference region

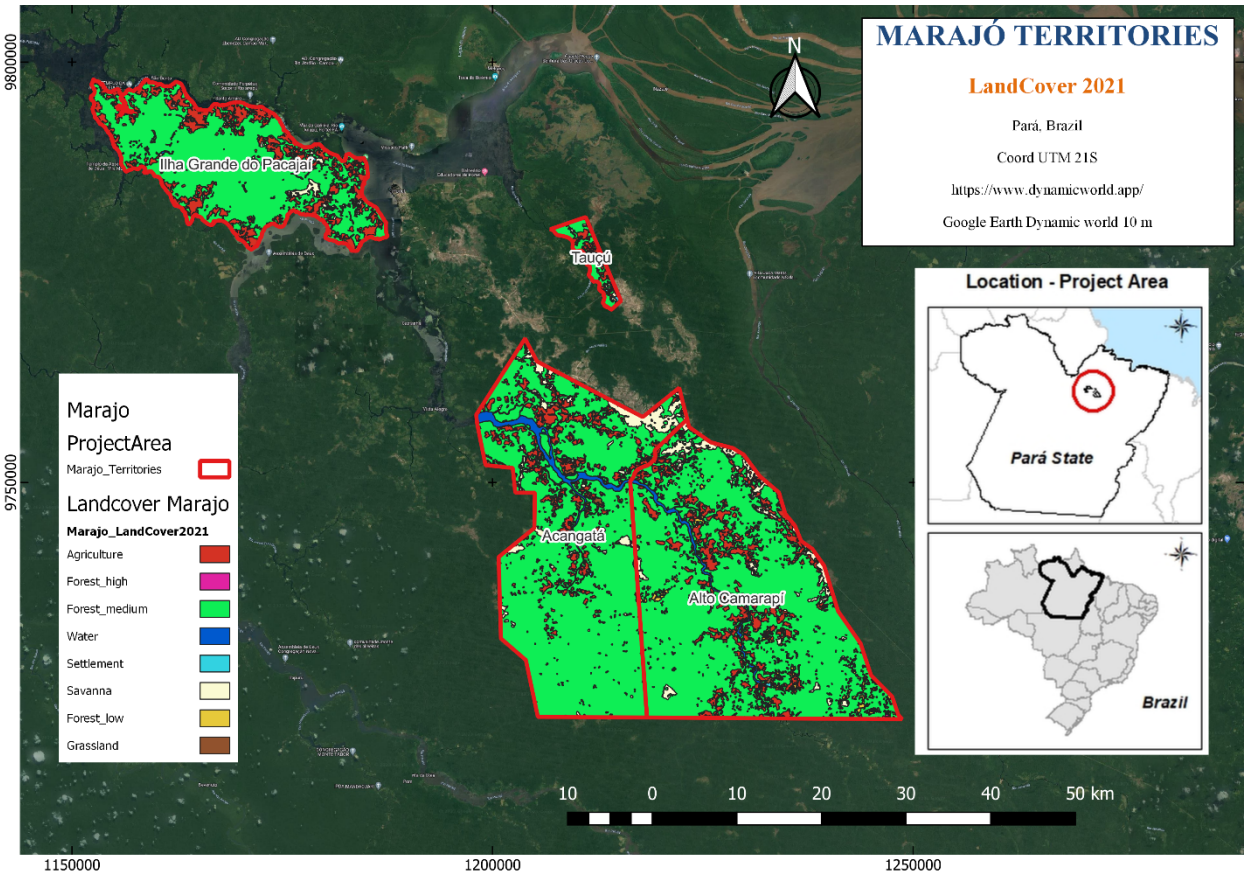
Vegetation Class	Hectares	%Total	%cumulative
Lowland dense ombrophilous (terra-firme) forest	154,582.50	65.35%	65.35%
Water bodies	1,895.21	0.80%	66.16%
Agriculture, old fields and fallows	39,397.04	16.66%	82.81%
Settlements	78.87	0.03%	82.85%
Wooded savanna	40,576.69	17.15%	100.00%
Totals	236,530.32		

Table 11. Vegetation classes in project territories as of 2021

Vegetation Class	Hectares	%Total	%cumulative	Rank
Lowland dense ombrophilous (terra-firme) forest	138,285.00	80.00%	80.00%	1
Agriculture, old fields and fallows	22,170.28	12.83%	92.82%	2

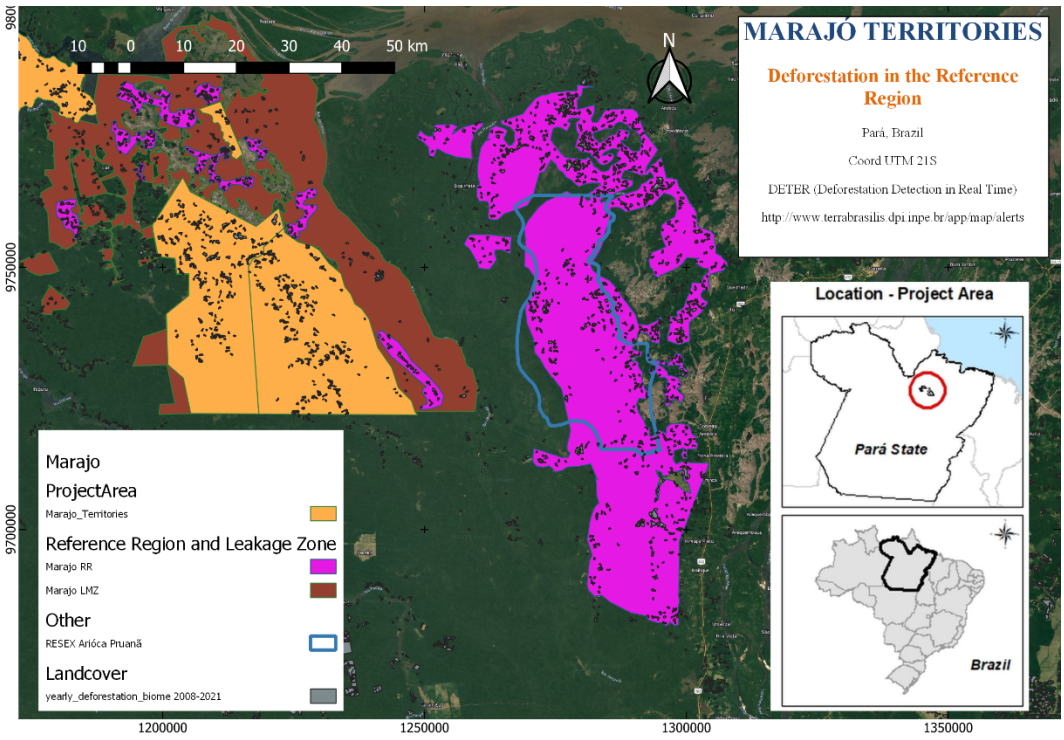
Vegetation Class	Hectares	%Total	%cumulative	Rank
Wooded shrubland	8,753.13	5.06%	97.89%	3
Water bodies	3,476.34	2.01%	99.90%	4
Settlements	173.78	0.10%	100.00%	5
Total	172,859			

Figure 10. 2021 Landcover in the Marajó territories



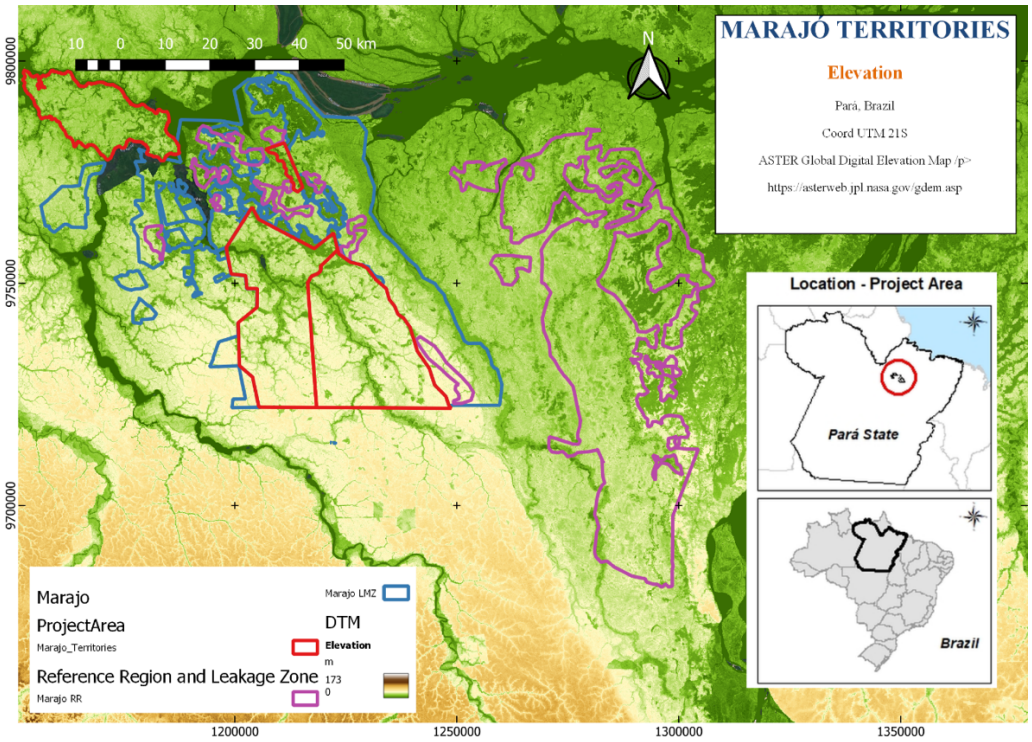
Source: ClearBlue Markets

Figure 11. Deforestation in the Reference Region and location of the RESEX Arióca Pruanã



Source: ClearBlue Markets

Figure 12. Elevation map of the Region of Reference



Source: ClearBlue Markets

Project area

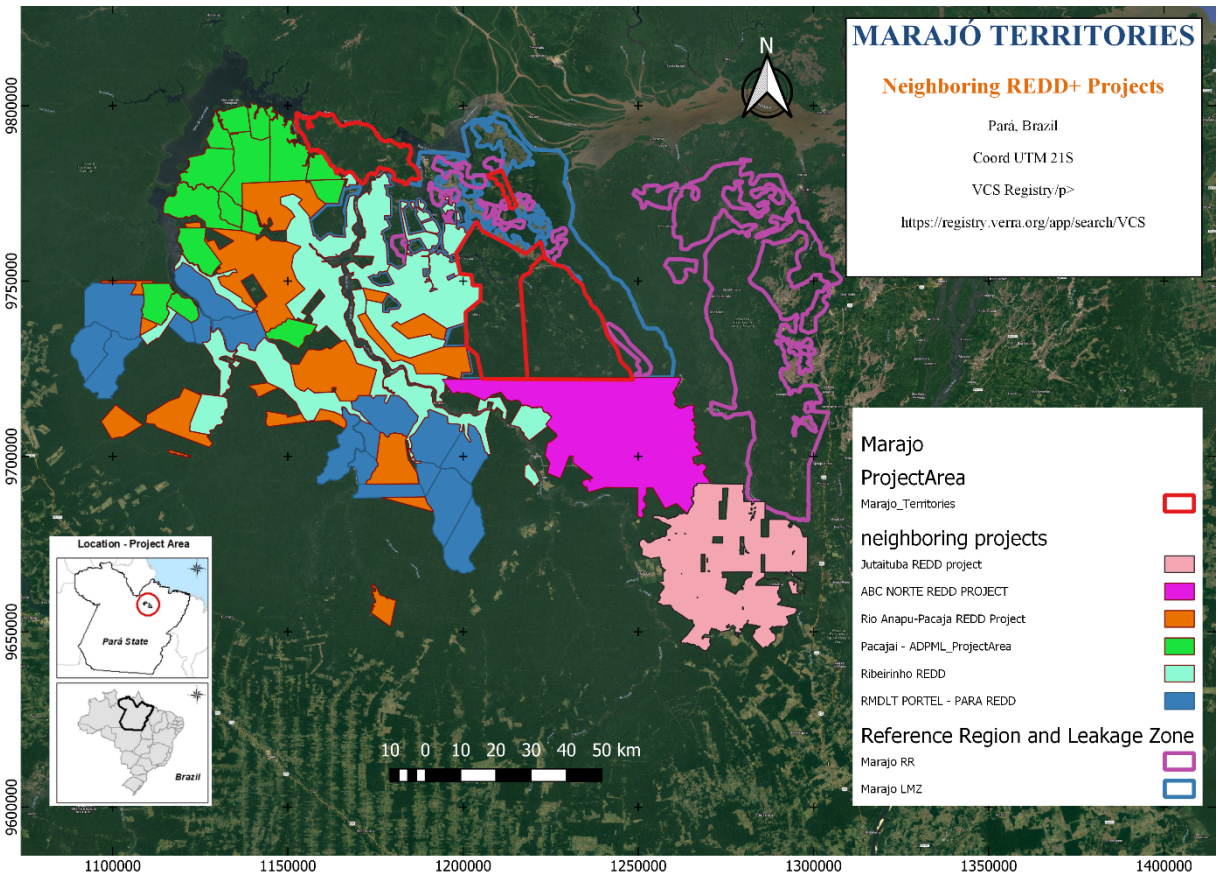
The Marajó REDD+ Project covers a forested area of 138,285 hectares as of 2021 (Table 12).

Leakage Management Zone

The Marajó REDD+ Project is not located within a jurisdictional project and therefore the LMZ is in the area where the displacement of activities will occur in the project scenario. The LMZ **(**Figure 9**)** was located in between the disjunct territories of Marajó as the possibility that activities in the baseline scenario move there if the project is developed is higher. To the west of the Marajó REDD+ Project, there is another REDD+, project the Pacajaí - ADPML Portel-Pará REDD+ project[33]. To the south there are the Anapú REDD+ project[34], the Boa Fe REDD Project[35] and the RMDLT Portel-Pará REDD+ project[36], and in between the Ribeirino REDD+ Project[37] (Figure 13). Farther to the south there is another one, the Jutaituba REDD[38].

[33] https://registry.verra.org/app/projectDetail/VCS/981
[34] https://registry.verra.org/app/projectDetail/VCS/2252
[35] https://registry.verra.org/app/projectDetail/VCS/2558
[36] https://registry.verra.org/app/projectDetail/VCS/977
[37] https://registry.verra.org/app/projectDetail/VCS/2620
[38] https://registry.verra.org/app/projectDetail/VCS/3590

Figure 13. REDD+ Projects neighboring the Marajó territories



Source: ClearBlue Markets

3.1.4 Baseline Scenario

In the baseline scenario deforestation happens primarily due to two factors: riverine dwellers use slash-and-burn agriculture for their own subsistence and there are illegal loggers, which perform selective cutting of trees in small, scattered areas. Fires from slash-and-burn can sometimes get out of control and cause degradation at a larger scale than small-scale agriculture would.

Definition of classes of Land-Use and Landcover

The land use classes correspond to those in the Brazil FREL. Most forest in the area corresponds to Lowland Dense Humid Forest.

Table 12. Land use change during three periods in time in the Marajó project. Areas in Hectares

LandCover	2009	2016	2021	Trend
Agriculture	15,748.15	14,848.91	22,170.28	Rising
Water	3,099.23	3,365.73	3,476.34	Constant
Developed	611.63	70.00	173.78	Variable
Savanna/Grassland	4,025.18	7,804.38	8,753.13	Rising
Forest_Low Biomass	859.69	7,798.95	2,061.14	Rising
Forest_high Biomass	56.00	515.62	56.00	Rising
Forest_medium Biomass	148,514.68	138,914.57	135,708.24	Decreasing
Forests overall	149,374.37	146,769.52	138,285.00	Decreasing

Here, FOREST corresponds to remaining forest belonging mostly to Ombrophilous Lowland Forest.

The land cover classification and biomass estimation were performed using *Google Earth Engine, ArcGIS pro,* and *R Studio.* Landsat satellite imagery was used since it was available for the entire analysis period in contrast with other sensors. Landsat acquisition was done using the Landsat Simple Composite Algorithm (*ee.Algorithms.Landsat.simpleComposite),* which computes Landsat top of the atmosphere (TOA) from a collection of raw scenes that were clipped using the project's area of influence. The Landsat Simple Composite Algorithm selects the lowest possible range of cloud scores for each pixel and computes values from accepted pixels in the selection to have a clear image without clouds. 3 periods were analyzed 2021, 2016, and 2009. In the first 2 cases, USGS Landsat 8 Collection 2 Tier 1 and data Raw Scenes ('LANDSAT/LC08/C02/T1') were used, while for analysis in 2009 USGS Landsat 5 TM Collection 2 Tier 1 Raw Scenes were selected LANDSAT/LT05/C01/T1. The error matrix for this process can be seen in Table 13.

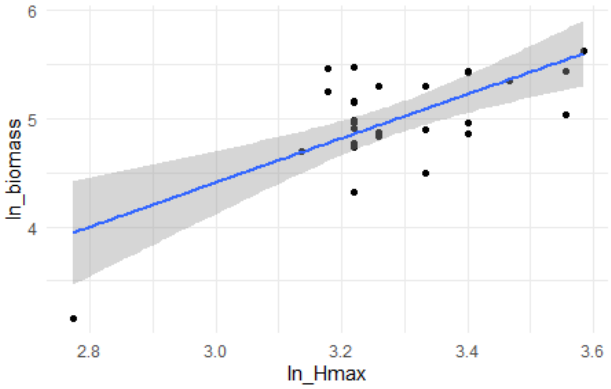
Due to year-round cloud coverage in the project's area, broad date ranges were implemented. 2021 analysis ranged from June 2019 to November 2021. 2016 analysis ranged from June 2014 to November 2016. Finally, 2009 started in June 2007 to November 2015.

Table 13. Error matrix of land cover classification

	Agriculture	Grassland	Water	Developed	Wooded savanna	Forest_Low	Forest_high	Forest_medium
Agriculture	0.96					0.04		
Grassland		0.96			0.04			
Water			1					
Developed		0.24		0.76				
Wooded savanna		0.04			0.96			
Forest_Low	0.12	0.08				0.8		
Forest_high							0.88	0.12
Forest_medium							0.24	0.8

To estimate field biomass and increase biomass training points, *GEDI Full-wave form LiDAR data* (GEDI L2A Raster Canopy Top Height (Version 2)) was used for 2021. GEDI data is only available since 2019. The band *rh98* was used as the maximum height (Hmax) to avoid outliers like flying birds. After that, field data was used to fit linear regression where Biomass equation *(tons/hectare)* was used as dependent variable and maximum height *(m)* as independent variable. The resulting adjusted R-square was 0.4365.

Biomass = $exp((2.0439 * log(Hmax)) - 1.7221)$



Thus, GEDI points were used to estimate biomass and generate training points that in turn were used by the land cover classification algorithm. GEDI does not fully cover the entire extent of the project. Resulting biomass points with values higher than 30 tons/hectare were used. From that group points, 400 were randomly selected to be used as training points.

Figure 14. Example of GEDI liDAR points

Source: ClearBlue Markets

Biomass categories were calculated using the data collected in the field and allometric equations for the region[39]. All points here biomass equal or lower than the first quantile (123 tons/hectare) was classified as low biomass. Between 123 and 200 tons per hectare was considered medium biomass, while all the points with biomass higher or equal than 200 tons per hectare were considered high biomass.

Table 15. Biomass quantiles

Biomass (ton/hectare)				
Min	Q1	Q2	Q3	Max
23.41493638	123.4293733	145.2537654	207.7461707	275.7599396

The training points for agriculture, water, developed, and wooded savannah were selected using Brazil's landcover map, satellite imagery, and EVI (Enhanced Vegetation Index) for all analysis periods individually. After that, the Random Forest algorithm was used to classify the area into the categories described above with the function *ee.Classifier.smileRandomForest* in Google Earth engine[40]. To finalize editing, classified layers were exported to ArcGIS pro. Focal statistics were applied using the option Majority in a window size of 3X3. Thus, Raster to polygon tool was applied to vectorize the layer. Finally, the tool eliminate was used in the polygons smaller than 1 hectare.

3.1.5 Additionality

Methodology VM0037 requires projects to demonstrate additionality through the following steps:

1. Project proponents must demonstrate regulatory surplus in accordance with the rules and requirements regarding regulatory surplus set out in latest version of the VCS Standard.

2. Determine additionality by applying the latest version of the VCS Tool VT0001 *Tool for the Demonstration and Assessment of Additionality in VCS AFOLU Project Activities*.

VT0001 contains a number of steps that must be completed successfully for the project to be deemed additional, these are:

1. Identification of alternative land use scenarios to the proposed VCS AFOLU project activity;
2. Investment analysis; or
3. Barriers analysis; and
4. Common practice analysis.

Step 0: Regulatory Surplus
As the project is not mandated by any law, statute or other regulatory framework, nor are there any national, regional or local policies in place that give comparative advantage the project, this requirement is fulfilled.

[39] Higuchi, N., dos Santos, J., Ribeiro, R.J., Minette, L. and Biot, Y., 1998. Biomassa da parte aérea da vegetação da floresta tropical úmida de terra-firme da Amazônia brasileira. *Acta Amazonica*, *28*, pp.153-153.
[40] Gorelick, N., Hancher, M., Dixon, M., Ilyushchenko, S., Thau, D., & Moore, R. (2017); Google Earth Engine: Planetary-scale geospatial analysis for everyone. Remote Sensing of Environment. https://earthengine.google.com/faq/#:~:text=How%20do%20I%20cite%20Earth,scale%20geospatial%20analysis%20for%20everyone

Step 1: Identification of alternative land use scenarios

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

Scenario 1: Continuation of the pre-project land use

Given the observed pattern of degradation over the historical reference period, continuation of the pre-project scenario seems like the most likely scenario. This baseline scenario is described in section 3.1.4 of this document.

Scenario 2: Proposed project activity without being registered as a VCS AFOLU project

In this scenario, the forest would be protected from degradation by implementing the activities as described in the project scenario:

- Income sources by engaging in the project activities: One of the main drivers of forest degradation in this area is illegal timber extraction. One of the main activities proposed in this project is the employment of members of the local community to patrol the area and protect it from illegal trespassers.
- Distribution of anaerobic digestors for biogas generation: To meet the communities' thermal energy needs, mostly for the preparation of food, the use of fuelwood and charcoal is still commonplace for the riverside communities. The extraction of fuelwood from the forest contributes to forest degradation. To mitigate this driver of degradation, the project is deploying biodigesters in the riverside communities, allowing them to convert their organic waste into biogas. In addition to a reduction in fuelwood collection, the combustion of fuelwood, especially in enclosed spaces, can lead to a variety of respiratory and cardiovascular diseases. Combustion of (bio)gas creates much less pollution, resulting in a net health benefit.
- Development of alternative skills/ income sources: Furthermore, the communities will be engaged in training and development programs that allow them to develop new skills, which will create additional sources of income which will reduce their dependency on forest resources for their income.
- Raising of awareness: The inhabitants of this region have always been reliant on the forest for their livelihood and / or often not aware or unable to avoid of the consequences of deforestation and forest degradation. Therefore, training programs will focus on the raising of awareness while teaching the communities how to interact more sustainably with the forest.

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

Scenario 1: Continuation of the pre-project land use

The current land-use scenario in the project area is in compliance with all mandatory legal and regulatory requirements. The communities residing within the area have the right extract resources from the forest. The only driver of forest degradation which is not in line with the applicable laws is the selective extraction of timer through illegal logging.

Scenario 2: Proposed project activity without being registered as a VCS AFOLU project

All the proposed activities are in compliance with the existing laws, statues, regulatory frameworks or policies. These laws and policies have been shown in detail in section 2.5.7.

Sub-step 1c: Selection of the baseline scenario

The most likely baseline scenario is the continuation of the pre-project land use scenario which will lead to further forest degradation in the project area.

Step 2: Investment Analysis

The Tool for the Demonstration and Assessment of Additionality in Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (VT0001), allows developers to choose between the Investment Analysis (Step 1) or the Barrier Analysis (Step 3). For this demonstration, the Barrier Analysis route has been chosen.

Step 3: Barrier Analysis

This analysis is performed to determine if the project faces barriers that:

a) Prevent the implementation of this type of proposed project activity without the revenue from the sale of GHG credits; and

b) Do not prevent the implementation of at least one of the alternative land use scenarios.

Sub-step 3a: Identify barriers that would prevent the implementation of the type of proposed project activity

Implementation of the proposed project activity without the sale of Verified Carbon Units (VCUs) faces a number of different barriers. These barriers prevent the activity from taking place.

Economic barriers:
The main barrier that Scenario 2 faces in the absence of environmental revenue is a financial barrier. The activities foreseen under the project such as the distribution of LPG to reduce the use of fuelwood, the hiring of members of the local communities to patrol the area and deter illegal timber extraction and educational programs require a constant and reliable source of funding.

Social and cultural barriers:

Beyond the economic barriers, scenario 2 is facing social and cultural barriers. Illegal land-use practices such as tree felling, non-timber product extraction and illegal grazing/land-grabbing are widespread in the province of Pará. People are insufficiently aware of the long-term effects of these practices. This is why raising awareness is a key aspect of the project. The revenue generated will aid the inhabitants of the project area decrease their reliability on forest resources.

Institutional barriers:

Although the state of Para has proper legislation with respect to land-use and land tenure rights, in many cases these regulations are not enforced which leads to land tenure disputes and land-grabbing.

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

None of the barriers described in sub-step 3a would affect scenario 1, as in this scenario no new activities are introduced. In this scenario the project area would continue to degrade. As there are no investments needed nor are there any efforts made to change existing habits, barriers identified would not apply.

Step 4: Common Practice Analysis

The types of activities foreseen under the Marajó REDD+ Project need external financing in order to be feasible. The main alternative to the income generated via the voluntary carbon market would

be in the form of the Amazon Fund, which "is a REDD+ mechanism created to raise donations for non-reimbursable investments in efforts to prevent, monitor and combat deforestation, as well as to promote the preservation and sustainable use in the Brazilian Amazon"[41]. However, there are some fundamental differences between projects funded via the Amazon Fund and via the VCS / CCB in terms of financing and monitoring. Moreover, the Amazon Fund has limited resources and had had no more projects approved from 2019[42] to 2022, although it was reactivated in 2023[43]. In an analysis of the database of the VCS registry, made on 05/12/2022, only 2 REDD+ projects were seeking VCS and CCB certification in Brazil, both in the State of Amazonas, out of a total of 15 projects under Sectoral scope 14 listed for Brazil (including 2 that have been withdrawn). Hence a project that strives to attain this is unusual practice for Pará.

Considering all of the above, it can be concluded that the Marajó REDD+ Project is additional.

3.1.6 Methodology Deviations

The project strictly adheres to all methods described or proposed under VM0037 and CCB standard 3.1. Hence there are no deviations.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

REDD+ Project

The data compiled in section 3.1.4 for the years 2009, 2016 and 2021 was used to estimate forest losses due to deforestation in the project area. Table 12 shows a net forest loss of 10,757.10 hectares due to deforestation proper, which amounts to about 770 hectares per year within the project's territories based on the RR. As shown in Figure 26, deforestation in the Amazon and particularly the state of Pará, has picked up to levels not seen before the 2010s, a phenomenon that has not gone unnoticed by the media and the scientific community at large[44].

Following the criteria in the VCM0037 methodology and other related sources[45], and the Winrock Sample Plot Calculator tool[46], it was estimated that to take advantage of the fieldwork done, and in order not to introduce statistical complications, and to be able to achieve a 10% error, at least 30 field plots of the same area and shape of those already executed by the REDDA team were deemed necessary for the Marajó REDD+ project. These were established in October 2022. As stated in

[41] FundoAmazonia. (2022). Fundo Amazônia: O Brasil cuida. O mundo apoia. Todos ganham. *Fundo Amazônia*. [https://www.fundoamazonia.gov.br/pt/fundo-amazonia/]
[42] Governo federal estuda reativar Fundo Amazônia. CNN Brasil. [https://www.cnnbrasil.com.br/politica/governo-federal-estuda-reativar-fundo-amazonia/]
[43] https://www.climatechangenews.com/2023/01/04/first-day-office-lula-revives-1-billion-fund-amazon/
[44] Escobar, H., 2020. Deforestation in the Brazilian Amazon is still rising sharply. Science 369(6504). https://www.science.org/doi/full/10.1126/science.369.6504.613
https://www.dw.com/en/how-has-the-amazon-rainforest-changed-under-jair-bolsonaro/a-63211783
[45] Pearson, T., Walker, S. and Brown, S., 2013. Sourcebook for land use, land-use change and forestry projects.
Pedroni, L., 2012. Methodology for Avoided Unplanned Deforestation. VM0015. Version 1.1.
Penman, J., Gytarsky, M., Hiraishi, T., Krug, T., Kruger, D., Pipatti, R., Buendia, L., Miwa, K., Ngara, T., Tanabe, K. and Wagner, F., 2003. Good practice guidance for land use, land-use change and forestry. *Good practice guidance for land use, land-use change and forestry.*
Achard, F., Boschetti, L., Brown, S., Brady, M., DeFries, R., Grassi, G., Herold, M., Mollicone, D., Mora, B., Pandey, D. and Souza, C., 2014. *A sourcebook of methods and procedures for monitoring and reporting anthropogenic greenhouse gas emissions and removals associated with deforestation, gains and losses of carbon stocks in forests remaining forests, and forestation* (No. COP20-1). GOFC-GOLD.
[46] https://winrock.org/document/winrock-sample-plot-calculator-spreadsheet-tool/

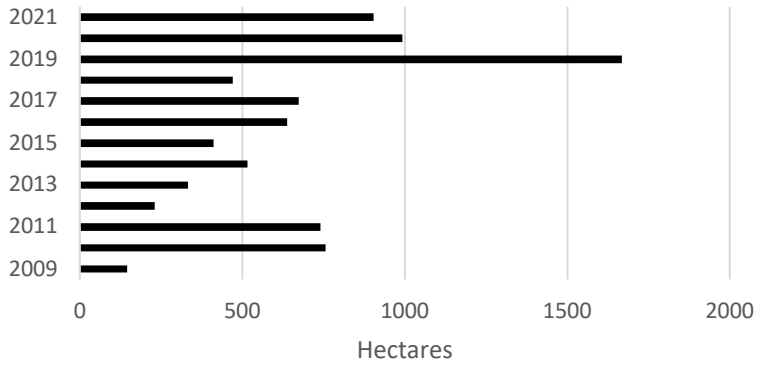
Table 15, the forest biomass levels resulting from field data were divided into three levels according to the plot results: medium, low, and high and the aboveground biomass stock was calculated accordingly (Table 16) for the whole forested areas inside the project according to these correlations between forest cover and biomass stock level.

The leakage belt has an area of 427,130 hectares, more than twice the territories of Marajó and according to the DETER (Figure 14) platform it has experienced 8479 hectares (2%) of forest loss in the period 2009-2021, amounting to 652 hectares per year, which is less than the 896 hectares on average on the same period for the Marajó REDD+ Project's territories. As it can be seen in Figure 15, deforestation is not homogeneous and remote areas to the south are much less likely to be affected, while sites near settlements are more intervened.

Table 16. Area of forests in the Marajó project according to biomass stock level (low, medium and high)

LandCover	Areas in hectares				Estimated Biomass stock for the areas total Tons		
	2009	2016	2021		2009	2016	2021
Forest_Low	860	7,799	2,061		154,842	1,404,705	371,242
Forest_high	-	56	516		-	10,087	92,871
Forest_medium	148,515	138,915	135,708		26,749,673	25,020,551	24,443,045
Forest total	149,374	146,770	138,285		26,904,515	26,435,344	24,907,158

Figure 14. Deforestation in the leakage belt according to PRODES DETER[47]



Deforestation on the leakage belt and in the project area does not follow a particular pattern nor does it involve large scale clearcuts as is the case further south near the Trans-Amazonian roads. Instead, it involves scattered intervention by settlers and loggers in small-scale fires or logging. In the absence of the project, it is expected that this trend continues. That being the case, deforestation in the Marajó territories can be projected to progress as it has been with several scattered areas that amount to a yearly average for the region, as stated above. Taking the medium aboveground and belowground biomass stock of 184.47 tons/hectare which is equivalent to 317.91 tCO2e/ha, that would amount to 255,933.3 tCO2e emitted in the project's area every year due to deforestation, taking into account the same deforestation rate found in the Reference Region.

$$\mathrm{BSL}_{C,si} = \mathrm{EF(LT)}(1{\rightarrow}2) * \left((LT(1-2)_{y2-y1,rate}\right) * S_{REDD,i}$$

Where

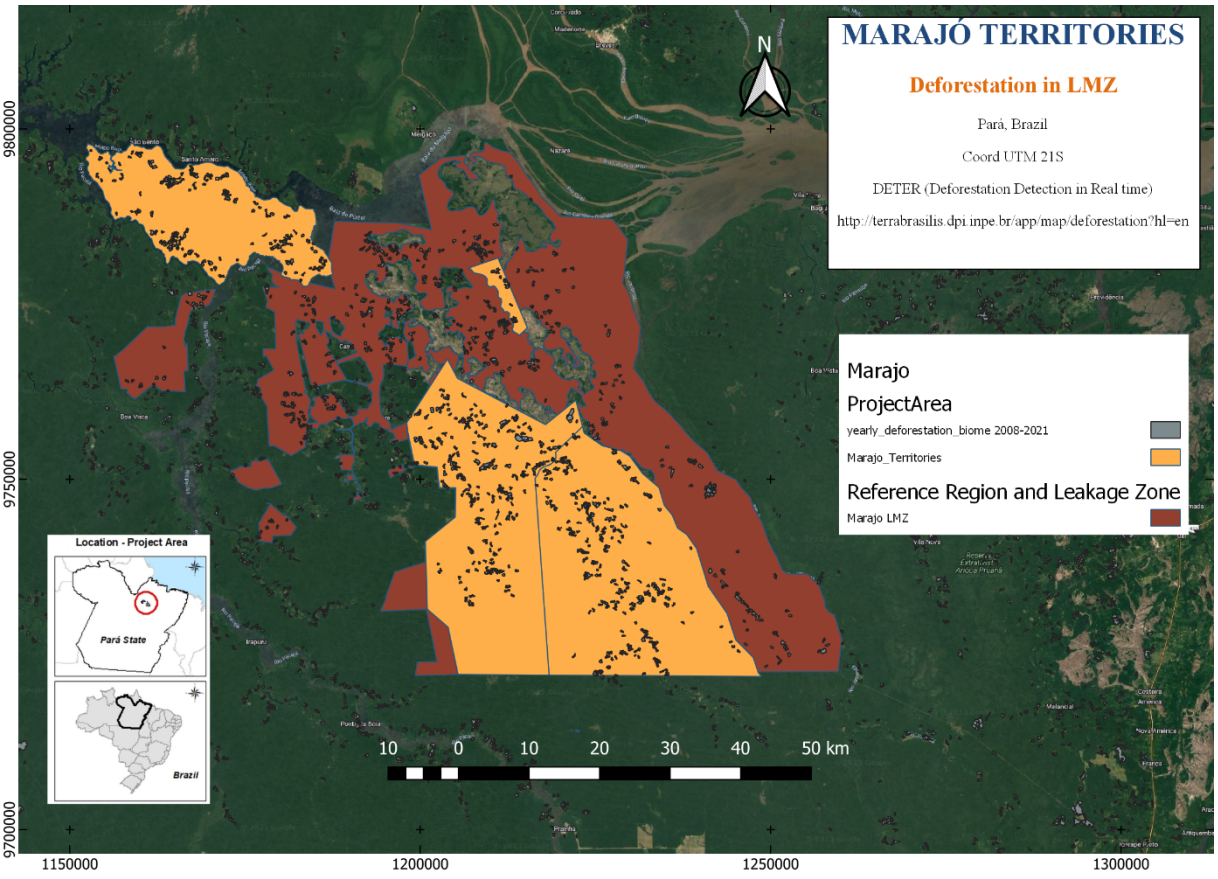
[47] http://www.terrabrasilis.dpi.inpe.br/app/map/alerts

$BSL_{c,si}$	= Change in carbon stocks due to land transitions in the baseline in the REDD project area (tC/ha)
EF(LT)(1→2)	= Change in carbon stock associated to transition from stratum 1 to stratum 2 (tC/ha)
LT(1-2)y2-y1, rate	= rate of annual average land transition from stratum 1 to stratum 2 from time-point y1 to time-point y2 (%)
$S_{REDD,i}$	= Area in stratum i within the REDD project area (ha)

The total baseline emissions were estimated using the below equation:

$$BE_{yREDD} = \sum(BSL_{C.si})$$

Figure 15. Deforestation in Marajó Leakage belt according to DETER



Source: ClearBlue Markets

The inventory error from the field plots amounted to 18% as stated below. If one takes this as a buffer and takes into account both deforestation and degradation in the project area taking into account the rates of change in carbon stock in the reference region, the emission reductions calculated in Table 17 below are obtained.

$$E = \sqrt{(tval^2/n) * \left[\sum(w_i s_i)\right]^2}$$

E = sqrt[1.7^2/30)(61^2)] = 18.93

Table 17. Estimated baseline CO2 emissions reductions

Year	Emissions per year DEFO	Emissions per year DEGRA	BE_{yREDD}
2021	49,083	14,479	63,562
2022	255,933	75,500	331,433
2023	255,933	75,500	331,433
2024	255,933	75,500	331,433
2025	255,933	75,500	331,433
2026	255,933	75,500	331,433
2027	255,933	75,500	331,433
2028	255,933	75,500	331,433
2029	255,933	75,500	331,433
2030	255,933	75,500	331,433
2031	255,933	75,500	331,433
2032	255,933	75,500	331,433
2033	255,933	75,500	331,433
2034	255,933	75,500	331,433
2035	255,933	75,500	331,433
2036	255,933	75,500	331,433
2037	255,933	75,500	331,433
2038	255,933	75,500	331,433
2039	255,933	75,500	331,433
2040	255,933	75,500	331,433
2041	255,933	75,500	331,433
2042	255,933	75,500	331,433
2043	255,933	75,500	331,433
2044	255,933	75,500	331,433
2045	255,933	75,500	331,433
2046	255,933	75,500	331,433
2047	255,933	75,500	331,433
2048	255,933	75,500	331,433
2049	255,933	75,500	331,433
2050	255,933	75,500	331,433
2051	255,933	75,500	331,433
2052	255,933	75,500	331,433
2053	255,933	75,500	331,433
2054	255,933	75,500	331,433
2055	255,933	75,500	331,433

Year	Emissions per year DEFO	Emissions per year DEGRA	BE_{yREDD}
2056	255,933	75,500	331,433
2057	255,933	75,500	331,433
2058	255,933	75,500	331,433
2059	255,933	75,500	331,433
2060	255,933	75,500	331,433
2061	206,850	61,021	267,871

According to the classification elaborated upon in section 3.1.4, forest cover data for 2009, 2016 and 2021 was utilised. From there the workflow according to the VM0037 methodology is as follows:

$$LT(1 \rightarrow 2)_{y2-y1} = (LC1_{y1} \rightarrow LC2_{Y2})/(y2 - y1)$$ Equation **1**

Where:

$LT(1\text{-}2)_{y2\text{-}y1}$ = Annual average land transition from stratum 1 to stratum 2 from time-point y_1 to time-point y_2 (ha)

$LC1_{y1} \rightarrow LC2_{Y2}$ = Total land classified as stratum LC1 (ha) in time point y1 which has undergone transition to land classified as stratum LC2 (ha) in time point y2 (ha)

Y_1 = Year of first time-point in the land transition analysis

Y_2 = Year of second time-point in the land transition analysis

This amounted to 1,005.07 hectares for the Reference Region (RR), which accounted for 0.6% forest loss since 2009, according to:

$$LT(1 \rightarrow 2)_{y2-y1,rate} = (LT(1 \rightarrow 2)_{y2-y1}/LC1_{Y1}) * 100$$ Equation 2

Where:

$LT(1\text{-}2)_{y2\text{-}y1,\ rate}$ = rate of annual average land transition from stratum 1 to stratum 2 from time-point y_1 to time-point y_2 (%)

$LT(1\text{-}2)_{y2\text{-}y1}$ = Annual average land transition from stratum 1 to stratum 2 from time-point y_1 to time-point y_2 (ha)

$LC1_{y1}$ = Total land classified as stratum LC1 (ha) in time point y1 (ha)

A discount factor to evenly distribute the estimated emissions over the entire project crediting period was applied. The discount factor was calculated as the ratio of the time taken for the stratum to completely undergo the change over the total period (132 years) for a value of 3.32.

$$N_{LT} = yLT(j), trans/\ y\ crediting\ period$$ Equation 3

Where:

N_{LT}	= land transition discounting factor due to scarcity of land
$y_{LT(i),trans}$	= time taken for the stratum(i) to completely undergo transition to other strata (years)
$y_{crediting\ period}$	= project crediting period (years)

Mean carbon content of the forest stratum was calculated as 86.70 tC/ha according to:

$$C - St_i = \Sigma(C)_{c-pool,i,SP} * 1/SP$$ Equation 4

Where:

C-St_i	= Carbon stock per hectare of stratum i (tC/ha)
$(C)_{C\text{-}pool,I,SP}$	= Carbon stock in each of the carbon pool in the sample plot in stratum i (tC/sample plot)
SP	= Area of sample plot (ha)

This includes both aboveground and belowground biomass. A root-to-shoot ratio of 0.24 was chosen according to IPCC (2006)[48].

Carbon change resulting from degradation was calculated also as 29.47 tC/ha of average loss according to:

$$EF\ (LT)(1 \rightarrow 2)_{y2-y1} = (CSt1_{y1} \rightarrow CSt1_{y2})$$ Equation **5**

Where:

EF(LT)(1→2)	= Change in carbon stock associated to transition from stratum 1 to stratum 2 (tC/ha)
CSt1	= Carbon stock in stratum 1 (tC/ha)
CSt2	= Carbon stock in stratum 2 (tC/ha)

The total loss of carbon stock from the project area in the baseline scenario is computed as

[48] Eggleston, H.S., Buendia, L., Miwa, K., Ngara, T. and Tanabe, K., 2006. 2006 IPCC guidelines for national greenhouse gas inventories, Table 3.1.A.8

$$BSL_{C,si} = EF(LT)(1\rightarrow 2) * \left((LT(1-2)_{y2-y1,rate}\right) * S_{REDD,i}$$ Equation 6

Where:

$BSL_{c,si}$	= Change in carbon stocks due to land transitions in the baseline in the REDD project area (tC/ha)
EF(LT)(1→2)	= Change in carbon stock associated to transition from stratum 1 to stratum 2 (tC/ha)
LT(1-2)y2-y1, rate	= rate of annual average land transition from stratum 1 to stratum 2 from time-point y1 to time-point y2 (%)
$S_{REDD,i}$	= Area in stratum i within the REDD project area (ha)

which, with a forest area of 138,285.00 hectares and an annual land transition of 0.5% from forest to no forest amounted to 3,615,632.73 tC. Total baseline emissions were then calculated as:

$$BE_{yREDD} = \sum(BSL_{C.si}) * 44/12$$ Equation 7

Where:

BE_{yREDD}	= Baseline emissions from REDD (tCO_2)
$BSL_{C,si}$	= Net change in carbon stocks due to land transitions in the baseline in the REDD project area (tC)

Amounting to 13,257,320 tCO2 over a 40-year crediting period. Additional baseline emission sources shall be calculated as follows:

$$BE_{yADD} = L_{fuelwood} + C_{fire} + C_{felling} + C_{ill}$$ Equation 8

Where:

BE_{yADD}	= Total additional baseline emissions (tCO_2)
$L_{fuelwood}$	= Annual carbon loss due to fuelwood gathering, tonnes C. yr^{-1} per species
C_{fire}	= Annual carbon loss due to forest fire, tonnes C. yr^{-1}
$C_{felling}$	= Annual carbon loss due to timber harvesting, tonnes C. yr^{-1}
C_{ill}	= annual carbon loss due to illegal activities C. yr^{-1}

As fires are the most common way of clearing land and data for fires for the Marajó territories is available according to DETER (2016-2022), 9,618 tCO2 per year were determined on this basis and considered as additional baseline emissions.

ARR Project

The Marajó REDD+ Project also contemplates an afforestation component for at least 1000 hectares planted during the lifetime of the project, with a minimum of 25 hectares per year. According to the VM0037 and AR-AMS007 methodologies, baseline emission removals from ARR activities are calculated as follows:

$$BE_{ARR} = \Delta C_{TREE\_BSL,t} + \Delta C_{SHRUB\_BSL,t} + \Delta C_{DW\_BSL,t} + \Delta C_{LI\_BSL,t}$$ Equation 14

Where:

$\Delta C_{TREE\_BSL,t}$ = Change in carbon stock in baseline tree biomass within the project boundary in year *t*, as estimated in the tool *Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*; tCO_2e

$\Delta C_{SHRUB\_BSL,t}$ = Change in carbon stock in baseline shrub biomass within the project boundary, in year *t*, as estimated in the tool *Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*; tCO_2e

$\Delta C_{DW\_BSL,t}$ = Change in carbon stock in baseline dead-wood biomass within the project boundary, in year *t*, as estimated in the tool *Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities*; tCO_2e

$\Delta C_{LI\_BSL,t}$ = Change in carbon stock in baseline litter biomass within the project boundary, in year *t*, as estimated in the tool *Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities;* tCO_2e

BE_{ARR} = Total baseline emission removals by sinks, tCO_2e

According to AR-TOOL-14 V4.2, the change in carbon stock ($\Delta C_{TREE_{BSl},t}$) is estimated as follows:

$$\Delta C_{TREE,t} = \frac{C_{TREE,t_2} - C_{TREE,t_1}}{T} \times 1\ year$$ Equation (11)

Since the plantations do not exist in a non-project scenario (and no trees have been planted yet), $\Delta C_{TREE_{BSl},t} = 0$ for the baseline and therefore BE_{ARR} =0 as well, as no shrubs nor deadwood nor litter are being considered either.

3.2.2 Project Emissions

Parameters	Description
Fossil fuel combustion PE_{ff}	Includes gasoline, diesel and lubricant oil.
Woody biomass removal for fire prevention activities (PE_{wbf})	Will not be performed
Woody biomass removal during assisted natural	Will not be performed

Parameters	Description
regeneration (ANR) activities (PE_{wbanr})	
Increased use of fertilizer (PE_f)	Will not be performed
Biomass burning/ Fire from natural disturbance/ Forest fire used for harvesting/ site preparation (PE_{bb})	Will not be performed.
Unplanned timber harvesting (PE_{uthy})	Will not be performed.

All project emissions are calculated using the following equation:

$$PE_{REDDy} = PE_{ffy} + PE_{wbanry} + PE_{fy} + PE_{bby} + PE_{uthy} + PE_{ny} + PE_{wbfy} \quad \text{Equation 15}$$

Where:

PE_{REDDy}	= Project emissions from REDD activities in year y; t CO_2e
PE_{ffy}	= Project emissions from fossil fuel combustion in year y; t CO_2e
PE_{wbfy}	= Project emissions from woody biomass removal for fire prevention activities in year y; t CO_2e
PE_{wbanry}	= Project emissions from woody biomass removal during ANR activities in year y; t CO_2e
PE_{fy}	= Project emissions from direct use of fertilizer in year y; t CO_2e
PE_{bby}	= Project emissions from biomass burning in year y; t CO_2e
PE_{uthy}	= Project emissions from unplanned timber harvesting in year y, t CO_2e
PE_{ny}	= Project emissions from n activities in year y; t CO_2e

Total project emissions amount to 47 tCO2 per year.

Net removals per sink are calculated according to VM0037 which in turn relies in AR-AMS007, as below:

$$PS_{ARR} = \Sigma \Delta C_{c-pool,i,SP} * \frac{1}{SP} * S_{ARR,i} * 44/12 \quad \text{Equation 16}$$

Where:

PS_{ARR}	=	Total project sequestration from ARR, tCO_2e
$\Delta C_{c\text{-}pool,i,sp}$	=	Total carbon content of all the carbon pools within the sample plots in stratum i, (tC/smaple plot)
SP	=	Area of sample plot, ha
$S_{ARR,i}$	=	Area under stratum i in ARR in ha

The ARR project will be undertaken with native species, particularly those mentioned in section 5.2.5. Using appropriate biomass equations and growth data for these[49], the proposed scenario is as follows in Table 19. This was accomplished by the modelling of tree growth and biomass according to AR Tool 14 v 4.2 (section 8.2). Aboveground biomass AGB was estimated with the Schumacher-Hall-equation used in the reference of footnote 49: AGB (kg) = 0.3893× $DBH^{2.2841}$ ×$HT^{-0.1430}$ where DBH = Diameter at breast height (1.3 m), HT = total tree height. BGB (belowground biomass) has been calculated here with the factor of 0.24 root-to-shoot ratio adopted according to IPCC-2006.

Table 18. Average Estimated tree growth modeling for the ARR project

Age_yr	DBH_cm	HT_m	TreeBiomass_kg	tCO2e	narbha	tco2e_ha
1	1.00	1.00	1.4	2.99	1,111.00	3.33
2	2.00	2.00	4.8	10.35	1,111.00	14.60
3	4.00	3.00	20.7	44.53	1,111.00	62.83
4	5.33	4.00	37.9	81.73	1,111.00	115.32
5	6.83	5.00	64.4	138.85	1,111.00	195.91
6	8.33	6.00	98.6	212.40	555.50	149.85
7	9.83	7.00	140.5	302.87	555.50	213.67
8	11.33	8.00	190.5	410.65	555.50	289.71
9	12.83	9.00	248.8	536.11	555.50	378.22
10	14.33	10.00	315.3	679.55	555.50	479.41
11	15.33	11.00	362.6	781.48	555.50	551.32
12	16.33	12.00	413.5	891.12	555.50	628.67
13	17.32	13.00	468.0	1,008.55	555.50	711.52
14	18.32	14.00	526.1	1,133.82	555.50	799.89
15	19.32	15.00	587.9	1,267.00	277.75	446.92
16	20.31	16.00	653.4	1,408.13	277.75	496.71
17	21.31	17.00	722.6	1,557.29	277.75	549.32
18	22.31	18.00	795.6	1,714.51	277.75	604.78
19	23.30	19.00	872.3	1,879.85	277.75	663.10
20	24.30	20.00	952.8	2,053.36	277.75	724.31
21	25.30	20.50	1,040.7	2,242.80	277.75	791.13
22	26.29	21.00	1,132.8	2,441.25	277.75	861.13
23	27.29	21.50	1,229.1	2,648.78	277.75	934.34
24	28.29	22.00	1,329.6	2,865.43	277.75	1,010.76
25	29.28	22.50	1,434.4	3,091.26	277.75	1,090.42
26	30.28	23.00	1,543.4	3,326.30	277.75	1,173.33
27	31.28	23.50	1,656.8	3,570.62	277.75	1,259.51
28	32.27	24.00	1,774.5	3,824.25	277.75	1,348.98
29	33.27	24.50	1,896.5	4,087.24	277.75	1,441.75
30	34.27	25.00	2,022.9	4,359.64	277.75	1,537.83
31	35.26	25.00	2,159.8	4,654.63	277.75	1,641.89
32	36.26	25.00	2,301.7	4,960.54	277.75	1,749.79

[49] Oliveira, R.G.D., Souza, A.S.D., Santos, V.A.H.F.D., Lima, R.M.B.D. and Ferreira, M.J., 2021. Long-term effects of plant spacing on the growth and morphometry of Bertholletia excelsa. *Acta Amazonica*, *51*, pp.181-190.

Age_yr	DBH_cm	HT_m	TreeBiomass_kg	tCO2e	narbha	tco2e_ha
33	37.26	25.00	2,448.8	5,277.43	277.75	1,861.57
34	38.25	25.00	2,601.0	5,605.39	277.75	1,977.26
35	39.25	25.00	2,758.3	5,944.52	277.75	2,096.88
36	40.25	25.00	2,920.9	6,294.88	277.75	2,220.47
37	41.24	25.00	3,088.7	6,656.57	277.75	2,348.05
38	42.24	25.00	3,261.8	7,029.65	277.75	2,479.66
39	43.24	25.00	3,440.3	7,414.22	277.75	2,615.31
40	44.23	25.00	3,624.1	7,810.33	277.75	2,755.04
41	45.23	25.00	3,813.3	8,218.08	277.75	2,898.87

Therefore PS_{ARR} = 1,295,017 tCO2e over the 40 years of the project for 1000 total hectares to be planted at a minimum of 25 hectares per year:

Table 19. Removals estimated for the ARR project

Year	Age	Number of stands	Hectares planted in year	Cumulative planted	Cumulative tCO2e	tCO2e per year
2023	0	1	25	25	25.0	25.0
2024	1	1	25	50	83.2	58.2
2025	2	2	25	75	448.1	364.9
2026	3	3	50	100	2,018.9	1,570.8
2027	4	4	50	150	4,985.1	2,966.2
2028	5	5	50	200	10,247.7	5,262.6
2029	6	6	50	250	15,564.7	5,317.0
2030	7	7	50	300	23,789.5	8,224.8
2031	8	8	50	350	35,930.0	12,140.5
2032	9	9	50	400	49,131.5	13,201.6
2033	10	10	50	450	66,458.6	17,327.0
2034	11	11	50	500	87,484.3	21,025.7
2035	12	12	50	550	112,656.6	25,172.2
2036	13	13	50	600	142,429.8	29,773.2
2037	14	14	50	650	176,210.1	33,780.3
2038	15	15	50	700	203,100.0	26,889.9
2039	16	16	50	750	233,305.6	30,205.6
2040	17	17	50	800	267,036.0	33,730.4
2041	18	18	50	850	293,328.6	26,292.6
2042	19	19	50	900	322,323.9	28,995.3
2043	20	20	50	950	354,164.6	31,840.7
2044	21	21		1000	389,062.4	34,897.8
2045	22	21		1000	427,002.0	37,939.6
2046	23	21		1000	467,738.3	40,736.3
2047	24	21		1000	509,643.9	41,905.6

Year	Age	Number of stands	Hectares planted in year	Cumulative planted	Cumulative tCO2e	tCO2e per year
2048	25	21		1000	552,666.5	43,022.7
2049	26	21		1000	595,562.8	42,896.2
2050	27	21		1000	644,827.2	49,264.5
2051	28	21		1000	695,128.6	50,301.4
2052	29	21		1000	746,020.0	50,891.3
2053	30	21		1000	797,042.6	51,022.6
2054	31	21		1000	847,843.7	50,801.0
2055	32	21		1000	900,066.1	52,222.4
2056	33	21		1000	953,617.5	53,551.4
2057	34	21		1000	1,008,520.4	54,902.9
2058	35	21		1000	1,064,692.5	56,172.2
2059	36	21		1000	1,144,397.5	79,704.9
2060	37	21		1000	1,227,694.9	83,297.4
2061	38	21		1000	1,295,017.4	67,322.6

3.2.3 Leakage

Some of the neighbouring REDD+ projects could not detect any leakage effects[50] but in order to be conservative a conservative estimate of 5% of expected leakage was adopted pertaining to deforestation figures. This amounts to 16,571.7 tCO2e per year and corresponding to activity-shifting leakage (unplanned timber harvesting) as the only component of total leakage, which is calculated as follows:

$$LE_y = CLE_y + ALE_y + LK_y \qquad \text{Equation 18}$$

Where:

LE_y = Leakage emissions in year y, tCO_2e

CLE_y = Total market leakage emissions as a result of REDD+ activities, in the year y since the start of the project activity, tCO_2e;

ALE_y = Activity shifting leakage emissions in year $ytCO_2e$

LK_y = GHG emissions due to leakage of ARR activities, in year *y*; t CO_2-e

No market leakage emissions are envisioned to occur nor are GHG emissions due to leakage of ARR activities expected.

[50] See, for example, https://registry.verra.org/app/projectDetail/VCS/977

3.2.4 Net GHG Emission Reductions and Removals

Net GHG emission reductions from REDD activities are calculated using the following equation from VM0037:

$$ER_{yREDD} = (BE_{yREDD} + BE_{yADD} - PE_{yREDD} - LE_y)(1 - \mathrm{UF}_{\mathrm{projectREDD}}) \quad \textbf{Equation 20}$$

Where:

ER_{yREDD} = Total GHG emissions reductions and removals in year y; tCO_2e

BE_{yREDD} = Baseline emissions from REDD activities in year y; tCO_2e

BE_{yADD} = Total additional baseline emissions in year y; tCO_2

PE_{yREDD} = Project emissions from REDD activities in year y; tCO_2e

LE_y = Leakage in year y; tCO_2e

$UF_{projectREDD}$ = Uncertainty (REDD)

Year	BE_{yREDD}	BE_{yADD}	PE_{yREDD}	Leakage	$UF_{project\ REDD}$	ER_{yREDD}
2021	63,562	1,845	9	3,178	18%	51,020
2022	331,433	9,618	47	16,572	18%	266,034
2023	331,433	9,618	47	16,572	18%	266,034
2024	331,433	9,618	47	16,572	18%	266,034
2025	331,433	9,618	47	16,572	18%	266,034
2026	331,433	9,618	47	16,572	18%	266,034
2027	331,433	9,618	47	16,572	18%	266,034
2028	331,433	9,618	47	16,572	18%	266,034
2029	331,433	9,618	47	16,572	18%	266,034
2030	331,433	9,618	47	16,572	18%	266,034
2031	331,433	9,618	47	16,572	18%	266,034
2032	331,433	9,618	47	16,572	18%	266,034
2033	331,433	9,618	47	16,572	18%	266,034
2034	331,433	9,618	47	16,572	18%	266,034
2035	331,433	9,618	47	16,572	18%	266,034
2036	331,433	9,618	47	16,572	18%	266,034
2037	331,433	9,618	47	16,572	18%	266,034
2038	331,433	9,618	47	16,572	18%	266,034
2039	331,433	9,618	47	16,572	18%	266,034
2040	331,433	9,618	47	16,572	18%	266,034
2041	331,433	9,618	47	16,572	18%	266,034
2042	331,433	9,618	47	16,572	18%	266,034
2043	331,433	9,618	47	16,572	18%	266,034
2044	331,433	9,618	47	16,572	18%	266,034
2045	331,433	9,618	47	16,572	18%	266,034
2046	331,433	9,618	47	16,572	18%	266,034

Year	BE_{yREDD}	BE_{yADD}	PE_{yREDD}	Leakage	$UF_{project\ REDD}$	ER_{yREDD}
2047	331,433	9,618	47	16,572	18%	266,034
2048	331,433	9,618	47	16,572	18%	266,034
2049	331,433	9,618	47	16,572	18%	266,034
2050	331,433	9,618	47	16,572	18%	266,034
2051	331,433	9,618	47	16,572	18%	266,034
2052	331,433	9,618	47	16,572	18%	266,034
2053	331,433	9,618	47	16,572	18%	266,034
2054	331,433	9,618	47	16,572	18%	266,034
2055	331,433	9,618	47	16,572	18%	266,034
2056	331,433	9,618	47	16,572	18%	266,034
2057	331,433	9,618	47	16,572	18%	266,034
2058	331,433	9,618	47	16,572	18%	266,034
2059	331,433	9,618	47	16,572	18%	266,034
2060	331,433	9,618	47	16,572	18%	266,034
2061	267,871	7,773	38	13,394	18%	215,014
					TOTAL	10,641,360

Net GHG emission reductions and removals from ARR activities are calculated using the following equation:

$$ER_{yARR} = BE_{ARR} - PS_{ARR} - LK_t \quad \text{Equation 21}$$

Where:

ER_{yARR} = Net GHG removals by sinks, in year *t*; t CO_2-e

BE_{ARR} = Baseline net GHG removals by sinks, in year *t*; t CO_2e

LK_t = GHG emissions due to leakage, in year *t*; t CO_2e

PS_{ARR} = GHG emissions reductions and removals in year y; tCO_2e

Year	BE_{ARR}	PS_{ARR}	LK_t	ER_{yARR}
2021	0	0	0	0
2022	0	0	0	0
2023	0	25	0	25
2024	0	58	0	58
2025	0	365	0	365
2026	0	1,571	0	1,571
2027	0	2,966	0	2,966
2028	0	5,263	0	5,263
2029	0	5,317	0	5,317
2030	0	8,225	0	8,225
2031	0	12,140	0	12,140
2032	0	13,202	0	13,202
2033	0	17,327	0	17,327
2034	0	21,026	0	21,026

Year	BE_{ARR}	PS_{ARR}	LK_t	ER_{yARR}
2035	0	25,172	0	25,172
2036	0	29,773	0	29,773
2037	0	33,780	0	33,780
2038	0	26,890	0	26,890
2039	0	30,206	0	30,206
2040	0	33,730	0	33,730
2042	0	26,293	0	26,293
2042	0	28,995	0	28,995
2043	0	31,841	0	31,841
2044	0	34,898	0	34,898
2045	0	37,940	0	37,940
2046	0	40,736	0	40,736
2047	0	41,906	0	41,906
2048	0	43,023	0	43,023
2049	0	42,896	0	42,896
2050	0	49,264	0	49,264
2051	0	50,301	0	50,301
2052	0	50,891	0	50,891
2053	0	51,023	0	51,023
2054	0	50,801	0	50,801
2055	0	52,222	0	52,222
2056	0	53,551	0	53,551
2057	0	54,903	0	54,903
2058	0	56,172	0	56,172
2059	0	79,705	0	79,705
2060	0	83,297	0	83,297
2061	0	67,323	0	67,323
			TOTAL	1,295,017

Net GHG emission reductions and removals are then calculated as follows:

$$NER_y = ER_{yREDD} + ER_{yARR}$$ Equation 22

Where:

NER_y = Net GHG emissions reductions and removals in year y; tCO_2e

ER_{yREDD} = GHG emissions reductions and removals by REDD project activities in year y; t CO_2e

ER_{yARR} = GHG emissions reductions and removals by ARR project activities in year y; t CO_2e

A table showing NER_y has been included below:

Figure 16. GHG emission reductions and removals

Year	ER_{yREDD}	ER_{yARR}	NER_y
2021	51,020	0	51,020
2022	266,034	0	266,034
2023	266,034	25	266,059
2024	266,034	58	266,092
2025	266,034	365	266,399
2026	266,034	1,571	267,605
2027	266,034	2,966	269,000
2028	266,034	5,263	271,297
2029	266,034	5,317	271,351
2030	266,034	8,225	274,259
2031	266,034	12,140	278,174
2032	266,034	13,202	279,236
2033	266,034	17,327	283,361
2034	266,034	21,026	287,060
2035	266,034	25,172	291,206
2036	266,034	29,773	295,807
2037	266,034	33,780	299,814
2038	266,034	26,890	292,924
2039	266,034	30,206	296,240
2040	266,034	33,730	299,764
2041	266,034	26,293	292,327
2042	266,034	28,995	295,029
2043	266,034	31,841	297,875
2044	266,034	34,898	300,932
2045	266,034	37,940	303,974
2046	266,034	40,736	306,770
2047	266,034	41,906	307,940
2048	266,034	43,023	309,057
2049	266,034	42,896	308,930
2050	266,034	49,264	315,298
2051	266,034	50,301	316,335
2052	266,034	50,891	316,925

Year	ER_{yREDD}	ER_{yARR}	NER_y
2053	266,034	51,023	317,057
2054	266,034	50,801	316,835
2055	266,034	52,222	318,256
2056	266,034	53,551	319,585
2057	266,034	54,903	320,937
2058	266,034	56,172	322,206
2059	266,034	79,705	345,739
2060	266,034	83,297	349,331
2061	215,014	67,323	282,337
Total	10,641,360	1,295,017	11,936,377

In order to address risks of non-permanence, buffer credits are set aside. These are determined using the net change in carbon stocks and the risk rating determined using the AFOLU Non-Permanence Risk Tool, using the following equations:

$$\text{Buffer}_y = \Delta C_y \times \text{RR}_y \quad \text{Equation 23}$$

$$\text{VCU}_y = \text{NER}_y - \text{Buffer}_y \quad \text{Equation 24}$$

Where:

VCU_y	= VCUs eligible for issuance in year y; tCO_2e
NER_y	= Net GHG emissions reductions and removals in year y; tCO_2e
$Buffer_y$	= Buffer credits to be deposited in the AFOLU Pooled Buffer Account in year y; t CO_2e
ΔC_y	= Net change in carbon stocks for REDD and ARR project activities in year y; t CO_2e
RR_y	= Risk rating determined in year y

For this project a buffer value of 18% has been applied.

Year	NER_y	$Buffer_y$	VCU_y
2021	51,020	18%	41,836
2022	266,034	18%	218,148
2023	266,059	18%	218,168
2024	266,092	18%	218,195
2025	266,399	18%	218,447
2026	267,605	18%	219,436
2027	269,000	18%	220,580

Year	NER_y	$Buffer_y$	VCU_y
2028	271,297	18%	222,464
2029	271,351	18%	222,508
2030	274,259	18%	224,892
2031	278,174	18%	228,103
2032	279,236	18%	228,974
2033	283,361	18%	232,356
2034	287,060	18%	235,389
2035	291,206	18%	238,789
2036	295,807	18%	242,562
2037	299,814	18%	245,847
2038	292,924	18%	240,198
2039	296,240	18%	242,917
2040	299,764	18%	245,806
2041	292,327	18%	239,708
2042	295,029	18%	241,924
2043	297,875	18%	244,258
2044	300,932	18%	246,764
2045	303,974	18%	249,259
2046	306,770	18%	251,551
2047	307,940	18%	252,511
2048	309,057	18%	253,427
2049	308,930	18%	253,323
2050	315,298	18%	258,544
2051	316,335	18%	259,395
2052	316,925	18%	259,879
2053	317,057	18%	259,987
2054	316,835	18%	259,805
2055	318,256	18%	260,970
2056	319,585	18%	262,060
2057	320,937	18%	263,168
2058	322,206	18%	264,209
2059	345,739	18%	283,506
2060	349,331	18%	286,451
2061	282,337	18%	231,516

Year	NER_y	$Buffer_y$	VCU_y
		Total	9,787,829

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Data / Parameter	$BEF_{2,j}$
Data unit	Dimensionless
Description	Biomass expansion factor for conversion of stem biomass to above ground tree biomass for tree species
Equations	4,11
Source of data	Values from IPCC Good Practice Guidance for LULUCF (2003) Table 3A.1.10. Default values of biomass expansion factors (BEFs)
Value applied	IPCC GPG Default value
Justification of choice of data or description of measurement methods and procedures applied	BEF must be sourced from data on local ecological systems. In case of unavailability of this data, regional, national and international data must be used, in that order.
Purpose of data	Project emissions and project sequestration
Comments	As the project's emissions are calculated with allometric equations using DBH and tree height data from field plots, BEF is not used.

Data / Parameter	*CFTree*
Data unit	tCt d.m. $^{-1}$
Description	Carbon fraction of dry matter for species of type *j*
Equations	4,8,9,11,12
Source of data	Methodological tool: "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" Latest version.*
Value applied	A default value of 0.47 is used following the A/R CDM methodological tool.
Justification of choice of data or description of measurement methods and procedures applied	To convert the dry biomass into carbon weight
Purpose of data	Project emissions and project sequestration

Comments	To calculate CO2 sequestered in equation CTree, t = 44/12 * B Tree, t * CF Tree where CFTree is the carbon fraction and CTree gives the CO2 content in tonnes.

Data / Parameter	*Dj*
Data unit	t d.m. m^{-3}
Description	Density overbark of tree stem for tree species j.
Equations	4,8,11
Source of data	Good Practices IPCC Guidelines, 1996 and Published literature
Value applied	-
Justification of choice of data or description of measurement methods and procedures applied	*Dj* must be sourced from data on local ecological systems. In case of unavailability of this data, regional, national and international data must be used, in that order.
Purpose of data	Project emissions and project sequestration
Comments	As the project's emissions are calculated with allometric equations[51] using DBH and tree height data from field plots, wood density is not used.

Data / Parameter	$V_{TREE,j,p,i,t}$
Data unit	m^3
Description	Stem volume of trees of species j in sample plot p of stratum i at time t calculated using a volume table or volume equation or allometric equations. In case a field analysis such as fractional downscaling has been conducted, this data need not be recorded.
Equations	4
Source of data	Field measurements for tree parameters (i.e. GBH, Height) measured in sample plot p of stratum i at time t. Volume equations of each species were taken from nationally accepted and published data. Not required in cases where fractional downscaling analysis is conducted.
Value applied	-
Justification of choice of data or description of measurement methods and procedures applied	$V_{TREE,j,p,i,t}$ must be sourced from data on local ecological systems. In case of unavailability of this data, regional, national and international data must be used, in that order.

[51] Higuchi, N., dos Santos, J., Ribeiro, R.J., Minette, L. and Biot, Y., 1998. Biomassa da parte aérea da vegetação da floresta tropical úmida de terra-firme da Amazônia brasileira. *Acta Amazonica*, *28*, pp.153-153.

Purpose of data	Project emissions and project sequestration
Comments	As the project's emissions are calculated with allometric equations using DBH and tree height data from field plots, volume is not used.

Data / Parameter	R_j
Data unit	Dimensionless
Description	Root-shoot ratio appropriate for biomass stock, for species *j*
Source of data	IPCC Good Practice Guidance for LULUCF (2003) Table 3A.8
Value applied	0.24
Justification of choice of data or description of measurement methods and procedures applied	Rj must be sourced from data on local ecological systems. In case of unavailability of this data, regional, national and international data (Values from IPCC Good Practice Guidance for LULUCF (2003) Table 3A.8 "*Average belowground to aboveground biomass ratio (root-shoot ratio, r) in natural regeneration by broad category (tons dry matter/ton dry matter)" may be considered as per the forest type.)* must be used, in that order.
Purpose of data	Project emissions and project sequestration
Comments	IPCC Good Practice Guidance for LULUCF (2003) Table 3A.8 was used.

Data / Parameter	$S_{REDD,i}$
Data unit	Ha
Description	Land area on which REDD activities are planned under the project scenario for year *t* and in stratum *i*
Equations	6
Source of data	To be monitored from the records of project implementation and associated records such as KML files, vector files of land-use activities
Value applied	138,285
Justification of choice of data or description of measurement methods and procedures applied	Follow the procedures described in Section 8.1.8.
Purpose of data	Project emissions and project sequestration
Comments	As per the procedures described in VM0037, Section 8.1.8, the project area corresponds to Lowland Dense Ombrophilous Forest, as defined by the IBGE - Instituto Brasileiro de Geografia e Estatística. Landcover classification from satellite imagery was

	and will continue to be used to determine the extent of forest cover.

Data / Parameter	$S_{ARR,i}$
Data unit	Ha
Description	Land area on which ARR activities are planned under the project scenario for year t and in stratum i
Equations	16
Source of data	To be monitored from the records of project implementation and associated records such as KML files, vector files of land-use activities
Value applied	1000
Justification of choice of data or description of measurement methods and procedures applied	Follow the procedures described in Section 8.2.2
Purpose of data	Project emissions and project sequestration
Comments	Please also refer to section 3.2.2.

Data / Parameter	*EF*
Data unit	g kg^{-1}
Description	Emission factor of forest fires
Equations	10
Source of data	At the time of validation of baseline
Value applied	See comment
Justification of choice of data or description of measurement methods and procedures applied	Follow the procedure described in Section 8.1.8.1, under Forest Fire.
Purpose of data	Project emissions
Comments	Forest area lost to fire is calculated with the PRODES[52] datasets (DETER) and mean carbon content lost as per the average content derived from field plots used to calculate forest biomass.

[52] http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes

Data / Parameter	*Be*
Data unit	Dimensionless
Description	Burning efficiency
Equations	10
Source of data	Surveys and/or government approved reports
Value applied	See comment
Justification of choice of data or description of measurement methods and procedures applied	Follow the procedure described in Section 8.1.8.1, under Forest Fire.
Purpose of data	Project emissions
Comments	Forest area lost to fire is calculated with the PRODES[53] datasets (DETER) and mean carbon content lost as per the average content derived from field plots used to calculate forest biomass.

Data / Parameter	DBH
Data unit	centimeters
Description	Diameter at breast height (1.3 m above the ground)
Equation	-
Source of data	Field measurements
Value applied	Measured for every tree in existing field plots
Justification of choice of data or description of measurement methods and procedures applied	As the project's emissions are calculated with allometric equations using DBH and tree height data from field plots, DBH in monitoring plots must be measured.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Comments	To be measured for both REDD+ and ARR components.

[53] http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes

Data / Parameter	Ht
Data unit	Meters
Description	Total tree height
Equations	-
Source of data	Field measurements
Value applied	Measured for every tree in existing field plots
Justification of choice of data or description of measurement methods and procedures applied	As the project's emissions are calculated with allometric equations using DBH and tree height data from field plots, tree height in monitoring plots must be measured.
Purpose of the data	Indicate one of the following: • Determination of baseline scenario (AFOLU projects only) • Calculation of baseline emissions • Calculation of project emissions
Comments	To be measured for both REDD+ and ARR components.

3.3.2 Data and Parameters Monitored

Data / Parameter	ER_{yREDD}
Data unit	tCO_2e
Description	Net GHG emission reductions in year t. Here only REDD activities are being considered and only sinks based on REDD is to be recorded.
Equations	21
Source of data	Based on field inventories and implementation data. Where applicable data as per the SAR/LIDAR and /or Fractional downscaling is acceptable.
Description of measurement methods and procedures to be applied	Measurement methods involves appropriate stratification and sampling and field data collection of biomass and SOC.
Frequency of monitoring/recording	Before each verification
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records.

Purpose of data	Calculation of project emission reductions
Calculation method	
Comments	Used to calculate Net GHG emission reductions and removals.

Data / Parameter	BE_{YREDD}
Data unit	tCO_2e
Description	Baseline GHG emission reductions in year t. Here only REDD activities are being considered and only sinks based on REDD is to be recorded.
Equations	7, 20
Source of data	Calculated
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Before each verification.
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Calculation of baseline emission.
Calculation method	
Comments	

Data / Parameter	ER_{YARR}
Data unit	tCO_2e
Description	Net GHG removals by sinks, in year t. Here only ARR activities are being considered and only sinks based on ARR is to be recorded.
Equations	21
Source of data	Based on field inventories and implementation data.

Description of measurement methods and procedures to be applied	The total stock of new plantations as per ARR activity is calculated. Carbon content in the stock is estimated over time. The rate of change of carbon stock of each stratum is added to arrive at the total change in carbon.
Frequency of monitoring/recording	Before each verification.
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Project emissions and project sequestration
Calculation method	
Comments	

Data / Parameter	PS_{ARR}
Data unit	tCO_2e
Description	Project sequestration of GHG emission reductions in year t. Here only ARR activities are being considered and only sinks based on ARR is to be recorded.
Equations	22
Source of data	Calculated
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Before each verification
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Calculation of project emission
Calculation method	
Comments	None

Data / Parameter	BE_{ARR}
Data unit	tCO_2e

Description	Baseline GHG emission reductions in year t. Here only ARR activities are being considered and only sinks based on ARR is to be recorded.
Equations	22
Source of data	Calculated
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Before each verification
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Calculation of baseline emission
Calculation method	
Comments	

Data / Parameter	$B_{Trees\text{-}ARR}$
Data unit	Number/dimensionless
Description	Number of baseline trees for the ARR component
Equations	16
Source of data	Field survey
Description of measurement methods and procedures to be applied	Data collected from field enumerations. Details of the trees are to be recorded appropriately.
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification or before each verification.
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	To monitor carbon sinks
Calculation method	

Comments	

Data / Parameter	$Fuelwood_{forest}$
Data unit	t/year
Description	Amount of fuelwood collected from forests in a year.
Equations	8, 9
Source of data	Survey records, government documents
Description of measurement methods and procedures to be applied	The fuelwood collection pattern must be based on surveys and government data such as working plan and micro plans which have been approved. Separate fuelwood assessment studies also may be undertaken for this.
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification or before each verification.
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Project and leakage emissions
Calculation method	
Comments	

Data / Parameter	$Fuelwood_{agri}$
Data unit	t/year
Description	Amount of fuelwood collected from agriculture land in a year.
Equations	8, 9
Source of data	Survey records, government documents
Description of measurement methods and procedures to be applied	The fuelwood collection pattern must be based on surveys and government data such as working plans and micorplans which have been approved. Separate fuelwood assessment studies also undertaken for this
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification or before each verification.
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records

Purpose of data	Project and leakage emissions
Calculation method	
Comments	

Data / Parameter	FG_i
Data unit	$m^3\ yr^{-1}$
Description	Annual volume of fuelwood species i gathered
Equations	8,9
Source of data	Surveys and/or government approved reports
Description of measurement methods and procedures to be applied	The fuelwood collection pattern must be based on surveys and government data such as working plan and micro-plans which have been approved. Separate fuelwood assessment studies also may be undertaken for this.
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification or before each verification
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Project and leakage emissions
Calculation method	
Comments	

Data / Parameter	HT_i
Data unit	$m^3\ yr^{-1}$
Description	Annual volume of harvested timber, species i
Equations	11
Source of data	Surveys and/or government approved reports
Description of measurement methods and procedures to be applied	As per section 8.1.8.1, under the Unsustainable Timber Harvesting
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification or before each verification.

QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Project and leakage emissions
Calculation method	
Comments	

Data / Parameter	Ax_{fire}
Data unit	ha Yr^{-1}
Description	Area lost due to forest fire
Equations	10
Source of data	Surveys and/or government approved reports
Description of measurement methods and procedures to be applied	Area affected by forest fires may be ascertained from government reports. In the absence of such reports, or if these reports are inconclusive, FGDs may be conducted. The FGDs must be conducted of forest managerial staff
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification or before each verification
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Project and leakage emissions
Calculation method	
Comments	

Data / Parameter	Fl
Data unit	g m^{-2}
Description	Fuel loading per unit area
Equations	8, 9
Source of data	Surveys and/or government approved reports
Description of measurement methods and procedures to be applied	The fuelwood collection pattern must be based on surveys and government data such as working plan and micro-plans which have been approved. Separate fuelwood assessment studies also may be undertaken for this.

Frequency of monitoring/recording	Before each verification and at the time of baseline update
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records.
Purpose of data	Project and leakage emissions
Calculation method	.
Comments	

Data / Parameter	B_w
Data unit	ha yr^{-1}
Description	Average biomass stock of forest areas
Equations	12
Source of data	Tables 3A.1.2, 3A.1.3, and 3A.1.4 of IPCC GPG LULUCF
Description of measurement methods and procedures to be applied	As per section 8.1.8.1, under Illegal Mining and Quarrying, Encroachment and Expansion of Subsistence Agriculture by Conversion of Forest Land
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification or before each verification.
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Project and leakage emissions
Calculation method	
Comments	Please also refer to footnote 45.

Data / Parameter	F_{biol}
Data unit	Dimensionless
Description	Fraction of biomass left to decay in forest (transferred to dead organic matter)
Equations	12
Source of data	Default value to be sourced from table 3A.1.11 of IPCC GPG LULUCF

Description of measurement methods and procedures to be applied	As per section 8.1.8.1 given under Illegal Mining and Quarrying, Encroachment and Expansion of Subsistence Agriculture by Conversion of Forest Lands
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification or before each verification.
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Project and leakage emissions
Calculation method	
Comments	

Data / Parameter	*Fire type*
Data unit	Dimensionless
Description	The cause of forest fire: Major categories being human induced or fire due to natural causes.
Equations	10
Source of data	Surveys and/or government approved reports
Description of measurement methods and procedures to be applied	Cause of forest fires may be ascertained from government reports. In the absence of such reports, or if these reports are inconclusive, FGDs may be conducted. The FGDs must be conducted of forest managerial staff
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification or before each verification.
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Project and leakage emissions
Calculation method	
Comments	

Data / Parameter	$LC1_{y1} \rightarrow LC2_{y2}$
Data unit	ha

Description	Total land classified as stratum LC1 (ha) in time point y1 which has undergone transition to land classified as stratum LC2 (ha) in time point y2
Equations	3
Source of data	Remote sensing analysis
Description of measurement methods and procedures to be applied	Calculate based on the remote sensing classification and stratification procedures, as described under section 8
Frequency of monitoring/recording	At least once before every baseline update
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Determination of baseline scenario
Calculation method	It may be used for producing baseline transition matrix for new instances to be added into the project area.
Comments	

Data / Parameter	N_{LT}
Data unit	ha yr-1
Description	Land transition discounting factor due to scarcity of land
Equations	3
Source of data	Remote sensing analysis
Description of measurement methods and procedures to be applied	Described under section 8
Frequency of monitoring/recording	At least once before every baseline update
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Determination of baseline scenario
Calculation method	It may be used for producing baseline transition matrix for new instances to be added into the project area.

Comments	

Data / Parameter	$LC1_{y1}$
Data unit	Ha
Description	Total area of LULC class or forest stratum 1 at time 1
Equations	2
Source of data	Remote sensing analysis
Description of measurement methods and procedures to be applied	Described under section 8.1.6
Frequency of monitoring/recording	At least once before every baseline update
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Project and leakage emissions
Calculation method	
Comments	

Data / Parameter	$area_{projectareawithharvest,projectscenario}(t,i)$
Data unit	ha yr-1
Description	Size of strata i within the project area with harvest activities during year t under the project scenario.
Equations	16
Source of data	Remote sensing analysis
Description of measurement methods and procedures to be applied	This is relevant for ARR and LMZ
Frequency of monitoring/recording	At least once before verification
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records

Purpose of data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	$FW_{commercial}$
Data unit	$m^3\ yr^{-1}$
Description	Annual volume of fuel wood gathering for commercial sale
Equations	8, 9
Source of data	1. Participatory rural appraisals 2. Recent (<10 yr) literature in the reference region 3. Recent (<10 yr) literature in an area similar to the reference region
Description of measurement methods and procedures to be applied	Estimate among participating communities and communities living in the leakage area.
Frequency of monitoring/recording	At the start of the project activity and every five years since the initial verification or before each verification
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	LE_y
Data unit	tCO_2e
Description	Leakage emission in year y
Equations	18
Source of data	Surveys and spatial analysis

Description of measurement methods and procedures to be applied	Estimate among participating communities and communities living in the leakage area.
Frequency of monitoring/recording	Before each verification and at the time of baseline update
QA/QC procedures to be applied	Standard SOPs recommended in the methodology must be applied. Review of monitoring records
Purpose of data	Calculation of leakage emissions
Calculation method	
Comments	

Data / Parameter	DBH
Data unit	centimeters
Description	Diameter at breast height (1.3 m above the ground)
Equations	
Source of data	Field measurements
Value applied	Measured for every tree in monitored field plots
Justification of choice of data or description of measurement methods and procedures applied	As the project's emissions are calculated with allometric equations using DBH and tree height data from field plots, DBH in monitoring plots must be measured.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Comments	To be measured for both REDD+ and ARR

Data / Parameter	Ht
Data unit	Meters
Description	Total tree height
Equations	
Source of data	Field measurements
Value applied	Measured for every tree in monitored field plots

Justification of choice of data or description of measurement methods and procedures applied	As the project's emissions are calculated with allometric equations using DBH and tree height data from field plots, tree height in monitoring plots must be measured.
Purpose of the data	Indicate one of the following: • Determination of baseline scenario (AFOLU projects only) • Calculation of baseline emissions • Calculation of project emissions
Comments	To be measured for both REDD+ and ARR

3.3.3 Monitoring Plan

Organizational Structure and Responsibilities

To ensure the integrity of the monitoring process, key responsibilities in the process will be assigned to fixed positions within the REDDA team. These members will be overseeing the process and ensuring all the proper procedures are applied. Data collection will be performed by the field team.

Monitoring Component	Assigned to
Biomass monitoring	Contracted specialized company
Social monitoring	IRAMA
Biodiversity monitoring	Community parabiologists trained and supervised by REDDA specialists
Data collection and storage	REDDA
ARR monitoring	REDDA

Data and Data Storage

All data collected through the project activities will be stored in line with VCS requirements.

Monitoring of Woody vegetation for the REDD component

Monitoring will be performed every five (5) years by community members trained by forestry professionals in field data collection. Field data analysis will be performed by forestry professionals in REDDA. .

The data to be collected in the field must meet the needs to calculate a baseline of carbon stock for the project. REDDA already has 30 field plots established in the territories. These plots are squares of 30×30 m (0.09 – 9/100 ha) plots in which all trees above an inch in diameter were

measured for DBH (diameter at breast height – 1.3 m) and total tree height, as well as botanically identified.

The number of plots was calculated with the Winrock Sample Plot Calculator tool[54].

A nested square plot (Figure 17) was proposed for the field inventory and measurement of woody vegetation. Measurement shall be performed as follows, according to the methods outlined in Winrock's SOP guide[55].

Materials and precision to be applied:

1. GPS receiver or GPS app in a smartphone with GPS capabilities; in the case of the latter having a power bank at the ready is necessary to make sure the battery does not die before the end of the day. In lieu of paper forms, an app such as Fulcrum on a smartphone is required for field data recording.

2. Measurement for DBH must be made with a diameter tape, graduated in cm, with a precision of ±0.1 cm. Follow the guidelines in
3. Figure 18[56] for measuring tree diameter in different situations. Tree diameter must be measured and recorded in centimeters.

4. A 30 m meter measuring tape must also be available for performing distance measurements, for instance, when measuring the sides of the plots. It is advisable to have this available even if the height meter (hypsometer) has a range finder.

5. A 1.3 m -long straight stick must be used to determine the height at which the tree diameter is to be measured.

Procedure to be followed:

1. Within the large 30x30 m plot, known as Subplot A (*Sub-parcela* A) DBH of all trees within the plot must be measured if the DBH is equal or above 50 cm.

2. Within the medium 20x20 m plot (*Sub-parcela* B), DBH of all trees within the plot must be measured if the DBH ranges between 20 and 50 cm.

3. Within the small 7x7 m plot (*Sub-parcela* C), DBH of all trees within the plot must be measured if the DBH ranges between 50 and 20 cm.

4. Tree height of all trees within the plot for which DBH is measured must also be taken, with an instrument that allows for ±0.5 m precision in the measurements, like a clinometer, a Haglöf Vertex or a Lasertech TruPulse, etc. To take this measurement, the field staff in charge of measurements shall stand at a distance from the tree similar to the observed height. Tree heigh must be measured and recorded in meters and instruments must always be used. Under no circumstances must naked-eye estimations of tree height be made and recorded.

5. Botanical identification of all trees must be performed.

54 https://winrock.org/document/winrock-sample-plot-calculator-spreadsheet-tool/
55 Walker, S.M., Pearson, T.R.H., Casarim, F.M., Harris, N., Petrova, S., Grais, A., Swails, E., Netzer, M., Goslee, K.M. and Brown, S., 2012. *Standard Operating Procedures for Terrestrial Carbon Measurement:* Version 2012. Winrock International. Distribution.
56 Fernández-Vásquez, S. de J. y Cardona-Granda, J.M. 2005. *Guia para el levantamiento de parcelas de inventario forestal.* Silvano Ltda. 81 p.

6. Palms, lianas, bamboos and arborescent herbs (like the "sororoca" *Phenakospermum guyannense* must also be measured if the DBH fits the plot where it is located).
7. The place in the tree stem where the DBH is measured must be marked with a brush and permanent paint; it is not necessary to paint all the way around the tree: only a 10-cm long strip as wide as the brush is enough.

8. Each tree measured must be assigned a number within the plot, which must be marked with permanent paint in the trunk.

Figure 17. Nested square plot

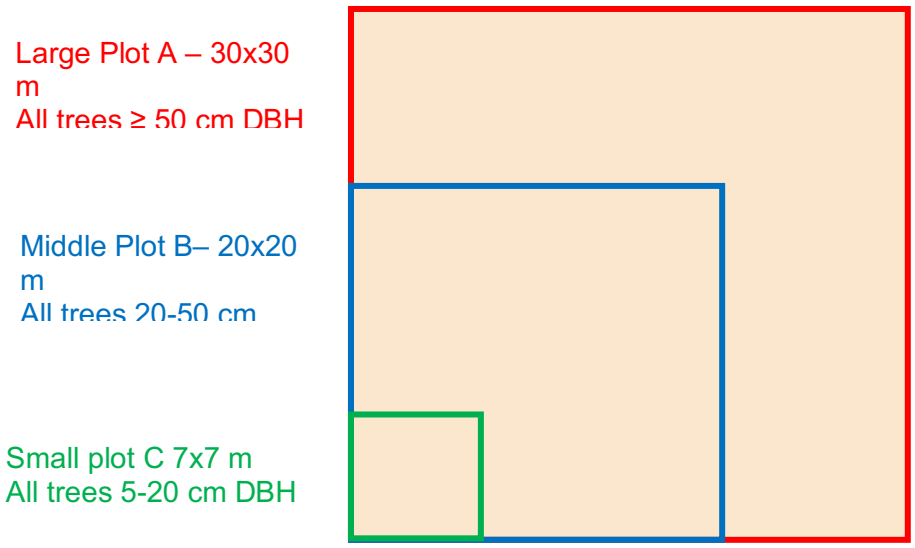
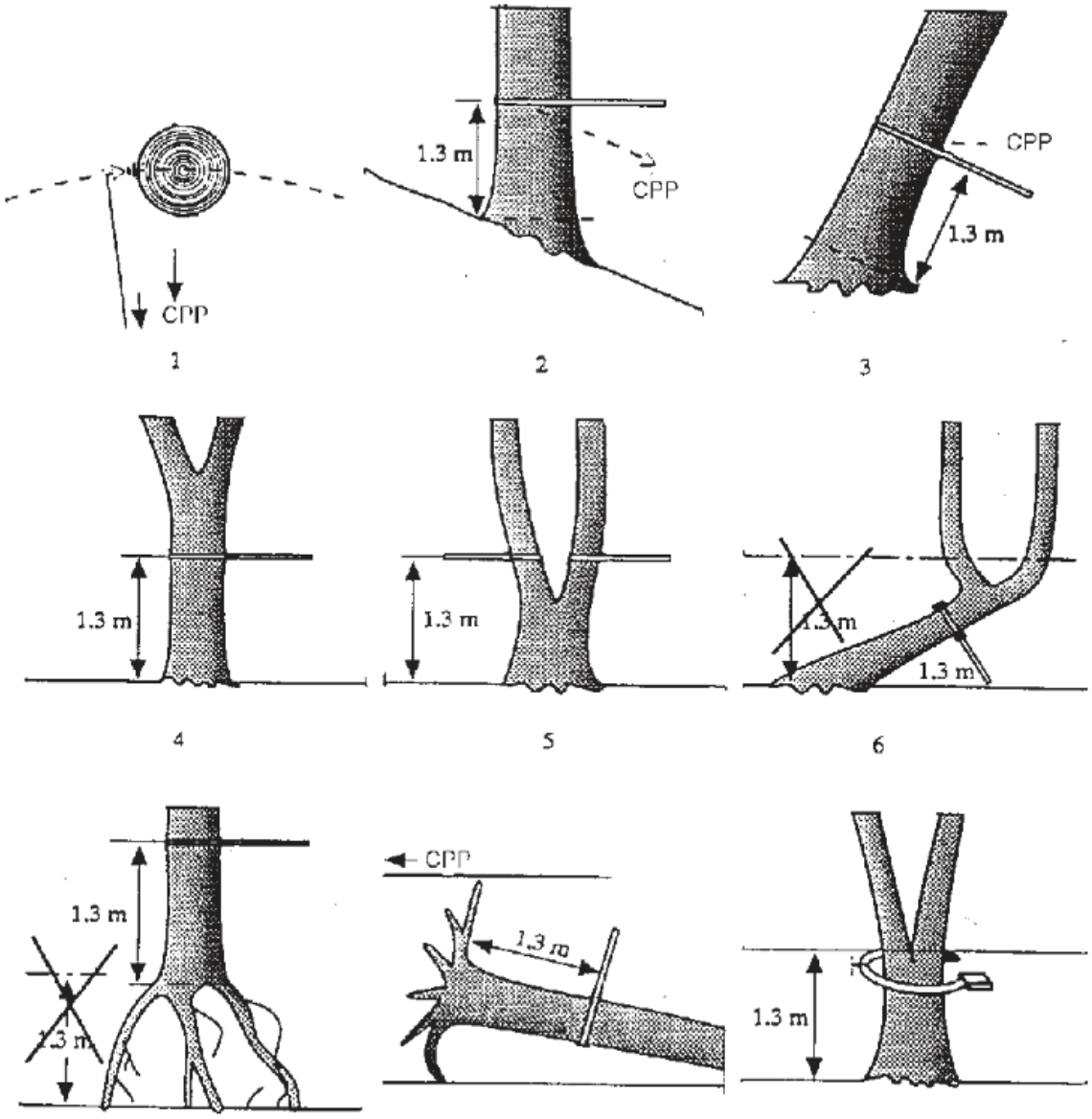


Figure 18. Different situations encountered when measuring tree diameter



1) border tree stem must be at least 50% inside the plot; 2) measuring diameter in sloping terrain must be done in the uphill side; 3) 5) , in leaning trees measure along the stem and not vertically, 4) forked tree above 1.3 m is considered 1 single tree; 5) forked tree below 1.3 m is considered two trees; 6) 5) in leaning forked trees measure along the stem and not vertically; 7) in trees with buttresses or stilt roots measure the 1.3 m above the place where roots end and cylindrical bole begins 8) Fallen trees are measured along the stem; 9) if the fork is just at 1.3 m measure just below.

REDDA will perform an audit which will include measuring 10% of the plots (chosen randomly) by a forestry professional after the community monitoring is done.

Monitoring of Woody vegetation for the ARR component
Monitoring will be performed every two (2) years by community members trained by forestry professionals in field data collection. Field data analysis will be performed by forestry professionals in REDDA.

Two plots per each 25 hectares planted must be established, so when the full 1000 hectares are planted, 80 plots will be available.

Materials and precision to be applied:

1. GPS receiver or GPS app in a smartphone with GPS capabilities; in the case of the latter having a power bank at the ready is necessary to make sure the battery does not die before the end of the day. In lieu of paper forms, an app such as Fulcrum on a smartphone is required for field data recording.

2. Measurement for DBH must be made with a diameter tape, graduated in cm, with a precision of ±0.1 cm. Follow the guidelines in
3. Figure 18[57] for measuring tree diameter in different situations. Tree diameter must be measured and recorded in centimetres.

4. A 30 m meter measuring tape must also be available for performing distance measurements. It is advisable to have this available even if the height meter (hypsometer) has a range finder.

5. A 1.3 m -long straight stick must be used to determine the height at which the tree diameter is to be measured.

Procedure to be followed:

1. Plots for ARR must be circular, 400 m² (11.28 m radius) plots.

2. All trees within the plot with a DBH of 3 cm or more should be measured. This also true for non-planted trees growing within the plot either pre-existing or growing naturally on their own in later years.

3. Botanical identification of all trees measured must be recorded.

4. Palms, lianas, bamboos and arborescent herbs (like the “sororoca” *Phenakospermum guyannense* must also be measured if the DBH is above 3 cm.

5. The place in the tree stem where the DBH is measured must be marked with a brush and permanent paint; it is not necessary to paint all the way around the tree: only a 10-cm long strip as wide as the brush is enough.

6. Each tree measured must be assigned a number within the plot, which must be marked with permanent paint in the trunk.

7. Tree height of all trees within the plot for which DBH is measured must also be taken, with an instrument that allows for ±0.5 m precision in the measurements, like a clinometer, a Haglöf Vertex or a Lasertech TruPulse, etc. To take this measurement, the field staff in charge of measurements shall stand at a distance from the tree similar to the observed height. Tree height must be measured and recorded in meters and always instruments must be used. Under no circumstances must naked-eye estimations of tree height be made and recorded.

57 Fernández-Vásquez, S. de J. y Cardona-Granda, J.M. 2005. *Guia para el levantamiento de parcelas de inventario forestal.* Silvano Ltda. 81 p.

Land cover and land use change
Professionals from REDDA will use satellite imagery for the monitoring of Land Cover and Land use. REDDA also has a network of nature inspectors, who, in the event of any undue interaction, call the central office, so that through remote sensing they can assess the data obtained by locals.

The community is primarily interested in keeping the forest standing and every day of the week, 24 hours a day, they monitor the movement of people down and up roads and rivers. These access pathways are the main driver to degradation and the main outlet for local hunting, logging, and fishing. Identification of unofficial roads can be done using satellite images through the methodology used by the Instituto do Homem e Meio Ambiente da Amazônia (IMAZON[58]), and only the local communities that are able to follow the unbridled evolution of these routes.

The Institute for Space Research (INPE), a unit linked to the Ministry of Science, Technology and Innovation (MCTI) created the monitoring of Forest Degradation in the Brazilian Amazon – DEGRAD[59], a system that aims to map the regions that are in the process of degradation.

With the discontinuation of DEGRAD, information began to be obtained from DETER[60] data (Real Time Deforestation Detection System). It is a system designed to map areas in the process of deforestation where the forest cover has not yet been completely removed.

Through the "TerraBrasilis"[61] Portal, the integrated datahub for queries, analysis and parameterization of data can be done through interactive spreadsheets and maps of the relationship burned with deforestation through the monitoring of native vegetation. Another way of monitoring degradation is the FIRMS system[62], an interactive map that integrates NASA, Planet and Sentinel databases.

The Dynamic World[63] dataset uses satellite images, which are typically acquired and processed in near-real-time. Unlike global land cover products, which have historically been produced on an annual basis, often with substantial lag times between image processing and dataset release. Dynamic world is an automated approach for globally consistent, high resolution, near real-time (NRT) land use land cover (LULC) classification leveraging deep learning on 10 m Sentinel-2 imagery[64]. It utilizes a highly scalable cloud-based system to apply this approach and provide an open, continuous feed of LULC predictions in parallel with Sentinel-2 acquisitions. This first-of-its-kind NRT product, which we collectively refer to as Dynamic World, accommodates a variety of user needs ranging from extremely up-to-date LULC data to custom global composites representing user-specified date ranges. Furthermore, the continuous nature of the product's outputs enables refinement, extension, and even redefinition of the LULC classification. In combination, these unique attributes enable unprecedented flexibility for a diverse community of users across a variety of disciplines.

Other platforms, still in early stages such as CTREES[65], which will provide fine spatial resolution datasets for measuring carbon stocks in forests, will also be used as they become available.

All the above present timely and near-real-time data suitable for monitoring of deforestation, degradation and landcover evolution in the Brazilian Amazon and will be used for the Marajó

[58] https://imazon.org.br/en/
[59] http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/degrad
[60] http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/deter/deter
[61] http://terrabrasilis.dpi.inpe.br/app/map/deforestation?hl=en
[62] https://firms.modaps.eosdis.nasa.gov/map/
[63] https://www.dynamicworld.app/
[64] https://www.nature.com/articles/s41597-022-01307-4
[65] https://ctrees.org/

REDD+ Project. The set of tools presents parameters so that, through a frequency, the control of information brings a careful analysis of the quality of the analyzed biome.

In order to support the monitoring process, REDDA has developed SIMA - Environmental Monitoring Integrated System (in Portuguese: Sistema Integrado de Monitoramento da Ambiental). SIMA identifies, maps and monitors the changes in the landscape of the project area with regards to the aspects that imply a detrimental and/or invasive change in use and coverage, evaluating the following aspects: (i) Identification of deforestation spots in the region; (ii) Degradations: mining, wood extraction (authorized and not authorized), burning, among others; (iii) Fishing and predatory hunting.

SIMA has three main lines of action: (1) Capacity-building and training courses aimed at evaluating the identification of anthropic actions identified by remote sensing or field activities; (2) Identification and mapping of landscape use and cover change activities by remote sensing; (3) Field evaluations of use and cover change activities, with the help of those engaged to protect the forest, in which the community is the protagonist in protecting its territory.

Biodiversity Monitoring

The project implements two main activities to monitor the biodiversity in the project area:

1. The project employs members of the Ribeirinho communities to patrol the project area. Besides the monitoring of the land encroachment, these patrols are an opportunity to monitor the wildlife. Since the participating members are well-acquainted with this forest, they are able to make a qualitive assessment of the net impact of the project activities on the biodiversity.

2. The project has installed motion triggered wildlife cameras on several points within the project region. The recorded footage is collected by the patrol staff and subsequently analysed and stored by the REDDA team.

Besides these monitoring activities, the biodiversity in the area has a strong correlation with the forest health. Significant improvements in canopy cover are likely to have a strong positive impact on the animal biodiversity.

3.3.4 Dissemination of Monitoring Plan and Results (CL4.2)

All results will be publicly available on the internet and summaries shall be developed that will be communicated to communities and other interested parties through appropriate means. In addition, all documents and information on the results of monitoring and verification will be published on the VCS and CCB standards platforms. REDDA has extensive experience in disseminating the information about the project to communities. The most effective means agreed with them is the dissemination of periodic information in social media on the progress of the project in all its phases. The monitoring plan and results will be disseminated eventually in Portuguese. The project will establish the tele-centers with internet facilities so that the communities will access the information as and when required.

3.4 Optional Criterion: Climate Change Adaptation Benefits

Not applicable.

4 COMMUNITY

4.1 Without-Project Community Scenario

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

The State of Pará is divided into 144 municipalities and 12 integration regions, its capital is the municipality of Belém (the most populous city in the state), which presents a region metropolitan area determined by the municipalities of Ananindeua, Belém, Benevides, Marituba, Santa Bárbara do Pará and Santa Izabel do Pará. These are home to the largest fluvio-maritime island in the world: the Marajo archipelago. The project area is a complex ecosystem and landscape throughout the area, concentrated in the Municipality of Portel/PA, where it houses the local communities.

The Marajó Archipelago has enormous water resources and makes up an extensive territoriality of islands and rivers. It considers 17 (seventeen) municipalities – Afuá, Anajás, Bagre, Breves, Cachoeira do Arari, Chaves, Curralinho, Gurupá, Melgaço, Muaná, Ponta de Pedras, Portel, Salvaterra, Santa Cruz do Arari, Sebastião da Boa Vista, Soure and Oeiras do Pará (the latter became part of the of the Marajó Integration Region in January/2022) – in the mentioned regions, which have geographic, climatic and cultural peculiarities as well as extreme poverty scenarios resulting from its weakened economy that results in low Municipal Human Development Indexes (IDHM).

The Portel microregion is part of the Pará Hydrographic Planning, and seven macro hydrographic regions are established in Pará, namely the: Atlantic Coast-Northeast, Tocantins-Araguaia, Xingu, Tapajós, Baixo Amazonas, Calha Norte and Portel-Marajó, highlighting the importance of the region, in order to guide the planning and management of water resources in the State. The hydrographic region of Portel – Marajó occupies[66] an area of 10.8% of the area of the State, comprising the basins of the Anapú and Pacajá rivers, through the basins of the western Marajó and eastern Marajó regions, having as main drainages the rivers Marinau, Tueré, Pracuruzinho, Curió, Pracupi, Urianã, Arataí, Mandaquari, Alligator-Paru Grande, Jacaré Paruzinho river, Anajás, Aramã, Alligator, Cururu, Afuá, Jurupucu, Jurará and dos Macacos. It encompasses the municipalities of Portel, Pacajá, Catfish, New Division, Anapú, Breves, Chaves, Afuá, Anajás, Curralinho, São Sebastião da Boa Vista, Muana, Soure, Salvaterra, Arari Waterfall, Santa Cruz do Arari and Ponta de Pedras. The hydrographic sub-regions Calha Amazonica, Marajó Ocidental, Marajó Oriental, Pará River adn Caxuanã Bay form these.

However, social indicators in Marajó, including Portel, point to low quality of life of the people who inhabit these territories, with minimal economic conditions, lack of access to formal employment, lack of access to healthcare, high dependence on public policies for social assistance, low quality of education, with high illiteracy rates, age-grade distortion and low Basic Education Development Index (IDEB), according to analysis of official data extracted from the Brazilian Institute of Geography and Statistics (IBGE), from the Amazon Foundation for Studies and Research (FAPESPA), from the Instituto National Institute of Educational Studies and Research Anísio Teixeira (INEP), DATASUS and TC Educate, presented later in this section.

To structure the concept of social change, with and without the project, we present the scenario of the municipality, beginning with the situational diagnosis, jointly outlining with the community indicators and timed goals as well as the necessary conditions to reach the desired results (with their causal relationships). These elements underlie the definition of interventions necessary to achieve the results identified as preconditions for achieving the long-term goal[67]. Jointly connected

[66] Fundação Amazônia de Amparo a Estudos e Pesquisas – Fapespa (2020). Pará em números 2020. [https://tinyurl.com/4y3tat4z]

[67] Borges, A.S., 2014. Notas para uma teoria da mudança social em Herbert Marcuse. *Psicologia & sociedade*, *26*, pp.533-539.

with the High Conservation Value approach and as a necessary condition for detection of important values and areas, information gaps are identified and discussion among stakeholders on long-term sustainability in their landscapes initiated. The Marajó REDD+ Project presents the local scenario based on indicators linked to socioeconomic, culture and well-being, access to health and social assistance and education and training for sustainable work, demarcating the process of monitoring, follow-up and development of the Project region in five the territories described above in Table 8. At the time of diagnosis and design at the beginning of the work in the communities, the elements of social and economic diversity, interactions and way of life were considered for these communities with strong similarities between them, including in the work shared. Thus, the most relevant themes are presented, connecting data from all these communities and the municipality itself.

Socioeconomic, Cultural and Well-Being Indicators

The vegetation of the state of Pará is determined by the Amazon rainforest (tropical rainforest rainfall), with a population of 577,790 thousand people, of which only 11% (63,831) live in the Municipality of Portel[68].

It is worth noting that the municipality has a balanced division of the POPULATION by sex: 53% of men and 47% of women, with aging rate of 14.05%[69]. With regard to the labor market, Marajó has 28,254 (twenty-eight thousand, two hundred and fifty-four) formal employment bonds, 13,934 of which were male and 14,320 female bonds. Portel represents 14.8% of this total, with 4,189 (four thousand, one hundred and eighty-nine) formal jobs (2,098 male positions and 2,091 male positions female)[70].

In relation to FORMAL EMPLOYMENT, with labor rights insured, 86% (3,617) are in Public Administration, 4.4% (184) are in industry transformation, such as lumber, 4% (182) are in commerce, and the rest in services and others. Data that reveal that the traditional population living in the countryside, forests and rivers has a high rate of unemployment, being in the job occupation scenario, the one that the person undertakes an informal income-seeking function on their own, a fact that in the initial diagnosis model of the project is evidenced.

A survey was carried out by the socio-environmental team of REDDA from 17 December to 19 December 2021. In total, 70 families were interviewed. During the interview, we asked the family to indicate a family representative responsible for answering the interview questionnaire. In between these family representatives 51% are men and 49% women, aged between 18 years (3%) and 75 years (3%), with the highest percentage (7%) being 44 years. Self-declared browns correspond to 67% and blacks to 29%. 43% constitute a stable union and 41% are married.

All interviewees have an identification document (Individuals Register - CPF and General Registry - RG). Regarding the housing situation in the project are, it was observed that 94% of families live in houses with wooden structures, 81% with wooden floors and 16% with a masonry floor, thus making the structural construction a hybrid house. 29% of the roofing of the houses is made of clay tile or, in an equal percentage, of straw. 14% combine straw and tile to cover the roof of their houses. The average number of residents in a house is 6.8%, with a single house housing a total of 13 people from the same family. The division by rooms in the residential structures are: in a single room (31%), up to two rooms (29%), up to three rooms (24%), where the family organizes a kitchen, bedroom and living room, and reaching up to 8 rooms (1%).

Despite the supply of clean energy, 89% of households source electricity from a diesel engine, 50% have candles and/or lamps and 38% solar panels installed in the communities by the company responsible for supplying electricity in the state of Pará, Equatorial, through the Abrace o Marajó project (a project that has received funding from the federal government via the Mais Luz Amazônia program). Firewood is used as a source of heat in food preparation (51%), followed by cooking gas

[68] https://ibge.gov.br/
[69] https://ibge.gov.br/
[70] https://portalfat.mte.gov.br/relacao-anual-de-informacoes-sociais-rais/

(39%) and coal (10%). The basis of the riverine diet is cassava, maniva, fish and game animals as a customary practice going back millennia.

Regarding HEALTH ISSUES of the riverside populations, the research identified that 81% of families do not have a bathroom inside the house, 51% do not have vases or sanitary cesspools, 33% do not have a bathroom and use the forest to dump solid and liquid waste. Garbage is disposed of by burning the solid waste (76%), composed mostly of plastic and biodegradable food leftovers. 18% of this waste is buried in areas close to homes. The population interviewed recognizes that the disposal of materials such as plastic, which according to the research corresponds to 80% of daily waste disposal, can be recycled and reused in their daily use and even commercialized. However, there is no incentive for this activity.

The research identified that 84.28% of the interviewees work as family farmers, with no formal employment relationship, working in the informal sector, selling the surplus of their production. 7% perform work functions with a fixed employment relationship, 7% are public servants and 6% are retired. 44% declared that the main source of family income is from the sale of flour and derivatives, 21% indicate that the family's monthly financial resource comes from marketing food outputs that they produce in the fields and 34% declare that the income family is linked, at the same time, to the commercialization of flour and derivatives and outputs from the fields. The interviewees reported that the average number of hours worked per day is around 8 hours (32.85%), 5 hours corresponding to 15.71% of the interviewed, 14.28% indicated that they work an average of 9 hours and 10% say work 4 and 6 hours a day. This average of hours worked fluctuates according to the period of the year, production demand, planting and/or harvesting stage and processing that the raw material needs.

The income of these families is around R$500.00 (53%) to R$1,100.00 (34%), also varying according to the monthly sales of products produced by the family. Regarding the experience of communities in forest areas, one can highlight that the Municipalities of Marajó contains 65,527.40 km2 of forested area, with most of this area being in the municipality of Portel. In this huge landscape of forests, there are a number of structural problems such as illegal logging, fires and deforestation, subsistence with hunting of animals and deforestation for the insertion of crops, with a high degree of lack of knowledge about the damage caused to the soil, water and biodiversity.

In 2020, Portel accumulated 2,620km² of deforestation by fires[71]. This strongly affects the territories linked to the Project. All the interviewees claimed to perceive climate change in the places where they live in the last 10 years. The main changes cited were climate-related: more hot weather (59%), increased rainfall and flooding (29%) and prolonged droughts (8%) in certain periods of the year. Deforestation leads, with 46%, as the main problem mentioned by the interviewees, followed by illegal hunting with 25% and fires with 13%. 14.49% were unable to indicate any environmental problem in their housing area.

In a follow-up survery, the interviews showed that 56% of the interviewees noticed that the areas of forest in the communities where they live have decreased considerably since 2010. 26% say that the areas of preserved forest in their communities remained the same and 19% indicate that there has been a subtle increase. Of the interviewees, who stated that there was an increase, 79% declare that it occurred in a natural way and 21% indicated that the reforestation process was responsible for this increase. Regarding the extraction of wood in the territory, 57% declare that there is no extraction of wood and 43% indicate that there is extraction of wood.

Of the latter, 71% stated that extraction is linked to logging / professional forest management and 29% indicated that the extraction activity is intended for subsistence use. Of those who consider that there was a decrease., they attribute this process to deforestation (66%), agriculture (15%), logging / professional forest management (12.76%) and fires to clear land (6.38%). There is unanimity regarding the importance of conserving the copper forest in the territories, where these

[71] https://queimadas.dgi.inpe.br/queimadas/bdqueimadas

families live and an awareness of the factors that can influence the destruction of this forest and the community itself. About the latter topic, the interviews pointed out that 49% consider that the timber trade is the factor that most influences the destruction of native forests close to the researched communities, followed by new pastures with 21%, agriculture with 4% and pebble extraction with 1%.

Those who were unable to give an indication correspond to 11.76% and those claim there is no indicator of influence for the increase in deforestation in areas close to its community correspond to 10.58%. Deforestation of the Amazon biome is a multifactorial environmental problem, or that is, there are many reasons that cause this environmental phenomenon in Brazil. The report Annual Report on Deforestation in Brazil 2021, published by the MapBiomas Alerta Project[72], indicates exponential growth of deforested areas in Brazil. The study was carried out for different territorial (state, municipality, biome) and land (rural properties, settlements, UCs, TIs) types.

The study also assessed evidence of illegality, the main drivers of deforestation and actions carried out by federal and state public bodies to control the problem. The State of Pará was the state with the largest hectares of deforested area in 2021. The loss was 402,492 ha, equivalent to 24.3% of the total deforested in the country. Of the 10 municipalities responsible for 23% of the country's total deforestation in 2021, Portel, municipality of Pará, where the Marajó REDD+ Project is being implemented, appears in 9th place. Of the families interviewed, 53% collect non-timber forest products for family and collective use in the community (86%) or for marketing purposes (14%). The products cited as examples by the interviewees included: bark, roots (cassava), oils (pracaxi, aloe copaiba and others), seeds, leaves, bee honey and fruits (pineapple, cashew, cocoa, copuaçu, bacaba palm and others).

Indicators of Access to Health and Social Assistance

With regard to access to Health, some important points are highlighted pertaining to the municipality of the Marajó REDD+ Project, with data from DATASUS[73], referring to the year of 2020:

- Infant mortality rates reached a rate of 8.62, with 13.9 being under 5 years old. The situation worsens when it comes to maternal mortality, with a rate of 132.8 due mainly to the high concentration of traditional people's children being delivered at home, with the help of traditional midwives (woman with inherited knowledge in the community that assists).
- Regarding the general mortality rates and percentage of deaths by gender, as of 2020, Portel has a total of 228 deaths, 65.3% of which were women.
- Physicians and health professionals attending to the communities are centered in a single municipal hospital. There are no medical posts with fixed doctors in the territories and forests, nor periodical service. There are some campaigns and lectures carried out throughout the year.

Therefore, presenting a substantial lack in the search for specialized medical care. See table below:

[72] https://alerta.mapbiomas.org/
[73] https://datasus.saude.gov.br/

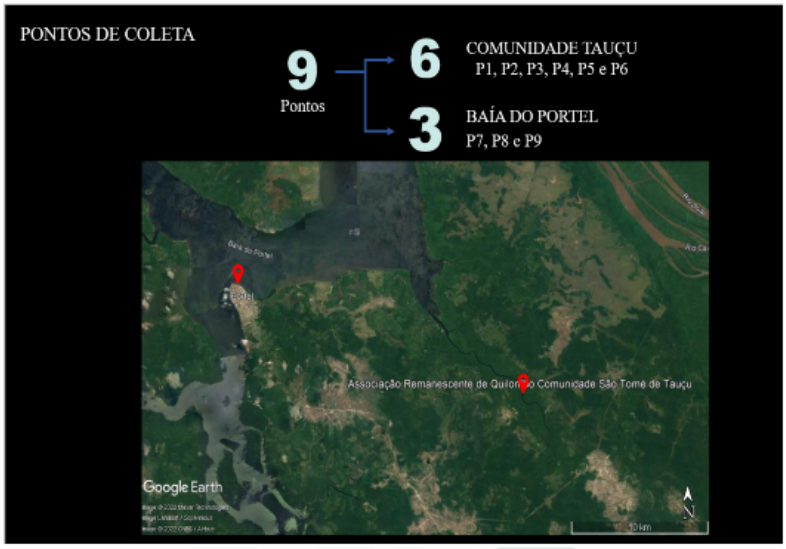
Table 20. Physicians and high-level healthcare professionals in Pará

State/ Municipality	Physicians	Social assistants	Chemist-pharmacists	General practitioners	Nurses	Physiotherapists	Phono audiologists	Obstetrician gynecologist	Family physician	Nutritionists	Dentist	Pediatrician	Psychologists	Other medical specialists	Other higher-level occupations related to Health
Pará	8,220	1,383	1,055	3,023	8,281	1,829	499	356	988	812	2,723	672	1,153	2,397	1,555
RI Marajó	156	42	24	51	297	25	9	-	78	26	72	8	21	15	46
Portel	13	4	2	5	34	3	1	-	8	2	7	-	2	-	6

Source https://www.fapespa.pa.gov.br/sistemas/radar2021/

It must be noted that in the municipality of the Marajó REDD+ Project, there is only one (01) public hospital, HOSPITAL MUNICIPAL DE SAUDE DE PORTEL, known as the Hospital General. Another important point in listening to the communities refers to the quality of the Water, which directly impacts the health of communities. For this diagnosis, REDDA hired the Amazon Water Quality Laboratory - LabÁgua to perform microbiological analysis (total coliforms, thermotolerant coliforms and E. Coli) and physicochemical (pH, conductivity, dissolved oxygen, turbidity, color, iron and temperature) of water from the São Tomé Taucú community and from the port of the municipality of Portel. The studies indicated the quality of the water consumed by the population and the treatment methodologies of that water for human consumption. The collection points were as follows:

Figure 19. Water sampling points



Fonte: Base de dados Redda+ Projetos Ambientais, 2022.

P1 is located at the source of the Acutipereira River (Latitude: 1°59.2040'S Longitude: 50° 37.6030'W).

At the time of collection, the area was flooded. The results of the analysis were:

PARÂMETRO	UNIDADE	RESULTADO	MÉTODO	LD
Temperatura	°C	23,5	SM 2550B	-
pH	-	5,3	SM 4000/4500 H^+	0,10
Condutividade	µS/cm	13,8	SM 2000/2510	0,01
Turbidez	NTU	11,27	SM 2000/2130B	0,09
Oxigênio Dissolvido	mg/L O_2	9,5	SM 4000/4500-O (G)	0,1
Cor Aparente	mg Pt Co/L	40	SM 2120C	-
Ferro total	mg/L	0,458	SM 3000/3111B	0,02
Col. Totais	NMP/100mL	Presença	SM 9000/9223	-
Col. Termotolerantes	NMP/100mL	Presença	SM 9000/9223	-
E. Coli	NMP/100mL	Presença	SM 9000/9223	-

Point P2, it is located at the entrance to the water tank of the São Tomé community. Tauçú (Latitude: 1º59.4390'S Longitude: 50° 37.9450'W), exit from the well with water underground, responsible for supplying the community. The result of the analysis follows in the table below:

PARÂMETRO	UNIDADE	RESULTADO	MÉTODO	LD
Temperatura	°C	26,4	SM 2550B	-
pH	-	5,13	SM 4000/4500 H^+	0,10
Condutividade	µS/cm	18,72	SM 2000/2510	0,01
Turbidez	NTU	6,34	SM 2000/2130B	0,09
Oxigênio Dissolvido	mg/L O_2	10,2	SM 4000/4500-O (G)	0,1
Cor Aparente	mg Pt Co/L	ND	SM 2120C	-
Ferro total	mg/L	0,053	SM 3000/3111B	0,02
Col. Totais	nmp/100mL	Presença	SM 9000/9223	-
Col. Termotolerantes	nmp/100mL	Presença	SM 9000/9223	-
E. Coli	nmp/100mL	Presença	SM 9000/9223	-

Point P3 was collected from the tap on the bridge in front of the community (Latitude: 1º59.4540'S Longitude: 50°37.9590'W), close to the community pier, where there are houses and nearby communities that collect tap water for daily consumption. After analyzing, the studies have indicated the below:

PARÂMETRO	UNIDADE	RESULTADO	MÉTODO	LD
Temperatura	°C	26,,9	SM 2550B	-
pH	-	4,86	SM 4000/4500 H^+	0,10
Condutividade	µS/cm	18,66	SM 2000/2510	0,01
Turbidez	NTU	<LD	SM 2000/2130B	0,09
Oxigênio Dissolvido	mg/L O_2	10,4	SM 4000/4500-O (G)	0,1
Cor Aparente	mg Pt Co/L	ND	SM 2120C	-
Ferro total	mg/L	0,047	SM 3000/3111B	0,02
Col. Totais	NMP/100mL	Presença	SM 9000/9223	-
Col. Termotolerantes	NMP/100mL	Ausência	SM 9000/9223	-
E. Coli	NMP/100mL	Ausência	SM 9000/9223	-

Point P4 is on the faucet of the kitchen sink integrated to the Deus Municipal School Está Contigo (Latitude: 1º59.4140'S Longitude: 50°37.9290'W) in the quilombola community. At the time of collection, the researchers identified a fabric used as a filter. See the next table:

PARÂMETRO	UNIDADE	RESULTADO	MÉTODO	LD
Temperatura	°C	25,6	SM 2550B	-
pH	-	4,63	SM 4000/4500 H^+	0,10
Condutividade	µS/cm	18,99	SM 2000/2510	0,01
Turbidez	NTU	2,11	SM 2000/2130B	0,09
Oxigênio Dissolvido	mg/L O_2	9,0	SM 4000/4500-O (G)	0,1
Cor Aparente	mg Pt Co/L	ND	SM 2120C	-
Ferro total	mg/L	0,051	SM 3000/3111B	0,02
Col. Totais	NMP/100mL	Presença	SM 9000/9223	-
Col. Termotolerantes	NMP/100mL	Ausência	SM 9000/9223	-
E. Coli	NMP/100mL	Ausência	SM 9000/9223	-

When asked about the treatment of this water for family consumption, 51% state that they submit the water to treatment before consuming it and 22% mention that they do not treat the water prior to consumption. Water treatment practices mentioned for family consumption included the cloth filter, boiling and hypochlorite. In the interviews it was indicated that the method of using a cloth filter is not combined with any other chemical method thus limiting its effectiveness in removing contaminants. It can be said that actions linked to water treatment and health will be the key focus for transforming the local situation, which has been in place for decades with poverty and vulnerability dominating the daily lives of the people.

This is confirmed by the data of the municipality of the total families enrolled in CadÚnico with a per capita family income of up to 1/2 minimum wage: 8,963 families, of which 75.8% received Bolsa Família in 2020. Regarding the interviewees' access to financial aid through governmental social policies, 53% declared that they did not receive any type of financial benefit and 47% affirm that

they were in receipt of, at the time of the interview, a financial benefit via social assistance. Cited in the interviews was Auxílio Brasil, Law 14,342/22, which replaced the Bolsa Família Program.

Education and Training for Work Indicators

According to the latest Human Development Index Municipal Council (IDHM) survey carried out in 2010 by the United Nations Program for the (UNDP), 6 (six) municipalities in Marajó were in the Very Low Human Development, 9 (nine) municipalities in the Low Development range Human Development, and 2 (two) municipalities in the Medium Human Development range, with educational indicators that reveal the low performance of the education network in all counties.

This result presented by the municipal HDI is affected, among other determinants, by the educational indicators occurring in each municipality, and in this case also involves the result presented by the state education network. At first, it leads to understand that the result of the educational indicators that year was not satisfactory. Educational data for 2019, ten years after the release of the IDHM, demonstrate that the unfavorable context in Marajó has not been resolved, with problems that last for decades, and on which, the data that follow are presented.

The average failure rate of students in the municipalities that make up Marajó is 17.22% in the initial years and 15.21% in the final years, presenting a much higher rate than the failure rate in the state of Pará, in which the index is around 10% in the initial and final years. Also the dropout rate of students from Marajó is almost two times higher than the average for the rest of the state.

Figure 20. Passing rate of students 2019

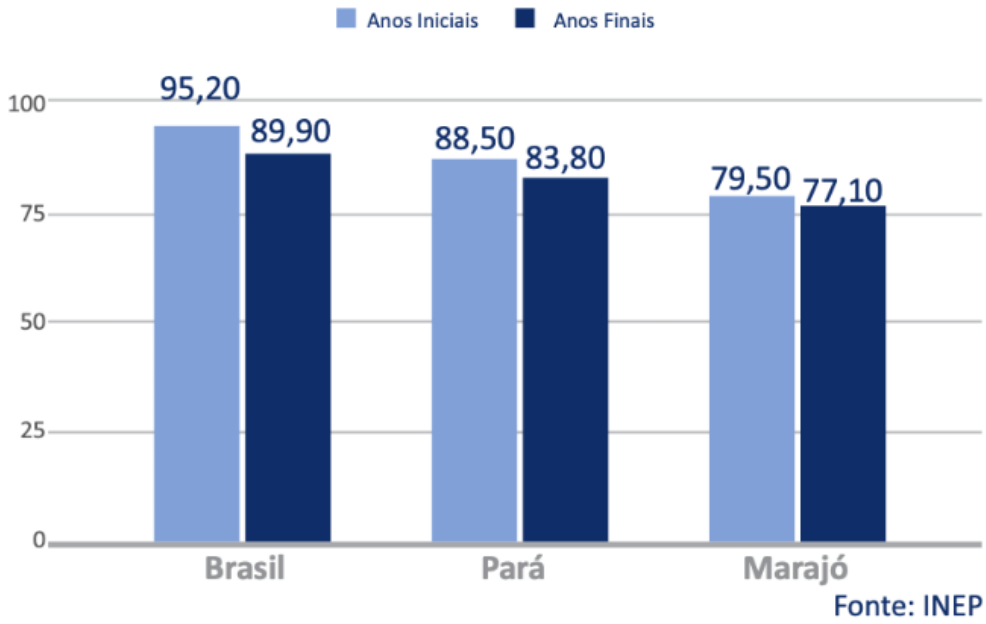


Figure 21. Failure rate of students

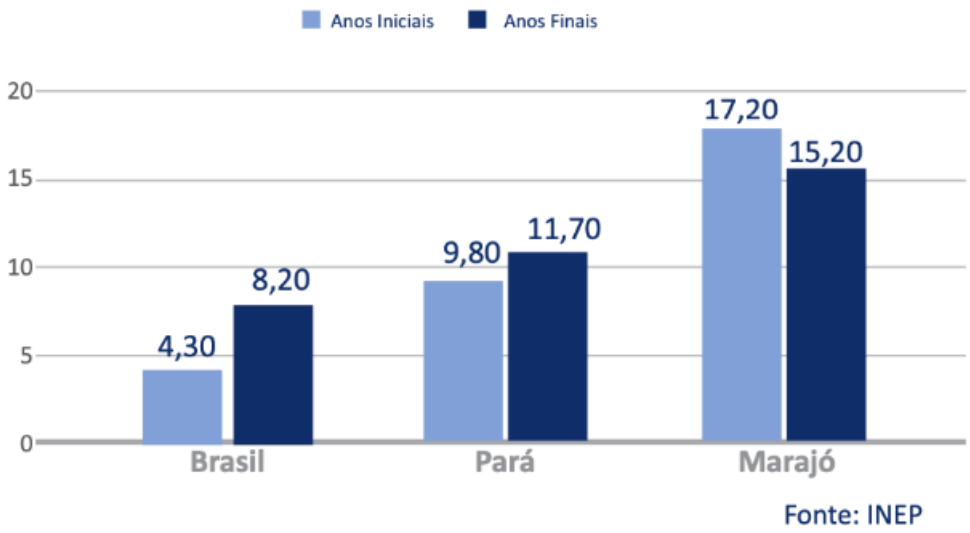
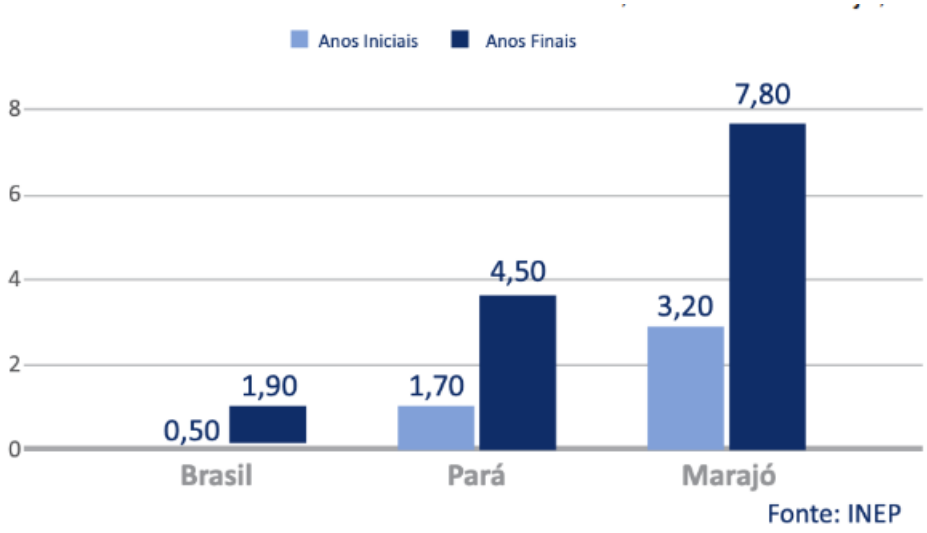


Figure 22. Dropout and delinquency rate



The age-grade distortion is defined by the proportion of students with more than 2 years of school delay. In Brazil, elementary education comprises the 1st to 9th grade, ensuring that the child enters at 6 years of age, with the expectation of completion of this stage of schooling at age 14. The failure rate evidenced above, in a first analysis, constitutes a factor that contributes to the age-grade distortion which, in Marajó, is 33.25% of the total number of students in the initial years, which represents an increase of 45% above the rest of the state, which is 22.90%. Worsening in the higher years, this rate distortion rises to 51.29%, that is, for each group of 100 (one hundred) students, 51 (fifty-one) are at least 2 (two) years behind in school.

The Marajó REDD+ Project is committed to thinking about a green school that can design and execute projects that encourage the development of educational technologies and innovative pedagogical practices that ensure literacy and encourage improvement of school participation and student learning, considering the various methodological

approaches and their effectiveness, without losing sight of the sustainable environment and the valorization of the standing forest. Schools need to expand strategies aimed at raising awareness of families regarding the relevance of participation in school life. The Escola Verde project is based on studies and research based on evidence that seeks to go beyond the elements and indicators of educational assessments and consider other fundamental aspects of the local reality, such as: social elements, cultural, among others. Therefore, it is essential that we have, at first, the construction of a diagnosis based on local evidence, through a process of listening and collecting information and local records, which took place during the on-site visit to the riverside and quilombola municipal schools inserted in the communities of the municipality project from Portel.

The diagnosis demonstrated the lacking infrastructure and equipment in about 80% of rural schools (from the territories, shown on the map, below), including a lack of classrooms, libraries, teachers' accommodation, lack of clean water, only one school had a drinking fountain, and about 90% of the students and teachers were exposed to intense heat (no fans provided). About 30% of schools still do not have energy. In relation to transport, 100% use the school boat as a mode of transport to arrive at school. About 40% of students arrive at school fasting, and most pass more than 1h inside the boat (combining round trips). All teachers interviewed want continuing education and would like a Political Pedagogical Project that enabled practical classes, innovation, and environmental issues closer to everyday life of the students.

Figure 23. School facilities in the territories of the Marajó project

ESCOLA SÃO RAIMUNDO

Nome da Escola	Escola São Raimundo
Território:	ASMOGAC
Localidade/Comunidade:	São Sebastião
nome do Rio(s) em frente a Escola	Rio Mirituba
Endereço GPS	
Cód. INEP	
Turnos de Funcionamento	Manhã/Tarde
TOTAL DE ALUNOS	97
Professores Presentes	8
Alunos Especiais	1

ESCOLA AGOSTINHO MACHADO

Nome da Escola	Agostinho Machado
Território:	ASMOGAC
Localidade/Comunidade :	Menino Deus
nome do Rio(s) em frente a Escola	Acangatá
Endereço GPS	
Cód. INEP	15022234
Turnos de Funcionamento	Manhã
TOTAL DE ALUNOS	40
Professores Presentes	
Alunos Especiais	0

ESCOLA GENÉSIO ANTÔNIO DA CRUZ

Nome da Escola	Genésio Antonios da Cruz
Território:	Ilha Grande /ATAIG-PA
Localidade/Comunidade:	São Matheus
nome do Rio(s) em frente a Escola	Igarapé Cumucuru
Endereço GPS	
Cód. INEP	
Turnos de Funcionamento	Manhã e Tarde
TOTAL DE ALUNOS	90
Professores Presentes	
Alunos Especiais	1

ESCOLA MARIA DIAS MATOS

Nome da Escola	Maria Dias Matos
Território:	Ilha Grande do Pacajaí
Localidade/Comunidade:	São José/Comunidade Conceição
nome do Rio(s) em frente a Escola	Baixo Anapú
Endereço GPS	
Cód. INEP	
Turnos de Funcionamento	Manhã, tarde e noite
TOTAL DE ALUNOS	123
Professores Presentes	6
Alunos Especiais	

ESCOLA NOSSA SENHORA DOS NAVEGANTES

Nome da Escola	Nossa Senhora dos Navegantes
Território:	Alto Cmapari
Localidade/Comunidade:	Canta Galo
nome do Rio(s) em frente a Escola	Camapari
Endereço GPS	
Cód. INEP	
Turnos de Funcionamento	Manhã e Noite
TOTAL DE ALUNOS	46
Professores Presentes	01
Alunos Especiais	01

ESCOLA DEUS É CONTIGO

Nome da Escola	Deus está contigo
Território/Associação:	ARQUICOST
Localidade/Comunidade:	Tauçu
nome do Rio(s) em frente a Escola	ACUTIPEREIRA
Endereço GPS	
Cód. INEP	
Turnos de Funcionamento	MANHA, TARDE E NOITE
TOTAL DE ALUNOS	118 só do território
Professores Presentes	1
Alunos Especiais	

ESCOLA MENINO DEUS

Nome da Escola	Menino Deus
Território/Associação:	ATAIG/PA
Localidade/Comunidade:	Menino Deus
nome do Rio(s) em frente a Escola	RIO ANAPÚ
Endereço GPS	
Cód. INEP	1°50'37"S 50°59'6"O
Turnos de Funcionamento	MANHA, TARDE E NOITE
TOTAL DE ALUNOS	mais de 100
professores presentes	francinei Correia nobre - prof EJA noturno
Alunos especiais	1 (prof Franciane acompanha)

ESCOLA FONTE DE LUZ

Nome da Escola	Fonte de Luz
Território:	Ilha Grande
Localidade/Comunidade:	Santo Agostinho
nome do Rio(s) em frente a Escola	Pacajá
Endereço GPS 1°59'39" S 50°57'40"O 244° SO	
Cód. INEP	
Turnos de Funcionamento	Manhã e tarde
TOTAL DE ALUNOS	139
Professores Presentes	
Alunos Especiais	2

One of the goals for the area is to change the prevailing education scenario and teaching conditions in 14 schools in the riverside areas of Portel/Marajó, impacting around 500 students, in addition to promoting sustainable development for 3000 families every 5 years.

4.1.2 Interactions between Communities and Community Groups (CM1.1)

Free, Prior and Informed Consent (FPIC) is the focus of the project's entry point into the communities, understanding that only a participatory process, respecting the peoples will have conditions for socio-environmental change. In this sense, FPIC is the consultation to Indigenous

Peoples and Traditional Communities refers to the right to participate in decision-making and to give, modify, withhold or withdraw consent to an activity that affect the holder of this right[74].

FPIC has been contemplated in several international documents since the 1990s. 1950, considering the Universal Declaration of Human Rights, of the International Covenant of Economic, Social and Cultural Rights, the International Covenant on Civil Rights and Politicians. Consent also provided for in Convention 169 of the International Organization of Labor, in the United Nations Declaration on the Rights of Indigenous Peoples and, adopted on June 7, 1989, in Geneva, in the Declaration of American States on the Rights of Indigenous Peoples. In the Marajó REDD+ Project, the FPIC aimed to meet the communities demands in a broad and public manner, even when there was no consultation protocol, priority was given to participatory processes to agree in a shared way on the items of the object of contract that values local development, respecting all rights, demands, the cultures and languages of indigenous peoples and traditional communities. In this, all the initial mobilization in each community that makes up the territory, with 100% interest of the communities in participating in the Project, whose official document was drawn up in a consent form, with photographic reports and signatures that prove this fact.

After the FPIC, considering the territorial extension of the Amazon a plurality of complex sociocultural structures, inherited from native peoples, with historically determined, with unique characteristics. To develop the proposed environmental project and aiming to reconcile the local traditional culture and the interests of generation of carbon credits, REDDA organized a survey of field, of an exploratory nature, applied in November and December 2021, with objective of recognizing territories and communities, compiling statistical data quantitative data and qualitative information about the reality of the territories where it operates. The consultation protocol methodology adopted by the Project begins with the pre-consultation with the COMMUNITY/TERRITORY, which consists of:

- Presentation visit with the leaders;
- Sending an Official Letter to request the Protocol of Consultation of the territory;
- Follow the steps described in the Protocol, if any;
- In the absence of the Consultation Protocol and as requested, a pre-consultation meeting to present the project is carried out and to find out about the interest of the communities, to listen to demands, doubts and interest in a dialogue to create consensus.

The pre-consultation was 100% positive for the parties, pointing out the most important points of discussion with the communities. So, the central parameters of the process of FPIC were defined and approved by the parties in six (06) methodological steps, which aimed mainly at building trust between the parties and strengthening the credibility, transparency, reliability and predictability of the process between groups and the companies.

The six steps are:

STEP 1 – Identification and Protocol

STEP 2 – Mobilization and Engagement

STEP 3: Participatory realization

STEP 4: Information and agreements

STEP 5: Validate and formalize the work plan

[74] Colchester, M. and MacKay, F., 2004, August. Indigenous peoples, collective representation and the right to free, prior and informed consent. In *Draft paper for the 10th conference of the International Association for the Study of Common Property, Oaxaca*.

STEP 6: Implementation and Monitoring

The pre-consultation phase, in addition to allowing the validation of these steps and mobilizing the communities in the territory, also allowed REDDA to identify potential risks and challenges that may arise during the FPIC process, and the adoption of measures mitigating measures to avoid them"[75]. To add to steps 2 and 3, the interview was chosen as a research technique and listening, with a structured interview script as a data collection instrument, delimiting the families settled as subjects of this research[76]. At questions that build the research instrument contemplate thematic axes about health, education, work, water consumption, climate change and the relationship between locals with nature.

In this first moment, the choice of territories for the research was made strategically since the territories that correspond to the area of the Marajó Project have several specificities. Then two criteria to draw the route for conducting the research were applied, specifically: the distance from the municipal headquarters to the localities in the territory (travel time) and the size of the area (ha).

The Quilombola Tauçú, is composed of 45 families distributed over two communities(São Tomé Tauçú and Com. Pentecostal da Paz) in an area of 2.568,62ha. As for PAE Ilha Grande do Pacajaí, the settled families are distributed among 25 communities (Assembleia de Deus, Barracão (Tio Bento), Congregação Cristã, Cristã do Brasil, Jerusalém, Menino Deus, Ministério Profético, Monte Horebe, Monte Sião, Nossa Senhora da Conceição, Nova Aliança, Novo Horizonte, Pauti, Porta Formosa, Santa Helena, Santa Luzia, Santo Agostinho, São Mateus, São Sebastião, São Supriano, São Tiago, São Tomé, Tamanboca, Torre Forte, Vila do Matadouro.) in an area of 37033.58 ha.

Among the two territories presented, it is worth pointing out that the number of families and communities are relevant factors for carrying out the surveys and the time required in each territory. For example, the PAE Ilha Grande do Pacajaí is one of the territories with the largest geographic extension, taking an average of three hours of travel time (round trip) between the municipal headquarters and the main communities of the territory.

Today, the surveys developed in TEQ Tauçú have been completed in 100% of the territory, thus indicating the total number of families present. In the case of PAE Ilha Grande, the surveys are in progress, with an average of 36% of the area registered, which will be taken up again in 2023.

With the information obtained in the field, a characterization of the communities in the absence of the project is to be obtained, helping in the planning of strategic actions aimed at preserving the ecosystem, environmental and social development, strengthening the policies of the organizations and women's groups, amongst others.

4.1.3 High Conservation Values (CM1.2)

According to the HCV network guidelines[77], two HCV types, which align with community needs are recognized:

HCV 5 – COMMUNITY NEEDS. Sites and resources fundamental for satisfying the basic needs of livelihoods, health, nutrition, water, etc.

HCV 6 – CULTURAL VALUES. Sites, resources or habitats and landscapes of global or national cultural, archaeological, or historical significance, with economic, religious or sacred importance for local communities.

[75] https://accountability-framework.org/
[76] MINAYO, M. C. de S. (org). 2012 Pesquisa Social: teoria, método e criatividade. 32º edição. Petrópolis, Rio de Janeiro, Editora Vozes.
[77] https://www.hcvnetwork.org/library

The social diagnostics necessary to identify whether or not HCV 5 and/or HCV 6 are applicable to the Marajó territories have not yet been carried out. The social monitoring team is planning is to carry out these diagnostics and if any either of these HCVs are applicable.

High Conservation Value	No social or community HCV candidate areas (HCV 5 and 6) have been identified at this time. Social diagnostics are to be carried out in the future.
Qualifying Attribute	N/A
Focal Area	N/A

4.1.4 Without-Project Scenario: Community (CM1.3)

The United Nations Development Program - UNDP (2013) indicates that the microregion of Portel has the worst HDI, corresponding to 0.47% in 2010. This HDI percentage is described in the research published by UNDP in 2013, which is based on 200 indicators of demography, education, income, labor, housing and vulnerability, and others, grouping data from the Demographic Census of the years 1991, 2000, and 2013.

In this sense, the region has a combination of negative issues regarding the population's health, education, and income. REDDA has already identified some, but there is a continuous effort to keep applying methods to understand and identify the root causes of these situations in order to design activities that work on addressing these.

It is a complex scenario of forests and communities threatened by deforestation increasing significantly in recent years. Pará, for example, in 2021 accounted for 24.3% of total deforestation in Brazil, which contributes significantly to the ongoing planetary climate changes, and profoundly affects the local population's way of life.

REDDA has been assisting in some viable solutions for the mitigation of local issues, such as contributing and stimulating the associations' political organization process, providing legal assistance to the associations so that they can denounce to the competent agencies the environmental problems in their territories and pressure the inspection of these and encourage the awareness of the local population.

Besides, the developed work plan, developed jointly by REDDA and local associations, is focused on the education and self-development of this region's population. They can increase their income based on sustainable alternatives and improve their lifestyle.

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

Based on the project analysis as indicated in section 4.1.4. The project is generating community impacts related to the strategic lines and activities of the project in all groups associated with it.

Specifically:

Community Group	Traditional communities - Ribeirinhos and Quilombolas
Impact(s)	Provide tools and support for resolving socio-environmental conflicts, promoting the protection of the forest and creating alternative livelihoods

Type of Benefit/Cost/Risk	One of the strategic lines of the project is communication and its activities include to create communication and information dissemination channels between the project implementer and communities in the project area, to raise awareness and sensitize communities to take care of natural resources of the project area & its surroundings. This would be an indirect benefit because the effectiveness of this line will therefore improve the quality and increase the quantity of the ecosystem services that the community rely on to maintain and improve their well-being. Another important strategic line, having similar impact, is socio-educational. Here, training on climate change, including REDD+ concepts, and management of the ecosystem as well as environmental education are envisioned. As per the line Communication, the benefit on well- being is indirect; however, it can lead to an increase of quantity of forest cover, enhance quality of ecosystem services like water, flora and fauna and climate resources.
Change in Well-being	The permanence of activities will guarantee the enhancement of ecosystem services, impacting directly and enhancing food security and access to water with higher quality from the rivers. Flora and fauna will achieve a more natural balance, finally contributing to the regulation of the climate change.
Community Group	Overall communities
Impact(s)	Economic empowerment and broader income and job opportunities
Type of Benefit/Cost/Risk	Direct benefits to part of the community members through the creation of new job opportunities, income generation, educational improvements, health improvements, food and water security will also increase. Also, the artisans would benefit from the sales of their handicrafts and increase the household income, reducing the dependency on the natural resources and enhancing well-being.
Change in Well-being	The activities will impact and enhance well-being as follows: The permanence of project activities and increase in job opportunities and ways to diversify the household income will increase the well-being of the community. Reduction of dependence from middlemen through the diversification of income opportunities in the project area.

4.2.2 Negative Community Impact Mitigation (CM2.2)

The activities and/or intentions of the project are to increase the positive and reduce any possible negative impacts. In addition, during interviews and participatory meetings, as part of the stakeholder consultation process, consulted community members showed a positive impression of the Project. No one identified the project activities as a potential risk to them. On the contrary, they realized that the project activities would only help to develop the region, increase care for the forest and expand the opportunity for training and work.

In the FPIC protocol it is made clear that any negative impact on communities will be identified and mitigated; feedback from community members to the REDDA team and partners shall be facilitated. In fact, it will be ensured that project activities will have positive impacts on the community and, if there is a risk of any negative impact, these may be mitigated as they are identified. The project also has an adaptive management process in place to identify any risks or negative impacts on the community and to mitigate them.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

The project aims to achieve Gold Level for the benefits of adapting to change climate change. Communities are supported to adapt to the likely impacts of climate change via project activities that:

1. Contribute to the strengthening of Intergenerational family ties in the communities;

2. Contribute to engagement in social and reforestation projects;

3. Contribute to the improvement of social indicators, such as education, health, sanitation, income, among others;

4. Cooperate with the qualification of the work carried out by the community in courses of short-term training, especially for young people and women;

5. Strengthen the spaces of solidarity economy and women, with investment in social enterprises of local culture;

6. Expand the debate on environmental education in different spaces, especially in school;

7. Strengthen schools and their curricula based on local knowledge/knowledge of the earth; and
8. Contribute to health quality with actions on water quality, health oral hygiene, body hygiene and preventive health actions.

4.2.4 High Conservation Values Protected (CM2.4)

The social diagnostics necessary to identify whether or not HCV 5 and/or HCV 6 are applicable to the Marajó territories have not yet been carried out. Therefore no measures are taken at this point, but the plan is to carry out these diagnostics and if any HCVs are identified, the appropriate measures will be taken to ensure protection.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

Other stakeholders, besides the communities were consulted during project conceptualisation and as the project is expected to bring only positive impacts the communities that live within the project territories, impacts are considered limited. Activities developed will bring more awareness to those interested in conservation, improving the quality of ecosystem services, improving the quality of community life and biodiversity during the life of the project and beyond. Furthermore, the consulted stakeholders perceived the project as positive and there was no mention of negative impacts on their well-being. REDDA also aims to engage with companies who may have hoped to obtain logging permissions, in territories that may no longer enter into the respective contracts.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

Although no negative impacts are anticipated due to the project activities being based on continuous risk mitigation, through monitoring activities and listening and polling mechanism, combined with the presence of project staff in the project area, any negative impact on stakeholder welfare will be identified and evaluated. This is done through the adaptive and participatory management process, annual meetings with the directors of the associations with regards to

collaborative planning of the following year, and every two years, a new round of community research.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

The project expects to cause only positive impacts on the well-being of the community, when compared to the scenario without a project. All the actions proposed in the work plan are collectively thought and rethought, with the main stakeholders in mind: community, community leaders, association management teams and local partners in order to carry out actions that can generate positive impacts for the communities living within or near the project area, but also for all other identified stakeholders and consulted during community meetings and research. Therefore, negative impacts on well-being are not expected. However, as described in the other sections above, mitigation measures will be discussed and implemented as part of the adaptive management process if any negative impact is anticipated or identified.

4.4 Community Impact Monitoring

4.4.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

This section will describe how the community impacts will be monitored over the project lifetime. As identified earlier, relevant community groups are the traditional riverside communities (Ribeirinhos and Quilombola). Net impact on females will be tracked separately using a few designated indicators.

ITEM	DESCRIPTION
Project design	The community impacts will be monitored throughout the crediting period. Improving the quality of life of the riverside communities is an important aspect of this project. Continuous community engagement combined with the monitoring of key performance indicators will be used determine the community impact.
Plan of Action	The Plan of Action has been designed according to the needs presented by traditional communities - Ribeirinhos and the Quilombola. Various activities have been implemented which must all be monitored appropriately. In broad lines, the relevant community activities are: Education and workshops: • Construction of schools. • Facilitation of a wide range of workshops. Healthcare and well-being: • Access to healthcare. • Trainings related to health and personal hygiene. Income generation • Full-time or part-time participation in the project monitoring. • Employment via the one of the sustainable partnerships set up by the project.

ITEM	DESCRIPTION
Monitoring Indicators	(1) socioeconomic, cultural and welfare indicators (2) indicators of access to health and social assistance (3) indicators of education and training for work
Variable	People served, employment, income increase, impacts by affected small farmers/community members; women attended, research completed, school enrollment, school dropout rate, internet access, environmental preservation, and subsistence activities
Action to be monitored	Using the aforementioned parameters, each of the community impacts shall be compared to the pre-project scenario.
Software or Survey	Data collection and automation
Sampling Methods	Selection of research sample, community, or territory
Monitoring Frequency	Depending on the purpose of the action/training
Measurement types	According to the action/training
Preparation of reports	Partial sent annually, and final, after five years of activities, to compose a new diagnosis, goals, and evaluation.
Net positive impacts	Qualitative and quantitative description.
Announcement of results	Company websites, social networks, reports delivered annually with simple language, and posters disclosing the results fixed in crucial communities.

4.4.2 Monitoring Plan Dissemination (CM4.3)

The project intends to disseminate the monitoring plan and the results of the monitoring undertaken in accordance with the requirements of the standard and via the Verra platform. In addition, the project maintains hardcopies of the plan and results whilst visiting the project area. These are shared with the communities as and when requested. Moreover, the project is establishing tele-centres with internet connection hence, the community members can easily access the monitoring plan and results as and when required.

4.5 Optional Criterion: Exceptional Community Benefits

4.5.1 Exceptional Community Criteria (GL2.1)

Despite having the strongest economy in Latin America, Brazil still has extremely high levels of poverty and inequality (Ferreira et al. 2006). According to the Institute of Applied Economic Research (IPEA) of Brazil, 21.4% of the population lives below the poverty line. While in the Northeast both poverty and inequality are high, in the North there are high levels of poverty but relatively low levels of inequality of income. Government-sponsored Amazon settlement projects and various types of rural development programs, aimed at promoting family farming, had limited impact on poverty reduction. Conflicts over land and forest resources with large capital companies and ranchers threatened the viability of family farming (Walker et al. 2000; Aldrich et al. 2006). In some cases, the lack of technical assistance combined with a disregard for rural infrastructure further increased the difficulties of rural populations (Brondizio and Moran 2008; Ludewigs et al. 2009; Brondizio et al. 2009).

Rural poverty is often a product of poor infrastructure that impedes development and mobility, due to the scarcity of investments. Rural areas tend to lack sufficient roads to increase access to goods and services and particularly, agricultural markets. Without roads, the rural, agro-extractive and riverine poor are, sometimes isolated from technological development and emerging markets occurring in more urbanized areas. Lack of sanitation and proper health care leads to diseases and higher infant mortality deaths, and the problems of malnutrition are common.

Data collected in the communities showed that about 60% of community members are paid ½ of the national minimum wage.

4.5.2 Short-term and Long-term Community Benefits (GL2.2)

The project hopes to generate community impacts related to the strategic foci and project activities in all groups associated with it and as described in Section 4.2.1. With respect to increasing local territorial governance capacity and management of natural resources, the economic empowerment of groups and the increase of employment opportunities in the project area are considered exceptional community benefits. These benefits are anticipated over the life of the project as well as beyond the lifetime of the project.

4.5.3 Community Participation Risks (GL2.3)

Conservation projects generally face risks related to community participation. Effective identification and mitigation of the underlying reasons for such a risk is key to the success of the Marajó REDD+ Project. One of the key risks typically and/ or primarily identified is the withdrawal of the member(s) of the community. In order to mitigate this risk, the involved communities have to be able to engage in a safe manner that fulfils their needs. Furthermore, the REDDA project team will need to assure that through an integrative and inclusive process in designing and coordinating project activities, motivation among the members of the community is upheld. The project team is in continual interaction with the communities and as such it is believed that this risk can be well managed.

4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

Community Group 1	In the project area, riverine and Quilombola community groups in the Portel Microregion have been identified as the groups marginalized and/or vulnerable, as defined by CCB. These

	communities comprise 100% of the population in the project area.
Net positive impacts	Increase the capacity of local territorial governance and natural resource management: direct benefit projected to vulnerable/ marginalized community groups is expected from the promotion of technical knowledge for the maintenance and management of forest ecosystems, flora and fauna and the development of theoretical-practical workshops and implementation of awareness-raising campaigns. Economic empowerment of community groups and increased employment opportunities in the project area are also designed to benefit vulnerable/ marginalized community groups by, for example, the promotion of alternative productive projects related to the production of bio-jewellery, sustainable gardens for home use, involving the community in activities of rehabilitation and restoration. The project is providing employment opportunities for communities.
Benefit access	The risks identified in section 4.5.3 could impact benefit access but shall be mitigated as elaborated.
Negative impacts	Increased migration to project areas due to improved living conditions could affect the living conditions of existing community groups. An increase in financial resources can potentially generate more emissions due to the use of transportation to other locations and/or for increased transport of produce.

4.5.5 Net Impacts on Women (GL2.5)

The Marajó REDD+ Project aims in all its actions to foster the participation of women. Whether in training courses for work, in continuing education, in appreciation of their practices and customs. However, to better identify the impacts generated, an action research project called Women of the Amazon – MAMA, which seeks to develop actions to increase the economic autonomy of women, especially those who are more invisible within the Amazon region.

To develop autonomy, the project aims to strengthen women's groups through actions that address the following axes: human rights; equality of gender and women's empowerment. A rigorous monitoring and evaluation methodology will be used to measure the impact of actions, recording lessons learned and good practices. MAMA aims to develop cases within the circular and creative economy to achieve gender equality, which corresponds to the 5th of the Goals of Sustainable Development (SDG) created by the United Nations (UN) to comply with the agreements made in the 2030 Agenda.

The MAMA project utilises a methodology organized into four (04) phases:

FIRST PHASE: Situational Diagnosis with each group of women that make up associations. A SWOT matrix that has been adapted to simple language is used as the basis for an instrument of analysis that aims to understand the reality of groups of work and serves as a starting point for planning strategic actions. Moreover, the 'dynamics of dreams' is used and aims to generate a record in the community that it is possible to dream of better days. Hereby, each woman receives a piece of tape

and a pen and is asked to write on the tape words that represent her respective dreams and then attach these to the dream catcher.

Figure 24. Marajó REDD Project – MAMA project diagnosis, women from the Menino Deus Community, Acangatá

SECOND PHASE: Continuing Education - composed of a set of activities that involve the following axes: Gender; Human Rights and Empowerment. For all axes, activities will be carried out according to the result of the situational diagnosis of each group of women. The activities will feature partnerships with different institutions that are committed to the equality of gender, professional training, financial education, a business plan and qualification-specific approach, according to the vocation of each group. Partnerships will be made with universities, study groups, Sebrae, the International Institute of Brazilian Education – IIEB, and the Federation of Agriculture and Livestock of Pará – Faepa, among others.

THIRD PHASE: Development of the Business Structure. This phase corresponds to organized business planning and financial assistance for structuring and minimum organization to start activities. Collaboration for legal advisory and accounting is also foreseen.

FOURTH PHASE: Monitoring, mentoring and consultancy for assuring good progress of the project and actions. Regarding Impact Monitoring, a capacity survey was adopted for entrepreneurial venture that will be applied by the social management research group for local development (GESDEL) of the University of the Amazon (UNAMA), which will observe items of engagement, well-being, economic and social change, applied after diagnosis, and at the end of each phase. And then, every two years, to identify the evolution of women and capacity for local development in their activities.

Besides the MAMA project, other initiatives are being pursued to increase the economic autonomy of women. Specifically, the partnerships with Amazon Forest People and Amazon Oil strongly encourage women participation throughout the production chain, from seed collection to extraction and marketing. Attendance during these meetings overwhelmingly consists of women.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

REDDA builds relationships with the communities based on equality, transparency and communication.

Before the beginning of activities in the field, the financial amounts invested, and further generation of income were discussed in formal meetings and also are stated in the contract signed with the respective communities.

One of the first activities, a detailed study (diagnosis) is undertaken, which aims to identify the more vulnerable families as well as the fragilities of the territory in order to guide the decision-making process with regards to project design and sharing of project benefits beyond project start-up.

REDDA also created the “Nossa Floresta” program, a policy to incentivize environmental activities; a social and environmental program supporting environmental activities through the provision of monetary and non-monetary incentives to riverside families and family farmers settled in traditional communities of the mesoregion of Marajó. The core of this program is to share responsibility for environmental preservation.

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

REDDA recognizes that a lack of discussion and transparent communication regarding the expected project benefits represents a high risk for the project and thus adheres to an agenda of frequent dialogue with the communities and their leadership.

REDDA is in regular contact with the communities in order to clarify any doubts that may appear during the process. Any changes that need to be made are formalized through formal meetings with appropriate documentation. In addition, other communication channels exist to attend to any doubts of the community members at any time they need.

An overview of key meetings held with the communities can be seen below in Table 21.

Table 21. Meetings held to communicate risks, costs, and benefits

Activity	Date	Description
Participatory Meeting with Associations	06.21	Dialogue to hear the community's demands
Community Sensitization and Mobilization to explain the Marajó REDD+ Project (2021)	09.21	Explaining the implementation and context of REDD+ projects
Leadership Course and Workshop for Association Leaders	12.21	Workshop for the community leaders in the sense of giving them support to improve the relationship with the communities
Community Planning	02.22	Propose activities and changes for 2022.

Management for Riparian Organizations - 1.2 - Planning Workshop In Excel	08.22	Training in Excel to support leadership to improve management in the territories
Participative Meeting with Associations to discuss registration and diagnosis	09.22	Dialogue with associations to decide on diagnosis actions
Participative Socio-Environmental Diagnosis - Mobilization with the Associations	09.22	Share with community's members the diagnosis context
Evaluation of the actions developed In the Year 2022 - Marajó Project.	11.22	Dialogue with the community to review the 2022 activities
Informative Meeting - Marajó Project (Jan 2023)	01.23	Dialogue in the sense of sharing some changes for 2023 and perspectives for the following years

4.5.8 Governance and Implementation Structures (GL2.8)

The project's governance and implementation structures, and any relevant self-governance or other form of governance are contingent on personnel capacity and financial resources. As such 55% of funds are destined for investment in the project territories, which are managed by REDDA as well as through a participatory process with the communities. Funds so far have been spent on biogas digestors, rainwater harvesting, and educational actions, amongst others. These are implemented in accordance with the prior consent of the community in a jointly coordinated manner. 5% of the amounts are used for the management of the association, which are contingent and remitted upon request via Official Letter, for sporadic expenses for different purposes. 20% are dedicated to managing the association, 10% are responsible for managing income through the PSA, 10% for generating local employment.

The governance structure was instituted through courses for administrators and community members. Courses on information technology, document preparation and financial administration were provided. All investment decisions are made through meetings with the community and consolidated through documentation filed at the company. The accounting office sends REDDA financial overviews, rendering of accounts and certificates for effective verification of community governance. Although governance is related to control, there is a commitment on the part of REDDA to assure that the communities' resources are employed in a prudent fashion. This extends from the strategic decisions of the directors of the associations, to the search for operationally and financially sustainable actions, so that there is solidity with regards to the transferred resources.

4.5.9 Smallholders/Community Members Capacity Development (GL2.9)

The working plan attached to the signed contract with the community was first designed to address the lack of formal education in this territory. Many activities thus focused on facilitating the community members' participation as protagonists in the new possibilities offered through the partnership established with REDDA. In December 2021, the first "Leadership course" for leaders of the Associations aimed to identify, strengthen, counsel, and empower key actors in order to support them in the understanding of the project and its implementation in the territory.

Afterwards more specific courses took place such as "Management for Riparian Organizations - 1.2 - Planning Workshop In Excel", which provided experience in shared management practices

and administrative techniques for Association leaders and community leaders in order to raise the organizational capacity as well as capacity for self-management amongst organizations in the Amazon.

On request from the communities, “Technical Consulting" to project development was offered on the occasion of a ‘Call for Projects’, where the community asked for support with the preparation of a project submission. Since the start of project activities, several training courses have been conducted in more specific areas such as meliponiculture, soil fertility, seed collection, and forest inventory among others. Besides, REDDA has a training program for environmental monitoring under development, that will focus on empowering local people to operate in their own territories with REDDA support.

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

Flora

As part of the carbon biomass stock baseline, thirty 30×30 m plots were established throughout the territories of the Marajó REDD+ Project. Besides biometric measurements, trees in the plot were also identified with the help of experienced forestry engineers and local woodsmen. Over 300 trees of 120 species were recorded. Those which could be identified are listed on Table 22; Table 2 also lists species to occur.

Table 22. List of tree species found in Marajó field plots

Local name	Species	FAMILY
Taquari	*Alchornea discolor* Poepp	EUPHORBIACEAE
Louro abacate	*Aniba williamsii O. C.* Schmidt	LAURACEAE
Pente de Macaco	*Apeiba glabra* Aubl.	MALVACEAE
Palmeira Mumbaca	*Astrocaryum munbaca*	ARECACEAE
Palmeira Inajá	*Attalea dubia (*Mart.*)* Burret	ARECACEAE
Palmeira Inaja / Anaja	*Attalea maripa (*Aubl.*)* Mart	ARECACEAE
Amaparana	*Batocarpus amazonicus (*Ducke*)*	MORACEAE
Goiaba da Mata	*Bellucia grossularioides (*L.*)* Triana	MELASTOMATACEAE
Urucurana	*Bixa excelsa* Gleason & Krukoff	BIXACEAE
	Campsiandra laurifolia Benth.	LEGUMINOSAE
Embauba vermelha	*Cecropia glaziovii* Snethl	URTICACEAE
Embaúva	*Cecropia palmata* Willd.	URTICACEAE
Cramuri	*Chrysophyllum sp.*	SAPOTACEAE
Pitomba	*Citronella melliodora (*Sleumer) R.A.Howard	CARDIOPTERIDACEAE
Freijo branco	*Cordia bicolor* A.DC.	BORAGINACEAE
Macucu/ Macucu de sangue	*Couepia elata* Ducke	CHRYSOBALANACEAE
Coco pau	*Couepia robusta* Huber	CHRYSOBALANACEAE
Angelim vermelho	*Dinizia excelsa* Ducke	LEGUMINOSAE

Local name	Species	FAMILY
Abiurana-seca	*Diploon venezuelana* Aubrév.	SAPOTACEAE
Sucupira preta	*Diplotropis peruviana* J.F.Macbr	LEGUMINOSAE
Cumaru / Cumaru amarelo	*Dipteryx odorata (*Aubl.) Willd.	LEGUMINOSAE
Arataciu	*Dodecastigma uleanum (*Pax & K.Hoffm.*) G.L.Webster*	EUPHORBIACEAE
Louro-amarelo	*Endlicheria longicaudata (*Ducke*)* Kosterm.	LAURACEAE
Mamorana	*Eriotheca globosa (*Aubl.*)* A.Robyns	MALVACEAE
Sumauma	*Eriotheca longitubulosa* A.Robyns	MALVACEAE
Quarubarana	*Erisma uncinatum* Warm.	VOCHYSIACEAE
Matamata preto	*Eschweilera blanchetiana*	LECYTHIDACEAE
Matamata preto	*Eschweilera coriacea (*DC.) S.A Mori	LECYTHIDACEAE
Matamata branco	*Eschweilera grandiflora (*Aubl.) Sandwith	LECYTHIDACEAE
Matamata-preto	*Eschweilera ovata (*Cambess.*)* Miers	LECYTHIDACEAE
Jibóia	*Eschweilera sp.*	LECYTHIDACEAE
Matamata Vermelho	*Eschweilera sp.*	LECYTHIDACEAE
Murta	*Eugenia floribunda West*	MYRTACEAE
Louro faia	*Euplassa pinnata (*Lam.*)* I.M. Johnst.	PROTEACEAE
Quinarana	*Geissospermum sericeum* Benth. & Hook. *f.* ex Miers	APOCYNACEAE
Pau doce	*Pradosia schomburgkiana (*A.DC.) Cronquist	
Cupiuba	*Goupia glabra* Aubl	GOUPIACEAE
Itaubarana	*Guarea cinnamomea* Harms	MELIACEAE
Inharé	*Helicostylis podogyne* Ducke	MORACEAE
Seringa amarela	*Hevea brasiliensis (*Willd. ex A.Juss.*)* Müll.Arg	EUPHORBIACEAE
Seringa vermelha	*Hevea guianensis* Aubl	EUPHORBIACEAE
Seringa Preta	*Hevea sp.*	EUPHORBIACEAE
Jutai miri	*Hymenaea sp.*	LEGUMINOSAE
Angelim pedra	*Hymenolobium excelsum* Ducke	LEGUMINOSAE
Inga	*Inga alba (*Sw.*)* Willd	LEGUMINOSAE
Inga vermelho	*Inga calantha* Ducke	LEGUMINOSAE
Inga branco	*Inga capitata* Desv	LEGUMINOSAE
Inga branco	*Inga gracifolia* Ducke.	LEGUMINOSAE
Inga-xixica	*Inga heterophylla* Willd.	LEGUMINOSAE
Ingarana	*Inga paraensis* Ducke	LEGUMINOSAE
Inga Xixica	*Inga sellowiana* Benth	LEGUMINOSAE
Ucuuba da terra firme	*Iryanthera juruensis* Warb	MYRISTICACEAE
Ucubarana / Ucuuba do gapó	*Iryanthera laevis* Markgr	MYRISTICACEAE
Papo de Mutum	*Lacunaria sp.*	OCHNACEAE
Jatereua	*Lecythis idatimon* Aubl.	LECYTHIDACEAE
Pau jacare	*Lecythis lurida* (Miers) S.A.Mori.	LECYTHIDACEAE

Local name	Species	FAMILY
Jarana	*Lecythis lurida (*Miers) S.A.Mori	LECYTHIDACEAE
Cariperana	*Licania apetala (*E.Mex.) Fritsch	CHRYSOBALANACEAE
Macucú-de-sangue	*Licania heteromorpha* Benth.	CHRYSOBALANACEAE
Macucu-branco	*Licania oblongifolia* Standl.	CHRYSOBALANACEAE
Casca-seca	*Licania tomentosa (*Benth.) Fritsch.	CHRYSOBALANACEAE
Tachi branco	*Macrosamanea pubiramea (*Steud.*)* Barneby & J.W.Grimes	LEGUMINOSAE
Maparajuba	*Manilkara Bidentada (*A.DC) A.Chev.	SAPOTACEAE
Maçaranduba	*Manilkara huberi (*Ducke) Chevalier	SAPOTACEAE
Maparajuba	*Manilkara paraensis (*Huber*)* Standl.	SAPOTACEAE
Merauba	*Mouriri callocarpa* Ducke	MELASTOMATACEAE
Louro Vermelho	*Nectandra rubra* (Mez) C.K.Allen	LAURACEAE
João mole	*Neea floribunda* Poepp. & Endl	NYCTAGINACEAE
Louro-preto	*Ocotea baturitensis* Vattimo	LAURACEAE
Louro	*Ocotea sp.*	LAURACEAE
Palmeira Bacaba	*Oenocarpus bacaba* Mart.	ARECACEAE
Fava Bolota	*Parkia pendula (*Willd.*)* Walp.	LEGUMINOSAE
Fava-arapari	*Parkia sp.*	LEGUMINOSAE
Escorrega macaco	*Peltogyne paniculate* Benth.	LEGUMINOSAE
Mapatirana	*Pourouma guianensis* Aubl.	URTICACEAE
Guajara Branco	*Pouteria ambelaniifolia (*Sandwith*)*	SAPOTACEAE
Abiu amarelo	*Pouteria decorticans* Penn	SAPOTACEAE
Guajara pedra	*Pouteria elegans* (A.DC.) Baehni	SAPOTACEAE
Abiurana Preta	*Pouteria krukovii* (A.C.Sm.) Baehni.	SAPOTACEAE
Guajara Bolacha	*Pouteria oppositifolia (*Ducke) Baehni	SAPOTACEAE
	*Pouteria reticulata (*Engl.) Eyma	SAPOTACEAE
Abiurana Branca	*Pouteria reticulata (*Engl.) Eyma *subsp. reticulata*	SAPOTACEAE
Abiurana	*Pouteria sp.*	SAPOTACEAE
Abiu vermelho	*Pouteria torta (*Mart) Radlk *subsp. Glabra* Penn	SAPOTACEAE
Breu branco	*Protium palidum* Cuatrec.	BURSERACEAE
Fava timborana	*Pseudopiptadenia suaveolens (*Miq.) J.W.Grimes	LEGUMINOSAE
Mututirana	*Pterocarpus officinalis* Jacq.	LEGUMINOSAE
Mandioqueiro	*Qualea sp.*	VOCHYSIACEAE
Canela de jacamim	*Rinorea riana* Kuntze	VIOLACEAE
Casca seca	*Sagotia brachysepala (*Müll.Arg.*)* Secco	EUPHORBIACEAE
Morototo	*Didymopanax morototoni (*Aubl.) Decne. & Planch	ARALIACEAE
Marupa	*Simarouba amara* Aubl.	SIMAROUBACEAE
Ananim	*Simphonia globulifera* L.	
Urucurana	*Sloanea dentata* L.	ELAEOCARPACEAE
Pitaica	*Swartzia acuminata* Willd.ex Vogel	LEGUMINOSAE

Local name	Species	FAMILY
Tachi vermelho	*Tachigali myrmecophila (*Ducke) Ducke	LEGUMINOSAE
Tachi-preto	*Tachigali myrmecophila* Ducke	LEGUMINOSAE
Tachi preto	*Tachigali paniculate* Aubl.	LEGUMINOSAE
Tatapiririca	*Tapirira guianensis* Aubl.	ANACARDIACEAE
Breu vermelho	*Tetragastris altissima (*Aubl.) Swart	BURSERACEAE
Breu barrote	*Tetragastris panamensis*	BURSERACEAE
Cacaui	*Theobroma sylvestre* Mart.	MALVACEAE
Breu sucuruba	*Trattinnickia rhoifolia* Willd.	BURSERACEAE
Tachirana	*Vantanea parviflora* Lam.	HUMIRIACEAE
Casca de vidro	*Virola albidiflora* Ducke	MYRISTICACEAE
Lacre	*Vismia baccifera* (L.*)* Triana & Planch.	HYPERICACEAE
Quaruba	*Vochysia maxima* Ducke	VOCHYSIACEAE
Quaruba cedro	*Vochysia vismiifolia* Spruce ex. Warm	VOCHYSIACEAE
Acapu	*Vouacapoua americana* Aubl.	LEGUMINOSAE
Angelim Rajado	*Zygia racemosa (*Ducke) Barneby & J.W.Grimes	LEGUMINOSAE

Although it did not make it into the plots, one species that occurs in the area and which deserves attention is *Bertholletia excelsa* Bonpl. known as castanheira-do-Brasil or Brazil nut. Usually located in terra-firme areas throughout the Amazon and belonging to the final phase of ecological succession as a long-lived species, it is also considered one of the most important species of the whole biome, because of its importance to wildlife and to trade. Other nut-producing trees such as the Piquiá (*Caryocar* spp) were also seen near settlements.

Of the tree species known to occur in the Portel region, 12 are known to be under threat according to the IUCN and the Portaria MMA Nº 561/2021[78] (Table 23). Of these, four were confirmed in the project area.

Table 23. Species of flora occurring in the region classified as threatened

IUCN Threat category	Scientific name
Critically endangered – CR	*Vouacapoa americana* Aubl. *
Endangered – EN	*Hymenaea parvifolia* Huber *Eschweilera piresii S.A.Mori* *Virola surinamensis* (Rol. ex Rottb.) Warb.
Vulnerable – VU	*Bertholletia excelsa* H&B ** *Pouteria oppositifolia (*Ducke) Baehni * *Pouteria krukovii* (A.C.Sm.) Baehni * *Mezilaurus ita-uba (*Meisn.) Taub. ex Mez *Apuleia leiocarpa (*Vogel) J.F.Macbr. *Euxylophora paraensis* Huber *Hymenolobium excelsum* Ducke

[78] https://www.in.gov.br/web/dou/-/portaria-mma-n-561-de-15-de-dezembro-de-2021-367747322

IUCN Threat category	Scientific name
	Qualea coerulea Aubl

** occurred in the plots*
*** can be seen near settlements and in the forest although it did not occur inside plots*

Fauna

The forests of the Amazon are home to a great diversity of wildlife, and the region of Portel is no different. Wildlife surveys performed by camera trapping yielded the following species of mammals: *Cuniculus paca, Dasypus novemcinctus, Didelphis marsupialis, Eira barbara, Guerlinguetus sp, Mazama americana, Mazama nemorivaga. Pecari tajacu, Tamandua tetradactyla.* The area south of Portel is also home to the local endemic monkeys Silvery marmoset (*Mico argentatus*) and Red-handed howler (*Alouatta belzebul*, VU); the margay or "gato-maracajá" (*Leopardus wiedii,* VU) and the tapir (*Tapirus terrestris*) also occurs in the area.

Preliminary bird surveys by the REDDA team yielded 37 species, but local birdwatching lists record over 160[79] and others in neighboring regions like the Caxiuanã national forest yielded over 280[80]. Notable records are as follows:

Table 24. Notable bird species records for the Portel region

Species	IUCN classification
Harpy eagle (*Harpia harpyja*)	VU
Dark-winged trumpeter (*Psophia viridis*)	VU
Crested eagle (*Morphnus guianensis*)	NT
Golden Parakeet (*Guaruba guarouba*)	VU
Pearly Parakeet (*Pyrrhura lepida*)	VU
White-tailed Cotinga (*Xipholena lamellipennis*)	NT
Blue-winged Macaw (*Primolius maracana*)	NT
White-throated Toucan (*Ramphastos tucanus)*	VU
Red-throated piping guan (*Pipile cujubi*)	VU
Scaled ground cuckoo, *Neomorphus squamiger*	VU
Carajás woodcreeper (*Xiphocolaptes carajaensis*)	(ENDEMIC)
Brigida's woodcreeper (*Hylexetastes brigidai*)	(ENDEMIC)

Notable species from other vertebrate groups can be seen in Table 25 and Table 26. The snakes in it are endemic to the Marajoara region.

Table 25. Notable reptile species records for the Portel region

Species	IUCN classification
Tracajá (*Podocnemis unifilis*) river turtle	VU
Jabuti-tinga (*Chelonoidis denticulatus*) tortoise	VU
Bela Vista Spindle Snake, (*Atractus alphonsehogei*)	LC
Dark-spotted anaconda (*Eunectes deschauenseei*)	VU

[79] https://ebird.org/hotspot/L7796349
[80] CM, 2012. Plano de manejo Floresta Nacional de Caxiuanã. Instituto Chico Mendes de Conservação da biodiversidade, Brasilia, 406 p.

Table 26. Notable mammal species recorded for the area

Species	IUCN classification
Tapir (*Tapirus terrestris*)	VU
Margay (*Leopardus wiedii)*	VU
Silvery marmoset *(Mico argentatus)*	ENDEMIC
Red-handed howler monkey (*Alouatta belzebul)*	VU
Uta Hick's bearded saki *(Chiropotes utahickae*)	EN
Giant armadillo (*Priodontes maximus*)	VU
Bush dog (*Speothos venaticus*)	NT
Amazonian manatee (*Trichechus inunguis*)	VU

5.1.2 High Conservation Values (B1.2)

A preliminary assessment was undertaken according to current methodologies[81] for the screening of possible HCV values in the Marajó territories. The following were considered:

- HCV 1 – Species diversity.
- HCV 2 – Landscape-level ecosystems, ecosystem mosaics and Intact Forest Landscapes.
- HCV 3 – Ecosystems and Habitats
- HCV 4 – System services.

The Marajó territories in the Project Region were found to harbor one **HCV3**: Naturally occurring, enclaves of open vegetation like savannas occurring discontinuously throughout the Amazon basin. These are now acknowledged as unique and important components of Amazonian biodiversity[82]. One of this is a special kind of vegetation growing on white sand and very poor soils, often (but not always) waterlogged, wooded savanna fields known in Brazil as *Campinarana* sensu Egler[83] and the IBGE[84], which is known to be rich in endemisms for flora and fauna, with several very local avifauna and flora associated with these enclaves, which should not be conflated with artificial pastures created by deforestation. The areas identified can be seen mapped in Figure 25.

Table 27. Identification of HCV areas in the Marajó territories

High Conservation Value	HCV 3 – It includes Rare, Threatened or Endangered ecosystems, habitats, or refugia. These ecosystems are a dynamic complex biological and environmental feature interacting as a functional unit which can be identified using vegetation classifications and physical environmental features.
Qualifying Attribute	Amazonian enclaves of natural savanna-like woodlands or *campinaranas* as they are locally known, can harbor unique, endemic species as they are isolated patches surrounded by Amazonian lowland evergreen forests. These Campiranas have

[81] https://www.hcvnetwork.org/library/hcv-screening-guide
https://www.hcvnetwork.org/library/common-guidance-for-the-identification-of-hcv-english-indonesian-french-portuguese
https://www.hcvnetwork.org/library/hcv-assessment-manual-2021

[82] Adeney, J.M., Christensen, N.L., Vicentini, A. and Cohn-Haft, M., 2016. White-sand ecosystems in Amazonia. *Biotropica*, *48*(1), pp.7-23.

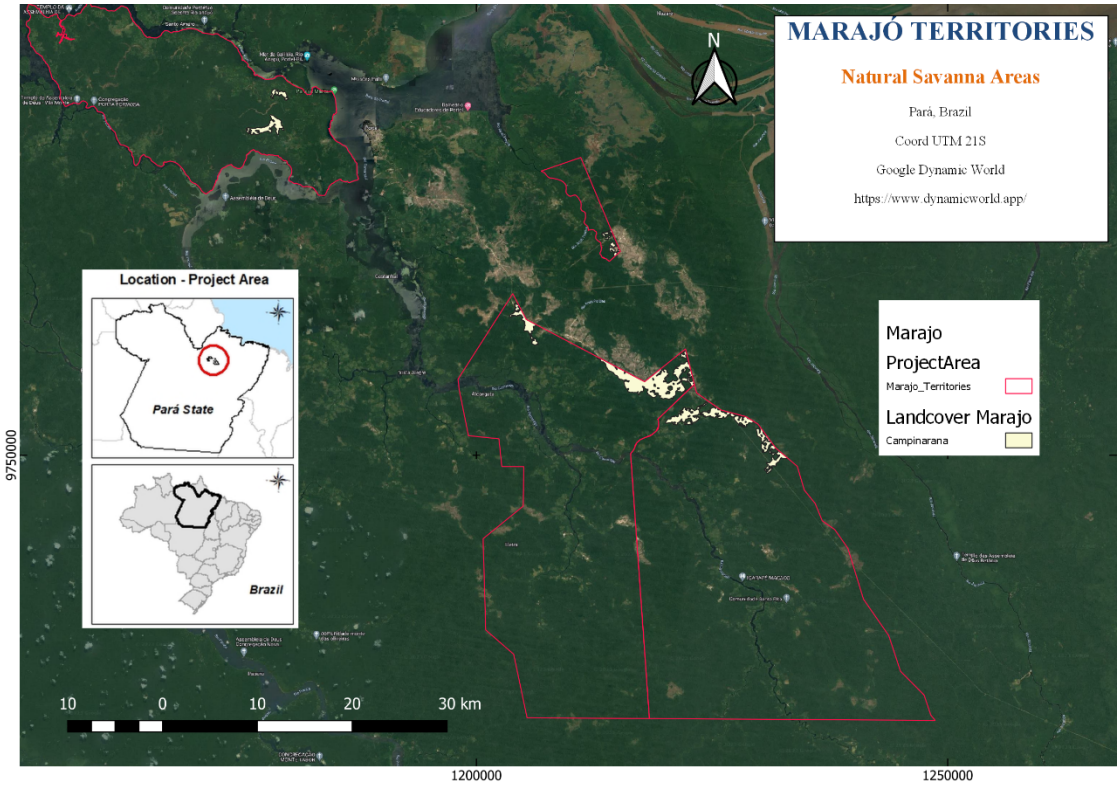
[83] GLER, W. A. 1960. Contribuções ao conhecimento dos campos da Amazonia. I - Os campos do Ariramba. Bolm. Mus. Para. 'Emilio Goeldi' (Bot.) 4: 1-37

[84] Veloso, H.P., Oliveira-Filho, L.D., Vaz, A.M.S.F., Lima, M.P.M., Marquete, R. and Brazao, J.E.M., 1992. Manual técnico da vegetação brasileira. *Rio de janeiro: IBGE*.

	a very different and often unique flora and fauna which they harbor, and which cannot survive or be found elsewhere.
Focal Area	The areas identified can be seen mapped in Figure 25, amounting to 3272 hectares detected through landcover classification.

It is important to note that the *campinarana* areas are embedded within the forest but are not considered nor accounted into the Project Area *sensu stricto* as they were not classified as forest.

Figure 25. Campiranana enclaves in the Marajo Territories

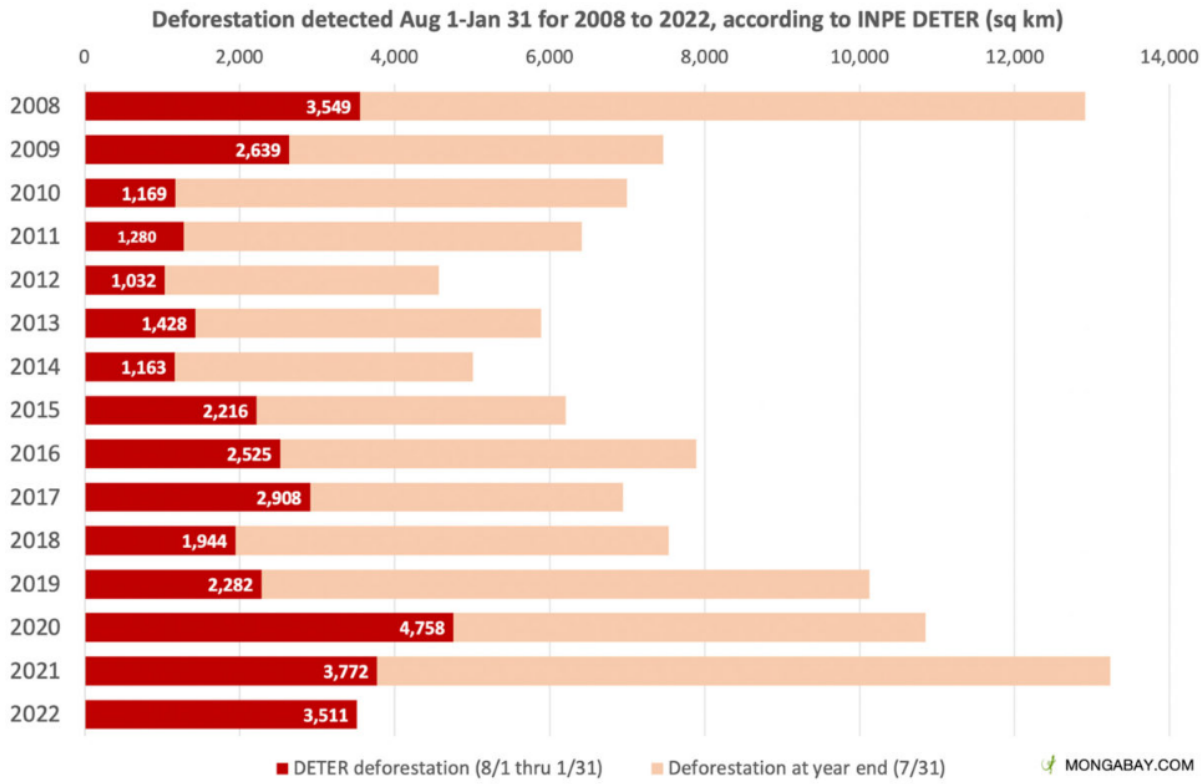


Source: ClearBlue Markets

5.1.3 Without-project Scenario: Biodiversity (B1.3)

In the absence of the Marajó REDD+ Project, illegal and legal logging, the encroachment of settlers, the ever-increasing expansion of slash-and-burn agriculture, animal traffic and overfishing would impact the forests and wildlife of the area. Without the activities contemplated in the project, dwellers would have no choice but to continue heretofore unsustainable practices and would continue to clear more forest areas and fell trees for subsistence agriculture. There also would be no limit to what external actors could do in the project area.

Figure 26. Deforestation in Brazil between Aug 1 and Jan 31 2008-2022, according to INPE's DETER system[85]



The state of Pará where Marajó REDD+ Project is located has consistently ranked in the first place for the one where most deforestation and degradation occurs in Brazil[86], with the municipality of Portel ranking third in the state in terms of this customary devastation. It goes without saying that forest loss directly impacts biodiversity, as it means the lessening or disappearance of plant species and habitats for wildlife.

The climate and biodiversity crises are closely related. Loss of biodiversity reduces resilience of both ecosystems and human systems and society. It is often the case that biodiversity and climate change are dealt with as if they were separate issues when the contrary is true[87].

The United Nations Framework Convention on Climate Change (UNFCCC) started in 2005 what today is known as the REDD+ framework. It focuses on reducing emissions from deforestation and forest degradation, conserving, and enhancing forest carbon stocks, and promoting the sustainable management of forests.

As mentioned above, of all Brazilian states, Pará had the most tree cover loss at 15.5Mha compared to an average of 2.33Mha; according to Brazil's INPE (National Institute for Space Research)'s data the trend seems to hold (Figure 26) for deforestation to continue in an only slightly downward path[88], which means that millions of hectares of forests can still be degraded or destroyed. Without the Marajó REDD+ Project, in a business-as-usual scenario, deforestation will

[85] https://news.mongabay.com/2022/02/january-deforestation-in-the-amazon-highest-in-14-years/
[86] https://imazon.org.br/imprensa/desmatamento-na-amazonia-cresce-23-em-novembro-mostra-imazon/
[87] Barber, C.V., Petersen, R., Young, V., Mackey, B. and Kormos, C., 2020. The nexus report: Nature based solutions to the biodiversity and climate crisis. *F20 Foundations, Campaign for Nature and SEE Foundation*.
[88] https://www.globalforestwatch.org/dashboards/country/BRA

increase and approach the boundaries of the area and degradation will continue unabated, with all the negative implications for biodiversity and habitats that would imply. The following sections detail how the territories in the Marajó region encompass a wide array of important habitats for endangered and/or endemic wildlife and tree species that would remain much more vulnerable without a project such as the Marajó REDD+ Project.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

Biodiversity Element	REDD+ Activities
Estimated Change	Reducing forest degradation and deforestation
Justification of Change	The activities of the Marajó REDD+ Project point towards the reduction of deforestation and forest degradation, based on sustainable forest management practices, monitoring of deforestation and degradation, patrimonial surveillance, technical assistance service, capacity building and many others, generating a positive impact on biodiversity and carbon sequestration.

5.2.2 Mitigation Measures (B2.3)

The Marajó REDD+ Project will work towards protecting habitats for trees and therefore wildlife, by reducing and controlling threats looming over the areas of the project.

As mentioned in the following sections, the Marajó REDD+ Project is embedded in a particularly important area in the Amazon in terms of biodiversity and endemism, and it also harbors many endangered species of plants and animals. In order to protect these resources, the project proposes a monitoring plan for fauna and flora to enhance knowledge of wildlife dynamics in the region and enable the project to better mitigate the possible impacts to local biodiversity, key conservation species (triggers) and high conservation value attributes.

The potential impacts generated by the forest management activity in the project area, carried out by REDDA in partnership with local communities, will be monitored throughout the project implementation period. Forest use is the main source of impact for biodiversity in the project area. If done in the right way, these activities bring forth positive impacts that guarantee its feasibility by anticipating and mitigating possible impacts. Forest management as implemented by REDDA would be carried out according to plan and environmental procedures that will be rigorously followed and monitored. Potential impacts generated on local biodiversity by the activities of responsible use of forest resources will be identified, as well as the appropriate mitigation measures that will be implemented whenever possible.

5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

Activities carried out by Marajó REDD+ Project are designed to generate benefits to communities, biodiversity, and climate. Avoiding or mitigating forest destruction and degradation bring net benefits to biodiversity and habitats.

Such benefits brought about by Marajó Project's activities include the protection and continuity of existing vegetation cover, conservation of biodiversity, fostering of native pollinators (Meliponiculture), avoidance of further fragmentation of habitats and population decline of endangered and non-endangered species alike, through improvement in forest management

practices, community capacity building, training and outreach, improvement of the quality of life of settlers, surveillance of the lands to avoid encroachment, poaching and other illegal activities, monitoring of deforestation and biodiversity and other activities performed during the life of the project.

5.2.4 High Conservation Values Protected (B2.4)

ARR activities will not be carried out within the areas classified as HCV 3 - *campirana* as they are not suitable for forest vegetation, being as they are sparsely wooded savannas not created by human activities. Instead, they are naturally occurring patches of mosaics of native grasslands and tree groves particular to this ecosystem and different from the surrounding tropical rainforest. Besides, REDD+ project activities will be directed to generate awareness within the communities about these, so they can protect these areas and shield them from any potential negative impacts that may arise and therefore ensuring that they are not transformed.

5.2.5 Species Used (B2.5)

As it is the case for most ribeirinhos communities in the state of Pará, the economy is based in extraction of forest products and timber for subsistence. Most extractivist activities rely on management of non-timber forest products (NTFP) of native species of the region, mostly Brazil nuts and açaí berry. Subsistence agriculture involves cassava products such as flour (mandioca), with other crops such as plantain, copuaçu, cocoa, maize also being grown.

A restoration program has been initiated where the following species, and the ones in Table 23 take precedence because of their importance to wildlife and trade:

- Piquiá - *Caryocar villosum*
- Piquiarana – *Caryocar glabrum*
- Castaneira – *Bertholletia excelsa*
- Acariquara – *Minquartia guianensis*
- Angelim da mata – *Hymenolobium excelsum*
- Cumarú – *Dipteryx odorata*
- Ucuúba blanca – *Virola flexuosa*
- Tanimbuca – *Terminalia* spp., *Buchenavia* spp.
- Angelim-vermelho - *Dinizia excelsa*
- Babaçu and other palms - *Attalea* spp.

Community nurseries have and will continue to be fostered by REDDA in the Marajó REDD+ territories in order to supply plant stock of the aforementioned species and others like cocoa and copuaçú used by communities in their agricultural practices.

The project also has been fostering native beekeeping (meliponiculture).

5.2.6 Invasive Species (B2.5)

The project's ARR components will involve only native species. Along some settlements, individuals of the potentially invasive *Acacia auriculiformis* have been observed as cultivated. The

community will be advised not to propagate them, and existing trees acacia trees will be gradually replaced with natives.

5.2.7 Impacts of Non-native Species (B2.6)

Non-native species will not be used in the Marajó REDD+ Project.

5.2.8 GMO Exclusion (B2.7)

The Marajó REDD+ Project will make no use of genetically modified organisms (GMOs). The seeds and seedlings of forest and agricultural species provided to communities will not be GMOs.

5.2.9 Inputs Justification (B2.8)

Name	Manure
Justification of Use	Applied to enhance the fertility of the soils.
Potential Adverse Effect	No possible adverse effects are expected.

5.2.10 Waste Products (B2.9)

A procedure for selective collection and reuse of waste products will be implemented by REDDA in the communities of the project.

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

All activities implemented under the Marajo REDD+ project are aimed at conserving and restoring the forest and its biodiversity. Because of this and because the project area is surrounded by other REDD+ projects, no outside negative impacts are envisioned, so mitigation actions are not needed and will not be undertaken.

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

Negative impacts outside of the project area are not expected. Leakage on the other hand could take place as illegal loggers and poachers take their activities elsewhere. The project is bounded by several other REDD+ projects[89] so leakage should be limited.

The main positive impacts would be the maintenance of ecological corridors and a haven for endangered species and ecosystems as within the project's territories ecological processes can continue with minimal human intervention and these limited to sustainable use, as in the general region of the project there are no legally declared protected areas, the closest one being the Floresta Nacional de Caxiuanã 28 km to the west, although as mentioned above, there are several REDD+ projects in the vicinity.

[89] See Figure 13.

5.4 Biodiversity Impact Monitoring

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

Table 28. Biodiversity monitoring program for Marajó REDD

Monitoring	Frequency	Purpose	Results	Indicators
Flora	Every 5 years	Structure and diversity	Monitoring of forest integrity and composition	Richness of species Recruitment, mortality
Birds	Every two years, twice a year (mid dry season and mid wet season)	Richness, composition	Biodiversity conservation	Biodiversity conservation
Mammals	Every two years, twice a year (mid dry season and mid wet season)	Richness, composition	Biodiversity conservation	Biodiversity conservation
Reptiles and invertebrates	Every two years, twice a year (mid dry season and mid wet season)	Richness, composition	Biodiversity conservation	Biodiversity conservation
Vulnerable species	Every two years, twice a year (mid dry season and mid wet season)	Monitoring of status	Keeping Gold Level	Presence of species classified as such
Endangered species	Every two years, twice a year (mid dry season and mid wet season)	Monitoring of status	Keeping Gold Level	Presence of species classified as such

The components in the above table will be monitored as follows:

- FLORA. Will be performed via the same plots used for biomass of large woody vegetation. For non-woody vegetation and non-arboreal woody vegetations the methodology of Variable Area Transect[90] will be used near the plots with an r=35. Because it is a fast and flexible method, and because the forest cover in the area is roughly linear, this study used variable area transects (VAT) that are practical for comparing composition and diversity for many distinct habitats and classes of plants. The transects are based on numbers of individuals to be sampled rather than area, do not require precise measurements, and can be modified for use with forests, savannas, clonal plants, epiphytes, floating aquatics, etc. They allow investigators to make more samples and spend more time on identification of critical plants. They are suitable for use when a statistically rigorous sample is impossible, but a first approximation of the vegetation is needed. The VAT can be considered a combination of distance and quadrat methods. At each of n randomly located points, a fixed width transect is searched until the r^{th} organism is found. In this way, the r^{th} organism is encountered as a consequence of traversing the transect. Consequently, searching and measuring are accomplished at the same time. This allows for robust density estimations found with high r values without the lengthy search times associated with other types of measurements such as plots and quadrat.

[90] Dobrowski, S.Z. and Murphy, S.K., 2006. A practical look at the variable area transect. *Ecology*, *87*(7), pp.1856-1860.

- BIRDS. The methodology used will be point count sampling[91] combined with sound recording. The Point Count method involves an observer standing in one location for a fixed time period and recording all birds detected, whether by sight or by sound. Each point count site should be at least 100 m apart, and preferably 150 to 200 m apart. A single observer can complete 12 to 15 point counts per morning, depending on the terrain. At least 30 counts should be conducted, depending on the abundance of the species and the purpose of the counts. Point counts can be conducted once or many times at a given site. The time spent at each point should represent the minimum time needed to sample at least 80 percent of the species present at a point. Different research suggest that a point count of 10 min duration may be adequate for most Neotropical surveys. The point count method, because of its simplicity and practicality in rough terrain and thick vegetation, is well suited for most birds' survey and monitoring. Unfortunately, point counts are not very accurate for estimating population densities, particularly for species with low densities. For instance, Burnham and others (Burnham et al. 1980) have shown that a minimum of 40 point counts must contain the species of concern to accurately estimate population density, so that density estimates for a rare species might require 100 or more point counts. However, for most conservation purposes, a density estimate may not be required, and the results from point counts can provide a reliable index of abundance.

- MAMMALS. Camera trapping[92] and visual encounter surveys transects will be used.

- REPTILES, AMPHIBIANS AND INVERTEBRATES. Transect surveys[93] will be used, particularly Visual Encounter Surveys[94]. The VES method, consists of walking through an area or habitat for a prescribed time period, systematically searching for animals. Time is expressed as the number of person-hours of searching in each area to be compared. This method is used to determine the species richness of an area, to compile a species' list (species composition of an assemblage), and to estimate relative abundances of species within an assemblage.

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The project intends to disseminate the monitoring plan and the results of the monitoring undertaken in accordance with the requirements of the standard and via the Verra platform. In addition, the project maintains and hardcopy of the plan and results whilst visiting the project area, which would be shared with the communities as and when requested. Moreover, the project is establishing tele-centres with internet connection so the community members can easily access the monitoring plan and results as and when required.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

The Marajó REDD+ Project offers various conservation measures and protection to the flora and fauna in the project area. Thus, conserving the biodiversity at this site will enable the country to fulfil the commitment made towards the Aichi targets under the Convention on Biological Diversity and with the priorities identified in a National Biodiversity Strategy and Action Plan. Additionally, in section 5.5.2, the project demonstrates the presence of endangered and endemic species (Table 23, Table 24, Table 25, Table 26, Table 29) concluding that the project area is a key biodiversity

[91] Ralph, C.J., Geupel, G.R., Pyle, P., Martin, T.E. and DeSante, D.F., 1993. Handbook of field methods for monitoring landbirds. USDA Forest Service. *General Technical Report PSW-GTR-144. Pacific Southwest Research Station, Albany, California, USA*.
[92] O'Connell, A.F. ed., 2011. *Camera traps in animal ecology: methods and analyses* (Vol. 271). New York: Springer.
[93] McDiarmid, R.W., Foster, M.S., Guyer, C., Chernoff, N. and Gibbons, J.W. eds., 2012. *Reptile biodiversity: standard methods for inventory and monitoring*. Univ of California Press.
[94] Heyer, R., Donnelly, M.A., Foster, M. and Mcdiarmid, R. eds., 2014. *Measuring and monitoring biological diversity: standard methods for amphibians*. Smithsonian Institution.

area of global significance. In addition, the project has estimated the initial population trends of the trigger species in the project area as stated in the section 5.5.2. Further, the project has rolled out various activities to maintain or enhance the populations of the trigger species in the project zone and to reduce the threats to them based on the causal model. The project as an indicator, monitors the flora or in other words the vegetation structure through remote sensing technologies as stated in the methodology VM0037 and/or GOFC Gold source book for monitoring,

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

The Marajó REDD+ Project area is within the Pará Area on Endemism[95] for birds and also significantly overlaps with the IBA012 (Important Bird Area) Caxiuanã / Portel[96] (Figure 27), which was delimited as the species in Table 29 inhabit it.

Table 29. Important bird species of the Important Bird Area Caxiuanã Portel

Species	Current IUCN Red List Category	Season
White-crested Guan, *Penelope pileata*	VU	resident
Crested Eagle, *Morphnus guianensis*	NT	resident
Harpy Eagle, *Harpia harpyja*	VU	resident
Pearly Parakeet, *Pyrrhura lepida*	VU	resident
Golden Parakeet, *Guaruba guarouba*	VU	resident
Scaled ground cuckoo, *Neomorphus squamiger*	VU	resident
White-tailed cotinga, *Xipholena lamellipennis*,	NT	resident
White bellbird, *Procnias albus wallacei*	VU[97]	resident
Dark-winged trumpeter, *Psophia dextralis*	EN	resident

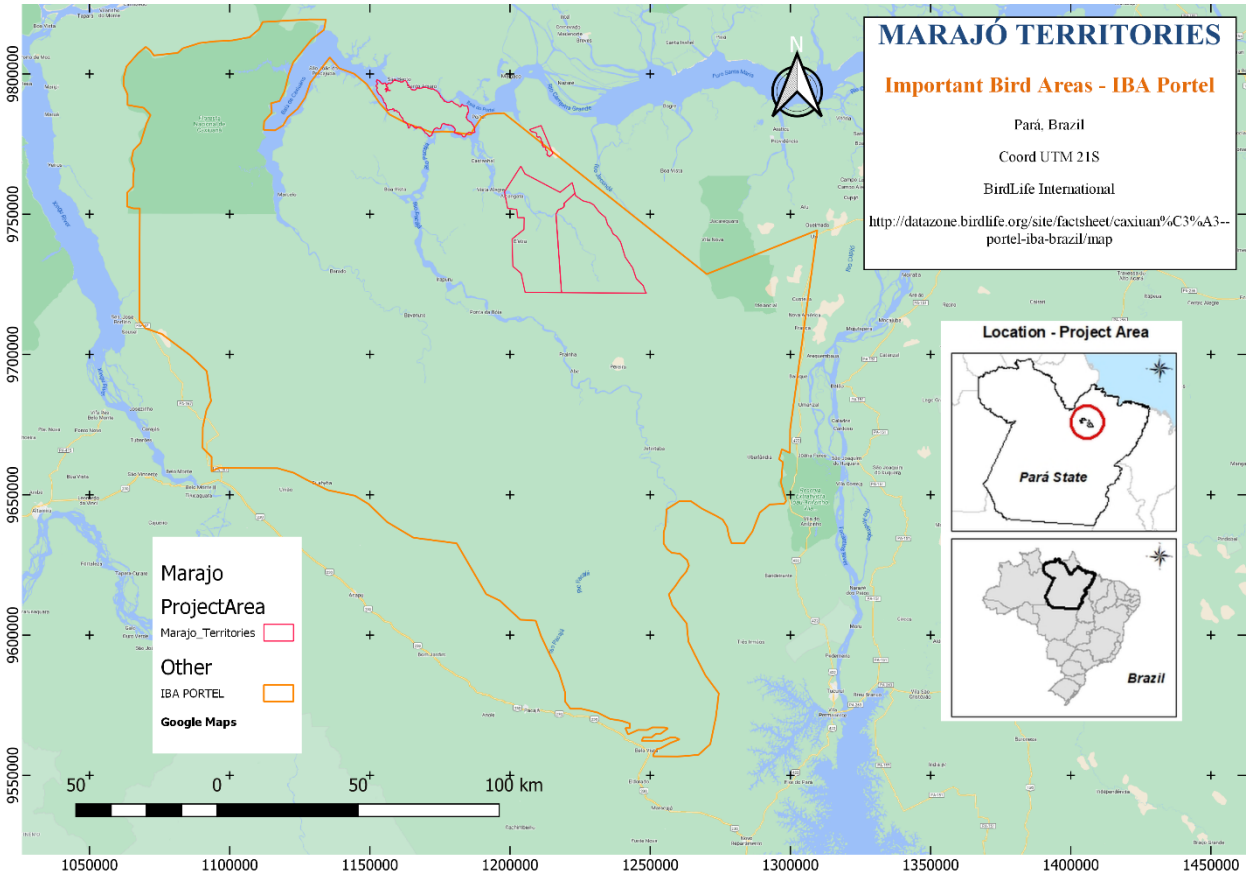
It must also be noted that the project's area is (Figure 28) within the Xingu subregion of vertebrate endemism within Pará[98]. Besides birds, the area south of Portel is home to other special species such as local endemic monkeys, silvery marmoset (*Mico argentatus*) and Red-handed howler (*Alouatta belzebul*, VU) and the dark-spotted anaconda species *Eunectes deschauenseei*[99] (VU). The rare species of salamanders (*Bolitoglossa paraensis* and/or *B. tapajonica* and others yet

[95] Cracraft, J., 1985. Historical biogeography and patterns of differentiation within the South American avifauna: areas of endemism. *Ornithological monographs*, pp.49-84.
Silva, J. M. C., F. C. Novaes & D. C. Oren. 2002. Differentiation of Xiphocolaptes (Dendrocolaptidae) across the river Xingu, Brazilian Amazonia: recognition of a new phylogenetic species and biogeographic implications. Bulletin of the British Ornithologists'Club 122: 185-194
[96] http://datazone.birdlife.org/site/factsheet/caxiuan%C3%A3--portel-iba-brazil
http://datazone.birdlife.org/site/factsheet/caxiuan%C3%A3--portel-iba-brazil/details
[97] de Melo Dantas, S., de Sousa Miranda, L., Ravetta, A.L. and Aleixo, A.P., 2017. a new documented record of the white bellbird *Procnias albus* (Hermann, 1783) from southern Brazilian Amazonia, with comments on its subspecies. Revista Brasileira de Ornitologia-Brazilian Journal of Ornithology, 25(1), pp.71-74.
[98] da Silva, J.M.C., Capítulo 22 Áreas de endemismo, corredores de biodiversidade e a conservação da Amazônia. In: Fearnside, P.M., Peres, C.A., Gardner, T.A., Barlow, J. and Vieira, I.C.G., 2013. *Conservação da Biodiversidade em Paisagens Antropizadas do Brasil.*
[99] Nogueira, C.C., Argôlo, A.J., Arzamendia, V., Azevedo, J.A., Barbo, F.E., Bérnils, R.S., Bolochio, B.E., Borges-Martins, M., Brasil-Godinho, M., Braz, H. and Buononato, M.A., 2019. Atlas of Brazilian snakes: verified point-locality maps to mitigate the Wallacean shortfall in a megadiverse snake fauna. *South American Journal of Herpetology*, *14*(sp1), pp.1-274.

unknown might also occur in the area[100], which despite its closeness to urban centers has been poorly surveyed in terms of wildlife and flora.

As mentioned earlier, *Bertholletia excelsa,* the Brazil nut, classified by the IUCN as Vulnerable, occurs in the area and it merits protection and propagation because of its importance to wildlife, communities, and trade. The tree species in Table 23 should also be conservation and propagation priorities.

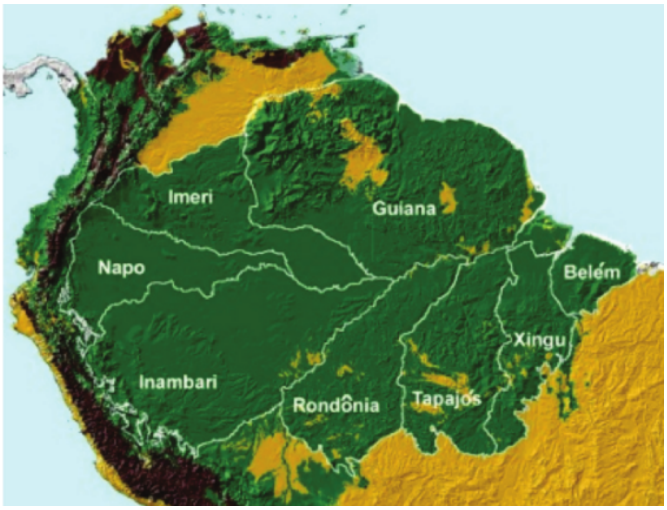
Figure 27. Important bird area of Caxiuanã – Portel in relationship with the Marajó territories



Source: ClearBlue Markets

[100] Brcko, I.C., Hoogmoed, M.S. and Neckel-Oliveira, S., 2013. Taxonomy and distribution of the salamander genus Bolitoglossa Duméril. *Zootaxa*, *3686*(4), pp.401-431.

Figure 28. Endemism areas in the Amazon[101]



5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

Trigger species data and population trends were taken from the Brazilian Red Books of Threatened Species series[102].

Trigger Species	*Guaruba guarouba*
Population Trend at Start of Project	Decreasing. Population must be around 10,000 individuals[103]. The species depends on cavities on large trees for nesting, which become scarcer as forest is degraded and large trees disappear. Population is expected to decline 30% in the next 22 years (three generations).
Without-project Scenario	Without the Marajó REDD+ Project, the population trend of this species will tend to decrease, and its threatened state will continue to worsen, mainly due to the loss of habitat caused by deforestation and forest degradation.
	The Marajó REDD+ Project's purpose is the mitigation and reduction of deforestation and forest degradation, which will in turn minimize habitat loss and consequent improvement in biodiversity conservation. Besides, the Project fosters research that will aid in the identification and conservation of natural environments. Therefore, it is expected that with the Project there will be improvements in the population of the Golden Parakeet.

[101] Da Silva, J.M., Novaes, F.C. and Oren, D.C., 2002. Differentiation of Xiphocolaptes (Dendrocolaptidae) across the river Xingu, Brazilian Amazonia: recognition of a new phylogenetic species and biogeographic implications. bulletin-british ornithologists club, 122(3), pp.185-193.
[102] https://www.gov.br/icmbio/pt-br/centrais-de-conteudo/publicacoes/publicacoes-diversas/livro-vermelho/livro-vermelho-da-fauna-brasileira-ameacada-de-extincao-2018
[103] Laranjeiras, T.O., 2011. Biology and population size of the Golden Parakeet (Guaruba guarouba) in western Pará, Brazil, with recommendations for conservation. *Volume 19, Número 3, Pags. 303-314*.

Trigger Species	*Pyrrhura lepida*
Population Trend at Start of Project	Decreasing. The population is expected to decline 30-50% each three generations (~12 years).
Without-project Scenario	Without the Marajó REDD+ Project, the population trend of this species will tend to decrease, and its threatened state will continue to worsen, mainly due to the loss of habitat caused by deforestation and forest degradation.
With-project Scenario	The Marajó REDD+ Project's purpose is the mitigation and reduction of deforestation and forest degradation, which will in turn minimize habitat loss and consequent improvement in biodiversity conservation. Besides, the Project fosters research that will aid in the identification and conservation of natural environments. Therefore, it is expected that with the Project, that there will be improvements in the population of the Pearly Parakeet.

Trigger Species	*Penelope pileata*
Population Trend at Start of Project	A population decrease of 30% is expected to occur every three generations due to hunting pressure and loss of habitat.
Without-project Scenario	Without the Marajó REDD+ Project, the population trend of this species will tend to decrease, and its threatened state will continue to worsen, mainly due to the loss of habitat caused by deforestation and forest degradation.
With-project Scenario	The Marajó REDD+ Project's purpose is the mitigation and reduction of deforestation and forest degradation, which will in turn minimize habitat loss and consequent improvement in biodiversity conservation. Besides, the Project fosters research that will aid in the identification and conservation of natural environments. Therefore, it is expected that with the Project, that there will be improvements in the population of the white-crested guan

Trigger Species	*Neomorphus squamiger*
Population Trend at Start of Project	A population loss of 17-31% is expected to occur each 12 years due to loss of habitat. This species is very vulnerable to alterations in the forest structure.
Without-project Scenario	Without the Marajó REDD+ Project, the population trend of this species will tend to decrease, and its threatened state will continue to worsen, mainly due to the loss of habitat caused by deforestation and forest degradation.
With-project Scenario	The Marajó REDD+ Project's purpose is the mitigation and reduction of deforestation and forest degradation, which will in turn minimize habitat loss and consequent improvement in biodiversity conservation. Besides, the Project fosters research that will aid in the identification and conservation of natural environments. Therefore, it is expected that with the Project there will be improvements in the population of the scaled ground cuckoo.

Trigger Species	*Psophia dextralis*
Population Trend at Start of Project	A population loss of 24-60% is expected to occur each 20 years due to loss of habitat. This species is very vulnerable to alterations in the forest structure.
Without-project Scenario	Without the Marajó REDD+ Project, the population trend of this species will tend to decrease, and its threatened state will continue to worsen, mainly due to the loss of habitat caused by deforestation and forest degradation.
With-project Scenario	The Marajó REDD+ Project's purpose is the mitigation and reduction of deforestation and forest degradation, which will in turn minimize habitat loss and consequent improvement in biodiversity conservation. Besides, the Project fosters research that will aid in the identification and conservation of natural environments. Therefore, it is expected that with the Project there will be improvements in the population of the olive-winged trumpeter.

Trigger Species	*Alouatta belzebul*
Population Trend at Start of Project	Population trend is declining and expected to be around 10,000 in the Amazon.
Without-project Scenario	Without the Marajó REDD+ Project, the population trend of this species will tend to decrease, and its threatened state will continue to worsen, mainly due to the loss of habitat caused by deforestation and forest degradation.
With-project Scenario	The Marajó REDD+ Project's purpose is the mitigation and reduction of deforestation and forest degradation, which will in turn minimize habitat loss and consequent improvement in biodiversity conservation. Besides, the Project fosters research that will aid in the identification and conservation of natural environments. Therefore, it is expected that with the Project there will be improvements in the population of the red-handed howler monkey.

Trigger Species	*Chiropotes utahickae*
Population Trend at Start of Project	Population trend is on the decline. The species occurs only in a narrow part of the Amazon between the rivers Xingu and Tocantins.
Without-project Scenario	Without the Marajó REDD+ Project, the population trend of this species will tend to decrease, and its threatened state will continue to worsen, mainly due to the loss of habitat caused by deforestation and forest degradation.
With-project Scenario	The Marajó REDD+ Project's purpose is the mitigation and reduction of deforestation and forest degradation, which will in turn minimize habitat loss and consequent improvement in biodiversity conservation. Besides, the Project fosters research that will aid in the identification and conservation of natural

	environments. Therefore, it is expected that with the Project there will be improvements in the population of the Uta Hick's bearded saki.