TAPERA AMAZONAS REDD+

Document Prepared by Organica Consultoria

Contact Information: Rémi Denecheau

Project Title	Tapera Amazonas REDD+
Version	V.01
Date of Issue	31/12/2023
Project Location	Urucará & Nhamundá municipalities, state of Amazonas - Brazil
Project Proponent(s)	Orgânica Consultoria – Fortaleza - Brazil
Prepared By	Rémi Denecheau , +55 85 99106-3502
Validation Body	EPIC
Project Lifetime	30 years 01-03-2021 – 28-02-2051; 30 years
GHG Accounting Period	01-03-2021 – 28-02-2051; 30 years
History of CCB Status	Not applicable
Gold Level Criteria	The Tapera Amazonas project plays an important role in reducing the impact of climate change, mitigating social differences, and conserving biodiversity. The project area presents a dense hydrographic network composed of springs and watercourses and will contribute to the conservation of water resources in the Amazon River basin. The project will therefore contribute to preventing the biome from reaching the point of no return, which is when the ecosystem is no longer able to sustain itself from the point of view of its hydrological cycle, according to IPCC: Climate change 2021(GL1) . The Gold Level for exceptional community benefits is achieved because it has been identified that the project zone is in an administrative area of a

	medium human development country where at least 50% of the households within the communities are below the national poverty line. Infrastructure and sanitation programs will provide access to water, electricity, education and information to low-income traditional extractive communities, enabling them to adapt to local climate change impacts (GL2). According to the vulnerability criteria described by the CCB, the Tapera project provides exceptional benefits for biodiversity as it presents endangered and critically endangered species (IUCN Red List), such as: Saguinus Bicolor , Cebus apella robustus, Mymercophaga tridactyla,Ateles marginatu and the Trichechos inunguis.
Expected Verification Schedule	March 2021 – February 2051.

Summary

Tables 8
Figures 13
1. Summary of Project Benefits 17
1.1. Unique Project Benefits 18
1.2. Standardized Benefit Metrics 18
2. General 23
2.1. Project Goals, Design and Long-Term Viability 23
2.1.1. Summary Description of the Project (G1.2) 23
2.1.2. Project Scale 26
2.1.3. Project Proponent (G1.1) 26
2.1.4. Physical Parameters (G1.3) 32
2.1.5. Social Parameters (G1.3) 82
2.1.6. Project Zone Map (G1.4-7, G1.13, CM1.2, B1.2) 98
2.1.7. Stakeholder Identification (G1.5) 100
2.1.8. Stakeholder Descriptions (G1.6, G1.13) 102
2.1.9. Sectoral Scope and Project Type 103
2.1.10. Project Activities and Theory of Change (G1.8) 103
2.1.11. Sustainable Development 104
2.1.12. Implementation Schedule (G1.9) 106
2.1.13. Project Start Date 108
2.1.14. Benefits Assessment and Crediting Period (G1.9) 109
2.1.15. Differences in Assessment/Project Crediting Periods (G1.9) 109
2.1.16. Estimated GHG Emission Reductions or Removals 110
2.1.17. Risks to the Project (G1.10) 111
2.1.18. Benefit Permanence (G1.11) 112
2.1.19. Financial Sustainability (G1.12) 112
2.1.20. Grouped Projects 113
2.2. Without-project Land Use Scenario and Additionality 115
2.2.1. Land Use Scenarios without the Project (G2.1) 115
2.2.2. Most-Likely Scenario Justification (G2.1) 115
2.2.3. Community and Biodiversity Additionality (G2.2) 116

2.2.4. Benefits to be used as Offsets (G2.2) 116
2.3. Stakeholder Engagement 117
2.3.1. Stakeholder Access to Project Documents (G3.1) 117
2.3.2. Dissemination of Summary Project Documents (G3.1) 118
2.3.3. Informational Meetings with Stakeholders (G3.1) 118
2.3.4. Community Costs, Risks, and Benefits (G3.2) 118
2.3.5. Information to Stakeholders on Validation and Verification Process (G3.3) 119
2.3.6. Site Visit Information and Opportunities to Communicate with Auditor (G3.3) 120
2.3.7. Stakeholder Consultations (G3.4) 120
2.3.8. Continued Consultation and Adaptive Management (G3.4) 121
2.3.9. Stakeholder Consultation Channels (G3.5) 121
2.3.10. Stakeholder Participation in Decision-Making and Implementation (G3.6) 122
2.3.11. Anti-Discrimination Assurance (G3.7) 122
2.3.12. Feedback and Grievance Redress Procedure (G3.8) 123
2.3.13. Accessibility of the Feedback and Grievance Redress Procedure (G3.8) 124
2.3.14. Worker Training (G3.9) 124
2.3.15. Community Employment Opportunities (G3.10) 125
2.3.16. Relevant Laws and Regulations Related to Workers´ Rights (G3.11) 125
2.3.17. Occupational Safety Assessment (G3.12) 127
2.4. Management Capacity 128
2.4.1. Project Governance Structures (G4.1) 128
2.4.2. Required Technical Skills (G4.2) 132
2.4.3. Management Team Experience (G4.2) 132
2.4.4. Project Management Partnerships/Team Development (G4.2) 134
2.4.5. Financial Health of Implementing Organisation(s) (G4.3) 134
2.4.6. Avoidance of Corruption and Other Unethical Behaviour (G4.3) 135
2.4.7. Commercially Sensitive Information (*Rules* 3.5.13 – 3.5.14) 135
2.5. Legal Status and Property Rights 136
2.5.1. Statutory and Customary Property Rights (G5.1) 136
2.5.2. Recognition of Property Rights (G5.1) 140
2.5.3. Free, Prior and Informed Consent (G5.2) 143

2.5.4. Property Rights Protection (G5.3) 147
2.5.5. Illegal Activity Identification (G5.4) 147
2.5.6. Ongoing Disputes (G5.5) 150
2.5.7. National and Local Laws (G5.6) 151
2.5.8. Approvals (G5.7) 153
2.5.9. Project Ownership (G5.8) 153
2.5.10. Management of Double Counting Risk (G5.9) 154
2.5.11. Emissions Trading Programs and Other Binding Limits 155
2.5.12. Other Forms of Environmental Credit 155
2.5.13. Participation under Other GHG Programs 155
2.5.14. Projects Rejected by Other GHG Programs 155
2.5.15. Double Counting (G5.9) 155
3. Climate 155
3.1. Application of Methodology 155
3.1.1. Title and Reference of Methodology 155
3.1.2. Applicability of Methodology 157
3.1.3. Project Boundary 163
3.1.4. Baseline Scenario 169
3.1.5. Additionality 187
3.1.6. Methodology Deviations 196
3.2. Quantification of GHG Emission Reductions and Removals 196
3.2.1. Baseline Emissions from Planned Deforestation - APD 196
3.2.2. Project Emissions 236
3.2.3. Leakage 238
3.2.4. Net GHG Emission Reductions and Removals 247
3.3. Monitoring 259
3.3.1. Data and Parameters Available at Validation 259
3.3.2. Data and Parameters Monitored 280
3.3.3. Monitoring Plan 312
3.3.4. Dissemination of Monitoring Plan and Results (CL4.2) 331
3.4. Optional Criterion: Climate Change Adaptation Benefits 331
3.4.1. Regional Climate Change Scenarios (GL1.1) 331

3.4.2. Climate Change Impacts (GL1.2) 334
3.4.3. Measures Needed and Designed for Adaptation (GL1.3) 335
4. Community 338
4.1. Without-Project Community Scenario 338
4.1.1. Descriptions of Communities at Project Start (CM1.1) 338
4.1.2. High Conservation Values (CM1.2) 349
4.1.3. Without-Project Scenario: Community (CM1.3) 350
4.2. Net Positive Community Impacts 352
4.2.1. Expected Community Impacts (CM2.1) 352
4.2.2. Negative Community Impact Mitigation (CM2.2) 354
4.2.3. Net Positive Community Well-Being (CM2.3, GL1.4) 354
4.2.4. High Conservation Values Protected (CM2.4) 355
4.3. Other Stakeholder Impacts 355
4.3.1. Impacts on Other Stakeholders (CM3.1) 355
4.3.2. Mitigation of Negative Impacts on Other Stakeholders (CM3.2) 356
4.3.3. Net Impacts on Other Stakeholders (CM3.3) 356
4.4. Community Impact Monitoring 356
4.4.1. Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5) 356
4.4.2. Monitoring Plan Dissemination (CM4.3) 360
4.5. Optional Criterion: Exceptional Community Benefits 360
4.5.1. Exceptional Community Criteria (GL2.1) 360
4.5.2. Short-term and Long-term Community Benefits (GL2.2) 361
4.5.3. Community Participation Risks (GL2.3) 363
4.5.4. Marginalised and/or Vulnerable Community Groups (GL2.4) 363
4.5.5. Benefit Sharing Mechanisms (GL2.6) 364
4.5.6. Benefits, Costs, and Risks Communication (GL2.7) 365
4.5.7. Governance and Implementation Structures (GL2.8) 367
4.5.8. Smallholders/Community Members Capacity Development (GL2.9) 367
4.5.9 Smallholders/Community Members Capacity Development (GL2.9) 367
5. Biodiversity 368
5.1. Without-Project Biodiversity Scenario 368
5.1.1. Existing Conditions (B1.1) 368

5.1.2. High Conservation Values (B1.2) 399
5.2. Net Positive Biodiversity Impacts 401
5.2.1. Expected Biodiversity Changes (B2.1) 401
5.2.2. Mitigation Measures (B2.3) 402
5.2.3. Net Positive Biodiversity Impacts (B2.2, GL1.4) 403
5.2.4. High Conservation Values Protected (B2.4) 404
5.2.5. Species Used (B2.5) 404
5.2.6. Invasive Species (B2.5) 404
5.2.7. Impacts of Non-native Species (B2.6) 404
5.2.8. GMO Exclusion (B2.7) 404
5.2.9. Inputs Justification (B2.8) 404
5.2.10. Waste Products (B2.9) 404
5.3. Offsite Biodiversity Impacts 404
5.3.1. Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2) 404
5.3.2. Net Offsite Biodiversity Benefits (B3.3) 405
5.4. Biodiversity Impact Monitoring 405
5.4.1. Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4) 405
5.4.2. Biodiversity Monitoring Plan Dissemination (B4.3) 407
5.5. Optional Criterion: Exceptional Biodiversity Benefits 407
5.5.1. High Biodiversity Conservation Priority Status (GL3.1) 407
5.5.2. Trigger Species Population Trends (GL3.2, GL3.3) 407
Appendices 411
Appendix 1: Stakeholder Identification Table 411
Appendix 2: Project Activities and Theory of Change Table 420
Appendix 3: Project Risks Table 423

TABLES

Table 1. Distribution of areas of the Tapera project

Table 2. Summary of the expected benefits from the Tapera project.

Table 3. Estimates of the net benefits of different metrics that Tapera project aims to achieve during the project lifetime.

Table 4. Tapera project scale

Table 5. Contact information for the proponent of the Tapera project.

Table 6. Contact information for other entities involved in the Tapera project.

Table 7: Location of Tapera APD Project activity area

Table 8.1. Vegetation in the APD Project Area according to inventory 1 (Piquiá) per species

Table 8.2: Vegetation according to inventory 1 per family

Table 8.3: Vegetation according to inventory 2 (Itaúba) per species

Table 8.4. Vegetation according to inventory 2 per family

Table 9. Components of the IFDM Index

Table 10. Dimensions and indicators that comprise sustainable livelihoods.

Table 11: Milestones in the project's development and implementation

Table 12: Events of crediting and verification of the project

Table 13. Estimated GHG emission reductions or removals (tCO2e)

Table 14. Summary of the Non-Permanence Risk Analysis for the Tapera project.

Table 15. Potential risks to the benefits of climate, community and biodiversity and their mitigation measures.

Table 16. Activities and responsibilities of the companies involved in the project.

Table 17. Members of Organica Consultoria who part of the Tapera project management team are, their respective positions and qualifications.

Table 18: Properties integrated in the Project Tapera

Table 19: Properties SIGEF Numbers

Table 20. Actions to combat and monitor illegal activities in the Tapera project area.

Table 21. Project ownership per property name

Table 22. Applicability criteria for the Tapera project.

Table 23. GHG sources included or excluded within the boundaries of the Tapera project area.

Table 24. Carbon storage compartments included or not in the Tapera project.

Table 25: Carbon pools considered in the Tapera Project

Table 26. Selected proxy areas, deforestation, deforestation rate, and legal reserve (LR).

Table 27. Land cover types

Table 28. Slope classes and elevations in the project area and proxy areas.

Table 29. Soil classes in the project area and proxy areas.

Table 30. Soil classes in the project area and proxy areas

Table 31. Slope classes and elevations in the project area and proxy areas.

Table 32. Selected proxy areas and deforestation rate.

Table 33 General CAPEX for infrastructure and equipment.

Table 34 General OPEX for maintaining the surveillance and monitoring system.

Table 35. Stratum of the Tapera project.

Table 36. Total and annual area of planned deforestation over the baseline scenario.

Table 37. The total value of biomass, carbon, and carbon dioxide equivalent for dense lowland Ombriphylous forest (Db) and Pastures of Brachiaria brizantha cv. Marandu (Br)

Table 38. Baseline carbon stock change in aboveground tree biomass (t CO2-e ha-1).

Table 39. Baseline carbon stock change in belowground tree biomass (t CO2-e ha-1)

Table 40. Summary of calculations of wood products carbon pool in the baseline scenario (t CO2-e ha-1).

Table 41.1 Stock changes in belowground biomass gradually over 10 years (t CO2-e).

Table 41.2 Stock changes in belowground biomass gradually over 10 years (t CO2-e)

Table 41.3 Stock changes in belowground biomass gradually over 10 years (t CO2-e)

Table 42.1 Stock changes in CWP100,i gradually over 20 years (t CO2-e).

Table 42.2 Stock changes in CWP100,i gradually over 20 years (t CO2-e)

Table 42.3 Stock changes in CWP100,i gradually over 20 years (t CO2-e)

Table 43. Calculation of the sum of baseline carbon stocks changes in all pools (t CO2-e).

Table 44. Non-CO2 emissions in the baseline case (t CO2-e).

Table 45. Net GHG emissions in the baseline from planned deforestation in the baseline period (t CO2-e).

Table 46. Net greenhouse gas emissions due to market-effects leakage (t CO2-e).

Table 47. Total net GHG emission reductions of the REDD project activity (t CO2-e) (ex-ante).

Table 48. Cumulative uncertainty for the REDD+ project activities and Total net GHG emission reductions of the REDD+ project activities up to year t* adjusted to account for uncertainty (t CO2-e) (ex-ante).

Table 49. Total net GHG emission reductions of the REDD project activity (t CO2-e) (ex-ante) and Buffer pool allocation (t CO2-e).

Table 50. Data and parameters that are determined or available at validation and remain fixed throughout the project crediting period at the Tapera Project.

Table 51. Data and parameters to be monitored during the crediting period of the Tapera project.

Table 52. Standardised Benefit Category, Project Activities, and Technical Description of the Monitoring Task.

Table 53. Data and parameters to be monitored during the Tapera project crediting period.

Table 54. Measures to assist communities and biodiversity adapt to the likely impacts of climate change.

Table 55. Number of families that inhabit the streams in the Tapera project area.

Table 56. Indicators and averages resulting from the application of the questionnaires with the communities.

Table 57. Identification of areas of high conservation value within the Tapera project.

Table 58. Description of impacts of project activities foreseen for specific community groups.

Table 59. Dimensions, indicators, and corresponding averages stipulated from the application of the MVS questionnaires.

Table 60. Activities and Impacts directed towards women.

Table 61: Species found in the region - Arthropoda

Table 62. Species found in the region - Herpetofauna

Table 63. Species found in the Project region - Avifauna

Table 64. Species found in the Project region - Mastofauna

Table 65. Vegetation according to inventory 1 per species

Table 66: Vegetation according to inventory 2 per species

Table 67. List of trees families endemic to the Brazilian territory and their respective endemism in the Amazon.

Table 68. List of threatened species in the Tapera project region (VU = Vulnerable, EN = Endangered).

Table 69. Main uses of threatened species in the Tapera project region.

Table 70: Species of commercial interest

Table 71. High Conservation Value (HCV) related to Flora biodiversity within the Tapera project zone.

Table 72. High Conservation Value (HCV) related to Flora biodiversity within the Tapera project zone.

Table 73. Expected changes in biodiversity resulting from Tapera project activities.

Table 74. Measures for the maintenance and improvement of the HCV attributes identified in the Tapera project area.

Table 75. Summary of the biodiversity monitoring plan for the Tapera project area.

Table 76. Population trends of the trigger species identified in the Tapera project region.

Table 77: Stakeholder Identification

Table 78: Project Activities and Theory of Change Table

Table 79: Project Management Risks

Table 80: Financial Viability Risks

Table 81. Opportunity Cost Risks.

Table 82: Project Longevity Risks.

Table 83: Internal rists

Table 84: Land and Resources Tenure Risk

Table 85: Stakeholders Engagement Risk

Table 86. Political Risk.

Table 87. Total External Risk

Table 88. Fire Natural Risk

Table 89. Pest and Disease Outbreaks Risk

Table 90. Extreme Climate Risk

Table 91. Geological Risks

Table 92. Total Natural Risks

FIGURES

Figure 1: The annual increase in deforestation (2008-2021) in the Municipalities of Urucará and Nhamundá, where the Tapera project is located.

Figure 2. The twenty-four properties that make up the Tapera project, with their respective permanently protected areas (APP), legal reserve areas (ARL), and planned deforestation areas (ADES) in hectares.

Figure 3: Key protection Areas of the Tapera Project

Figure 4: Location of the Tapera Project

Figure 5: Types of occupation and land use in the Tapera project region.

Figure 6: Digital elevation model of the Project Area.

Figure 7. Location of the Amazon Basin where the project is inserted (blue square). (modified from Motta Marcelo Batista, 2020)

Figure 8. Situation of the Amazon basin (Domínio Médio Amazonas) in the state of Amazonia (in blue) Motta Marcelo Batista, 2020

Figure 9. Geology of the region where the Tapera project is located.

Figure 10 displays the morphostructural units of the Tapera project, comprising three main components: Phanerozoic Sedimentary Basins and Covers, Quaternary Sedimentary, and Continental Water Body, which includes the major rivers.

Figure 10. Morpho-Structural Domains of the Tapera Project Area

Figure 11. Geomorphological Units of the Tapera Project Area

Figure 12. Model shape of the project area

Figure 13. Soil types of the region where the Tapera project is located.

Figure 14. Average monthly temperature in Urucará and Nhamundá.

Figure 15. Average monthly rainfall in Urucará and Nhamundá

Figure 16. Hydrographic network of the region where the Tapera project is located.

Figure 17. Location of water planning units of the region where the Tapera project is located.

Figure 18. Terrain map of part of the Lower Amazon region immediately north of Urucará showing several NW-trending drainage channels within the Project Area (orange line)

Figure 19. Vegetation class of the region where the Tapera project is located.

Figure 20. Localization of first forest inventory

Figures 21.a. 21. b. Forest inventory at Piquia property

Figure 22. Localization of Uirapuru Trail inventory (Second Inventory)

Figures 23.a 23.b. Forest inventory at Itaúba property

Figure 24. Accumulated Burnt Area in the state of Amazonas

Figure 25: Fire Spots of the Project Area

Figure 26. Extensive farms south of the Project site, suggesting encroachment in the future.

Figure 27. Population Pyramid (age-sex pyramid) showing the distribution by age groups and sex of the population of Urucará

Figure 28. Population Pyramid (age-sex pyramid) showing the distribution by age groups and sex of the population of Nhamundá

Figure 29. Map of the municipality of Urucará

Figure 30. Map of the municipality of Nhamundá

Figure 31. Historical line of the IFDM for health in the municipality of Urucará, Nhamundá and Brazil

Figure 32. Historical series of the IFDM for education in the municipalities of Urucará, Nhamundá and Brazil

Figure 33. Historical series of the IFDM for income and public management in the municipalities of Urucará, Nhamundá and Brazil

Figure 34: Indigenous Lands near the Project Area

Figure 35. Archaeological Sites near the Project Area

Figure 36. APD delimitations of the Tapera project.

Figure 37. Tapera project zone in the Urucará and Nhamundá municipalities, Amazonas, Brazil.

Figure 38: Location of communities south of the Tapera Project where families are distributed close to the project.

Figures 39.a, 39.b. Community of Apeua

Figure 40. Community of Nova Jerusalém

Figures 41.a.41.b. Training at Agrofrut

Figure 42. Management structure

Figure 43. Urupolpas aerial view

Figures 44.a.44.b. Monitoring activities

Figure 45. Signing contract between Agrofrut and Organica Consultoria

Figures 46.a and 46.b. Meetings held in Marajazinho and Nhamundá communities.

Figures 47.a and 47.b. Meetings in Urucará

Figures 48.a and 48.b. Visits to communities in Urucará and Nhamundá

Figures 49.a. and 49.b. Meetings with Organica Consultoria and Agrofrut to publicize the Tapera Project and partners.

Figures 50.a. and 50.b. Superposition of properties and illegal ecosystem transition

Figure 51: Map delimitating the area of the Tapera REDD+ Project

Figure 52. Hypsometry of the Project Tapera Area

Figure 53. Slope of the Project Tapera Area

Figure 54: Land use and land cover of the Tapera Project Area.

Figures 55.a and 55.b. Images of deforestation.

Figure 56. Distribution of the 7 selected proxy areas close to the property where the Tapera project is located.

Figures 57.a, 57.b, 57.c, 57.d, 57.e, 57.f and 57.g. Vegetation at proxy areas

Figures 58.a, 58.b, 58.c, 58.d, 58.e, 58.f, 58.g. Proxy areas type of soil.

Figures 59.a, 59.b, 59.c, 59.d, 59.e, 59.f, 59.g. Slope ranges identified, in percentage, in proxy areas

Figure 60. Observed temperature anomaly for 1961-1990 obtained from three data sources for Amazonia. Sources: GISS-NASA Goddard Institute for Space Studies, USA, NCDC-National Climatic Data Center, USA, HAdCRU-Hadley Centre-Climate Research United, United Kingdom.

Figure 61. Projections of temperature and precipitation changes in the tropical region of South America produced by the IPCC AR5 model defined for 2046-2065 and 2081-2100 with low emission (RCP2.6) and high emission (RCP8.5) scenarios, for the period from 1981-2010.

Figure 62. Projections of temperature changes up to 2100 for the various IPCC A5 emission scenarios for the Amazon.

Figure 63. Processes for improvement in the MVS dimensions

Figures 64.a, 64.b, 64.c, 64.d, 64.e, 64.f, 64.g. Implementation of the Project´s benefits

Figures 65a., 65.b, 65.c, 65.d. Jungle Tapera Project Forest

Figure 66: Arthropods

Figure 67: Amphibians and Reptiles

Figure 68: Variety of species of birds

Figure 68: Variety of species of mammals

Figure 69: Arthropod Traps. Image A – suspended hammock; Image B – trap for Coleopetera; Image C – Puça; Image D – Pitfall trap.

Figure 70. Image A – interception trap; Image B - Phyllobates lugubris

Figure 71. a) Image A and B – suspended mica line net, trap for bird and mammal fauna.

1. SUMMARY OF PROJECT BENEFITS

The Tapera Amazonas Reducing Emissions from Deforestation and Forest Degradation (REDD+) Project (hereafter: the Project) is an AFOLU Project focused on Avoided Planned Deforestation (APD) with **281,951.52** ha project area and consisting of 100% Amazon rainforest. The project's primary objective is to conserve **55.192,77** ha of Amazon rainforest through forest conservation and sustainable forest management. The project area (281,951.52 ha) will be allocated to Avoided Planned Deforestation (APD) (Table 1), and it is estimated that at the end of the project the emission of **28.318.039** tons of Greenhouse Gases (GHG) (tCO2e) will have been avoided.

The project will be developed considering the **CCB** Standards, with benefits for the **Climate**, **Community** and **Biodiversity**. As benefits to the climate, the maintenance of forest cover results in exceptional benefits for adapting to the impacts caused by climate change, such as changes in the rainfall regime, as the area presents a dense hydrographic network that contributes to the provision and quality of water in the Amazon River basin.

As benefits to the communities, the project will implement underground water collection and distribution systems, where access to water is complicated, install solar panels electricity generation, and provide satellite internet services in the main communities. Training contents will be created, a multipliers team will be trained, to diffuse training programs for collecting and pre-processing renewable sub products of the forest with good agroforestry and quality practices. A small factory will be implemented in the village of Urucará, to process these subproducts, and offer income alternative and long term financial resources to all communities involved in the project.

The maintenance of forest cover ensures the conservation of biodiversity, the maintenance of ecosystem functioning (e.g., nutrient cycling) and of ecosystem services provisioning (e.g., carbon sequestration) performed by living organisms. It is noteworthy that the project includes a high-priority area for biodiversity conservation, as it is located within a Key Biodiversity Area (KBA), in compliance with the vulnerability criteria of the CCB Gold Level, harbouring species endemic to the Brazilian Amazon and species classified as Vulnerable (VU), Critically Endangered (CR) and Endangered (EN) with extinction according to the International Union for Conservation of Nature (IUCN).

Table 1. Distribution of areas of the Tapera project

Area Description	Hectare	(%)
Property Area	281,951.52 ha	100 %
Legal Reserve - including Permanent Preservation Area (PPA)	226.758,75 ha	80,42 %
Project area: Multiple Use Area - Avoided Planned Deforestation (APD)	55.192,77 ha	19,58 %

1.1. Unique Project Benefits

The expected outcomes or impacts of the activities of the Tapera project during its lifetime are shown in Table 2.

Table 2. Summary of the expected benefits from the Tapera project.

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) Provide water security and access to electricity to improve the quality of life of local communities, based on the pillars of sustainability.	4.5.2
2) Increase the number of children, youth and adults with internet connection, and more access to information, and increase the offer in training and education.	4.5.2
3) Avoid the emission of 28.318.039 tons of Greenhouse Gases (GHG) (tCO_2e), contributing to the mitigation of climate change.	2.1.5
4) Maintenance of ecosystem functions (e.g., nutrient cycling), as well as the provision of ecosystem services (e.g., carbon sequestration) performed by living organisms.	5.1.5

1.2. Standardized Benefit Metrics

The estimates of the net benefits that the Tapera project intends to generate during its lifetime is presented in Table 3 below.

Table 3. Estimates of the net benefits of different metrics that Tapera project aims to achieve during the project lifetime.

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the project area, measured against the without-project scenario	not applicable	-
	Net estimated emission reductions in the project area, measured against the without-project scenario	28.318.039	G1.9
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	55.192,77 ha	G1.3
	For ARR[3] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	not applicable	
Improved land management	Number of hectares of existing production forest land in which IFM[4] practices are expected to occur as a result of project activities, measured against the without-project scenario	not applicable	
	Number of hectares of non-forest land in which improved land management practices are expected to occur as a result of project activities, measured against the without-project scenario	not applicable	
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	400	G1.5

[1] Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests (*VCS Program Definitions*)

[2] Reduced emissions from deforestation and forest degradation (REDD) - Activities that reduce GHG emissions by slowing or stopping conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*)

[3] Afforestation, reforestation and revegetation (ARR) - Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through the planting, sowing and/or human-assisted natural regeneration of woody vegetation (*VCS Program Definitions*)

[4] Improved forest management (IFM) - Activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood and fuelwood (*VCS Program Definitions*)

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	200	G1.5
Employment	Total number of people expected to be employed in project activities,[5] expressed as number of full-time employees[6]	6	G1.5
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	3	G1.5
Livelihoods	Total number of people expected to have improved livelihoods[7] or income generated as a result of project activities	400	G1.5
	Number of women expected to have improved livelihoods or income generated as a result of project activities	200	G1.5
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	400	G1.5
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	200	G1.5

[5] Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, subcontracted 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
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	400	G1.5
	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	200	G1.5
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	562	2.1.11
	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	281	2.1.11
Well-being	Total number of community members whose well-being[8] is expected to improve as a result of project activities	562	2.1.11
	Number of women whose well-being is expected to improve as a result of project activities	281	2.1.11
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	55.192,77 ha	2.1.11
	Expected number of globally Critically Endangered or Endangered species[10] benefiting from reduced	Fauna:12 fauna species;	2.1.11

[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

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	threats as a result of project activities,[11] measured against the without-project scenario	Flora: 6 (VU) and 2 (EN).	

[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 Tapera Amazonas Reducing Emissions from Deforestation and Forest Degradation (REDD+) Project is located in the municipalities of Urucará and Nhamundá, in the state of Amazonas, Brazil. Amazonas is currently suffering alarming rates of deforestation. In 2021, 4.913,00 km² of the forest was deforested in Amazonas, equivalent to 239 megatons of CO_2 emissions while in 2022 this value was 2.741,00 km²[12]. Deforestation in Amazonas is driven by several factors including legal and illegal timber logging, deforestation for cattle ranching, infrastructure development, expansion of agriculture and soy farming, and forest fires[13].Urucará and Nhamundá continue to boast an impressive natural landscape, with 94.85% and 85.91%[14] forest cover, respectively. Amidst global concerns about deforestation and environmental degradation, these regions stand as beacons of biodiversity and ecological richness. The Tapera project will act to implement actions that will further fortify and sustain this invaluable green expanse. With a commitment to environmental stewardship, the initiative aims to enhance conservation efforts, bolster biodiversity protection, and promote sustainable practices.

Lack of sufficient governance and low enforcement of forest protection also contributed to deforestation. Within the Project Area, the primary drivers of deforestation are legal forest conversion, illegal logging and timber harvest, and land clearance for agricultural expansion. In the municipality of Urucará, deforestation has advanced in recent years, mainly along the Urucará – São Sebastião road, because there is a large concentration of timber industries in São Sebastiao, which primarily work with clandestine wood, which is being extracted from the municipality of Urucará, accessed by road.

The Project will be a Verified Carbon Standard (VCS) Project within the **Sectoral Scope 14: Forestry.** The Project category is **Reduced Emissions from Deforestation and Degradation (REDD)**. The Project consists of **Avoiding Planned Deforestation and/or Degradation (APD).** The carbon project is expected to allow for increased monitoring of the area, as well as the hiring of new professionals to work on the farms. A portion of the carbon credits generated will be dedicated to improving the social and environmental conditions in the project region, specifically contributing to improved deforestation control, environmental awareness propagation, alternative income generation, and environmental education actions, in addition to the project's ecological and carbon benefits.

[12] Relatório Anual de Desmatamento 2022, MapBiomas, RAD_2022.pdf (storage.googleapis.com) acessado em 14/12/2023
[13] Relatório Anual de Desmatamento 2022, MapBiomas, RAD_2022.pdf (storage.googleapis.com) acessado em 14/12/2023
[14] Available at: http://www.dpi.inpe.br/prodesdigital/prodesmunicipal.php

According to the Brazilian Forest Code (Law No. 2.651/12), landowners must conserve 80% of the forest cover in properties located in the Legal Amazon. This guarantees the legality of converting 20% of forest cover to other commercial uses, such as livestock or agriculture, with the proper authorization from the responsible environmental agencies.

As benefits to the communities, the project will implement underground water collection and distribution systems, where access to water is complicated, install solar panels electricity generation, and provide satellite internet services in the main communities. Training contents will be created, a multipliers team will be trained, to diffuse training programs for collecting and pre-processing renewable sub products of the forest with good agroforestry and quality practices. A small factory will be implemented in the village of Urucará to process these subproducts and offer alternative income and long-term financial resources to all communities involved in the project. The date for starting operations is planned for January 2025.

The maintenance of forest cover ensures the conservation of biodiversity, the maintenance of ecosystem functioning (e.g., nutrient cycling) and of ecosystem services provisioning (e.g., carbon sequestration) performed by living organisms. It is noteworthy that the project includes a high-priority area for biodiversity conservation, as it is located within a Key Biodiversity Area (KBA), harbouring species endemic to the Brazilian Amazon and species classified as Vulnerable (VU), Critically Endangered (CR) and Endangered (EN) with extinction according to the International Union for Conservation of Natura (IUCN).

Finally, the project aims to guarantee the conservation of forest areas, resulting in the maintenance of forest cover under pressure from planned deforestation (allowed by Law). Forest monitoring will be done through satellite images, forest biomass inventory associated with the use of drones and innovative aerial photogrammetry techniques (e.g., drone LiDAR), patrimonial vigilance, monitoring of forest fires, fire prevention and firefighting activities, protection of threatened species and social orientation activities with traditional communities residing in and around the project area.

Figure 1: The annual increase in deforestation (2008-2021) in the Municipalities of Urucará and Nhamundá, where the Tapera project is located.

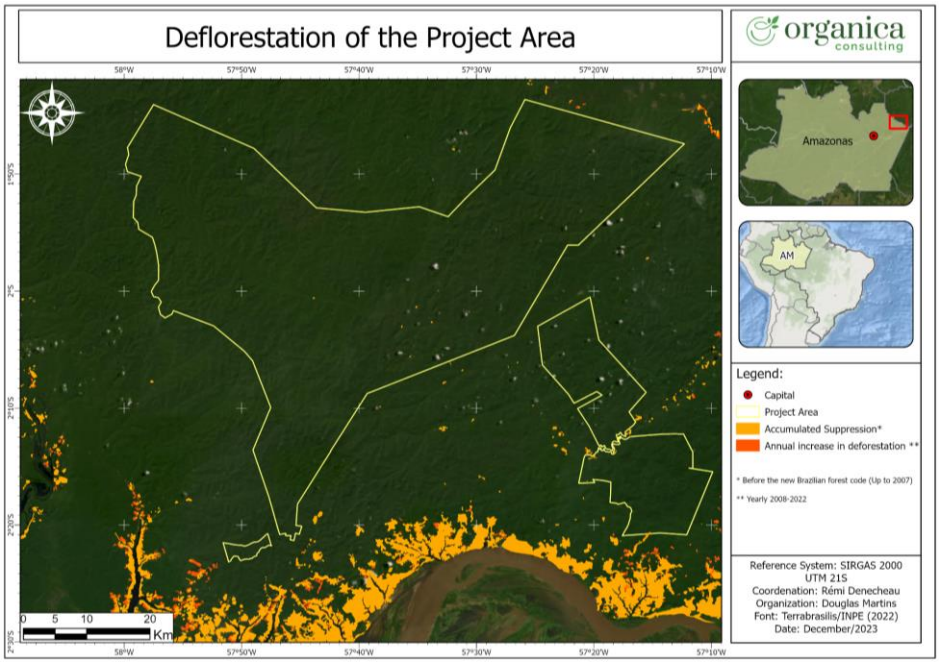
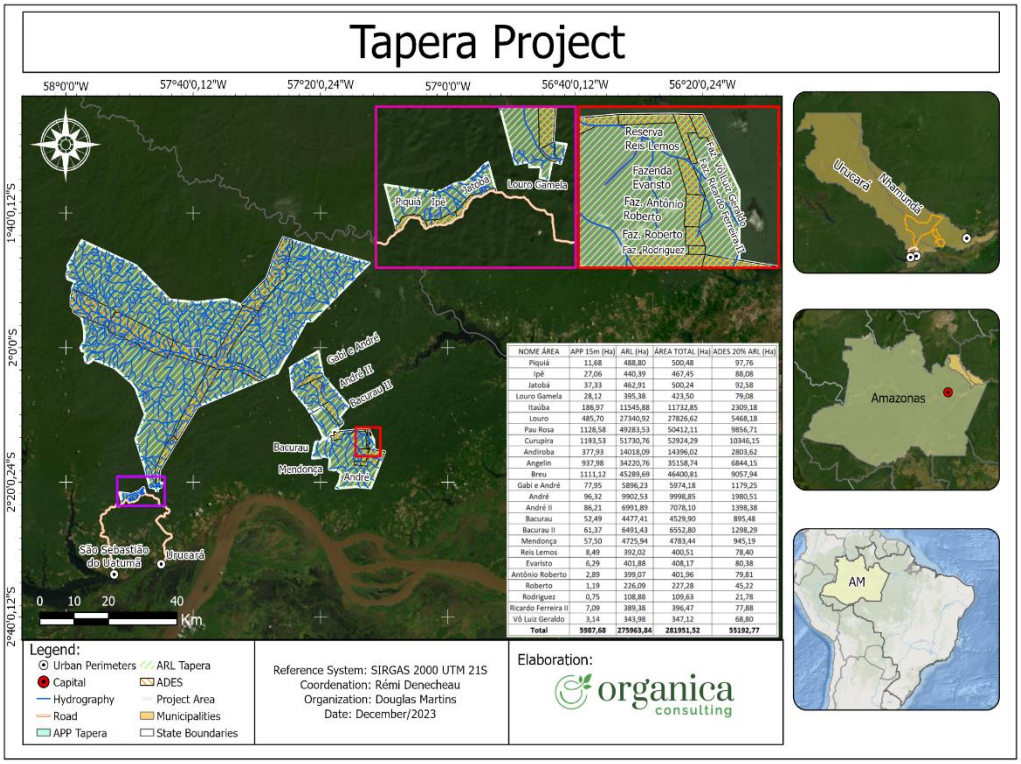


Figure 2. The twenty-four properties that make up the Tapera project, with their respective permanently protected areas (APP), legal reserve areas (ARL), and planned deforestation areas (ADES) in hectares.



NOME ÁREA	APP 15m (Ha)	ARL (Ha)	ÁREA TOTAL (Ha)	ADES 20% ARL (Ha)
Piquiá	11,68	488,80	500,48	97,76
Ipê	27,06	440,39	467,45	88,08
Jatobá	37,33	462,91	500,24	92,58
Louro Gamela	28,12	395,38	423,50	79,08
Itaúba	186,97	11545,88	11732,85	2309,18
Louro	485,70	27340,92	27826,62	5468,18
Pau Rosa	1128,58	49283,53	50412,11	9856,71
Curupira	1193,53	51730,76	52824,29	10346,15
Andiroba	377,93	14018,09	14396,02	2803,62
Angelin	937,98	34220,76	35158,74	6844,15
Breu	1111,12	45289,69	46400,81	9057,94
Gabi e André	77,95	5896,23	5974,18	1179,25
André	96,32	9902,53	9998,85	1980,51
André II	86,21	6991,89	7078,10	1398,38
Bacurau	52,49	4477,41	4529,90	895,48
Bacurau II	61,37	6491,43	6552,80	1298,29
Mendonça	57,50	4725,94	4783,44	945,19
Reis Lemos	8,49	392,02	400,51	78,40
Evaristo	6,29	401,88	408,17	80,38
Antônio Roberto	2,89	399,07	401,96	79,81
Roberto	1,19	226,09	227,28	45,22
Rodriguez	0,75	108,88	109,63	21,78
Ricardo Ferreira II	7,09	389,38	396,47	77,88
Vô Luiz Geraldo	3,14	343,98	347,12	68,80
Total	**5987,68**	**275963,84**	**281951,52**	**55192,77**

In the absence of the project, the advance of deforestation and degradation in the area would cause negative impacts on biodiversity. Habitat loss and landscape fragmentation can result in the loss of species, especially those that are less mobile (e.g., species that depend on large dispersing animals) and have more specialised characteristics (e.g., species adapted to dense, closed, undisturbed forests).

Therefore, the implementation of the project guarantees the conservation of the forest in a region with a high rate of deforestation and of recognized biological importance, since the region presents a Conservation Units with a great diversity of species of animals and plants, some of which are endemic to the Amazon and threatened with extinction. In addition, protecting the area favours the maintenance of continuous forest environments, ensuring the maintenance of gene flow of the species and the ecosystem services performed by species (e.g. provision of food, fresh water, wood), which favours local communities.

The development, implementation, monitoring, and certification of the Tapera project is the responsibility of Orgânica Consultoria. The counterpart of the landowners is to allow the project activities to be implemented on their properties and to freely commit to its long-term conservation.

2.1.2. Project Scale

Table 4. Tapera project scale

Project Scale	
Project	
Large project	X

2.1.3. Project Proponent (G1.1)

Table 5. Contact information for the proponent of the Tapera project.

Organisation name	Orgânica Consultoria
Contact person	Rémi Denecheau
Title	Chief Executive Officer
Address	Rua Barbosa de Freitas 1741 – sala 04, Zip code 60.170-021, Bairro Aldeota, FORTALEZA, Ceará
Telephone	+55 85 99106 3502
Email	admin@organica-consulting.com

Other Entities Involved in the Project

Table 6. Contact information for other entities involved in the Tapera project.

Organisation name	Urupolpas
Contact person	Ana Maria Gomes Mata
Title	Chief Executive Officer
Address	Estrada Governador Gilberto Mestrinho, KM 2, CEP 69.130-000, bairro Divino, Urucará, Amazonas
Telephone	+55 85 99431-7279
Email	contact@urupolpas.com

Organisation name	Agrofrut Cooperative
Contact person	Antonio Carlos Fonseca
Title	President
Address	Rua Dona Doquinha 247 – Casa do Colono – CEP 69.130-000 Bairro Aparecida – Urucara - AM
Telephone	+55 92 3571-1259
Email	Agrofrut1@gmail.com

Organisation name	Nat'Organico
Contact person	Ana Maria Gomes Mata
Title	Chief Executive Officer

Address	Rua Monsenhor Bruno 927/13, bairro Aldeota, CEP 60.115-190, FORTALEZA-Ceará
Telephone	+55 85 99431-7279
Email	a.mata@natorganico.com

Organisation name	Odielio Nascimento (PF)
Contact person	Odielio
Title	Agricultor
Address	Rua Rosa Falabella, 416, Bairro de Aparecida, Zip code 69130-000 Urucará, State of Amazonas, Brazil
Telephone	+55 92 9228-2989
Email	homemdebarro@gmail.com

Organisation name	Gerliane da paz
Contact person	Gerliane da paz
Title	Agricultor

Address	Estrada Governador Gilberto Mestrinho, KM 2, CEP 69.130-000, bairro Divino, Urucará, Amazonas
Telephone	+55 85 99108-2588
Email	gerlidapaz@gmail.com

Organisation name	André Evaristo Marcondes Cesar
Contact person	André Evaristo Marcondes Cesar
Title	Proprietário
Address	Rua Rafael Correia Sampaio, 1350, ap. 162, CEP: 09541-250, Bairro Santa Paula, São Caetano do Sul - São Paulo
Telephone	+55 11 98236-1867
Email	tapera@organica-consulting.com

Organisation name	Antonio Roberto Quevedo
Contact person	Antonio Roberto Quevedo
Title	Proprietário
Address	Avenida Isaltino do Amaral Carvalho, 1159, CEP: 17209-010, Bairro Jardim Alvorada, Jaú - São Paulo
Telephone	+55 11 98236-1867
Email	tapera@organica-consulting.com

Organisation name	Roberto Camargo Quevedo
Contact person	Roberto Camargo Quevedo

Title	Proprietário
Address	Rua Pais Leme, 215, CEP: 5424-010, ap. 1306 ala Terra, Bairro Pinheiros, São Paulo - São Paulo
Telephone	+55 11 98236-1867
Email	tapera@organica-consulting.com

Organisation name	Evaristo Marcondes Cesar
Contact person	Evaristo Marcondes Cesar
Title	Proprietário
Address	Rua General Osório, 494, ap. 131, CEP: 09541-320, Bairro Santa Paula, São Caetano do Sul - São Paulo
Telephone	+55 11 98236-1867
Email	tapera@organica-consulting.com

Organisation name	Ricardo José Rodriguez Ferreira
Contact person	Ricardo José Rodriguez Ferreira
Title	Proprietário
Address	Avenida Higienopolis, 826, ap 11, CEP: 01238-000, Bairro Higienópolis, São Paulo - SP
Telephone	+55 11 98236-1867
Email	tapera@organica-consulting.com

Organisation name	Marco Q Participações LTDA
Contact person	Marco Q Participações LTDA
Title	Proprietário
Address	Rua Manoel da Nóbrega, 986, sala 1082 IB, CEP: 04001-003, Bairro Paraíso, São Paulo - São Paulo

Telephone	+55 11 98236-1867
Email	tapera@organica-consulting.com

Organisation name	Aline de Abreu Mendonça Martins
Contact person	Aline de Abreu Mendonça Martins
Title	Proprietário
Address	Avenida Engenheiro Fernando Guilhon LT 01 casa B, Bairro Conquista, Santarém - PA. CEP 68035-000
Telephone	+55 11 98236-1867
Email	tapera@organica-consulting.com

Organisation name	Alcino Luís da Costa Lemos Júnior
Contact person	Alcino Luís da Costa Lemos Júnior
Title	Proprietário
Address	Avenida Engenheiro Fernando Guilhon LT 01 casa B, Bairro Conquista, Santarém - PA. CEP 68035-000
Telephone	+55 11 98236-1867
Email	tapera@organica-consulting.com

Organisation name	Ismar Luis Reis Lemos
Contact person	Ismar Luis Reis Lemos
Title	Proprietário
Address	Avenida Engenheiro Fernando Guilhon LT 01 casa B, Bairro Conquista, Santarém - PA. CEP 68035-000
Telephone	+55 11 98236-1867
Email	tapera@organica-consulting.com

2.1.4. Physical Parameters (G1.3)

The properties where the Tapera Project will be implemented have a total area of 281,951 Hectares, with the area corresponding to the project having **55.149,25** ha destined for Avoided Planned Deforestation (APD). It is located in the southeast region of Urucará municipality (Latitude 2º10'14"S and 2º23'09"S, Longitude 57º51'23"W and 57º42'23"W) and central region of Nhamundá municipality (Latitude 1º43'38"S and 2º13'40"S, Longitude 57º59'53" and 52º12'18"). Both municipalities are established in the Amazonian Centre Mesoregion, located in the east of the Amazonas state, close to the border of Pará state.

Urucará municipality has an area of 27.901,962 Km², 4,59 Km² of which are urbanised areas, with 18.631 inhabitants and population density of 0,67 inhabitants per km² (IBGE, 2022). Urucará is located 270 km in a straight line and 281 km by river distant from Manaus, the capital of the state of Amazonas. Located in the 9th Lower Amazon subregion, Urucará is 27 m above sea level, and its average annual temperature is around 30 °C. It is limited to the municipalities of: Nhamundá, Urucurituba, Itapiranga, São Sebastião do Uatumã, Presidente Figueiredo, Itacoatiara and Silves. The municipality of Nhamundá has an area of 14.107,040 Km², 3,86 Km² of which are urbanised areas, with 20.136 inhabitants and population density of 1,43 inhabitants per Km² (IBGE, 2022). There is poor road and transport accessibility. The Urucará-São Sebastião road is the closest to the project area linked to the urban areas of Urucará and São Sebastião do Uatumã. This is one of the ways to access the Tapera Project. Another way is by the Paracatu River from the Nhamundá port.

Within the Project Area the primary drivers of deforestation are legal forest conversion, illegal logging and timber harvest, and land clearance for agricultural expansion. Illegal deforestation in the Project Area is particularly prominent along a road linking Urucará township to São Sebastião where forest access is highest. There is an extremely low population density of 0.5 persons / km^2 and there is poor road and transport accessibility. The Urucará – São Sebastião road is the closest road to the Project Area. The Paratucu River, known for its suitability for commercial navigation, presents a significant environmental challenge for the surrounding regions, as it allows for the easy access to forested areas that could be subjected to logging and conversion to pasture.

Urucará municipality includes a portion of the 938,720 ha Uatumã Biological Reserve[15] (RDS in the Portuguese version) which was established in 2002 to protect the biological diversity of the dense rainforest

[15] Rebio do Uatumã — Instituto Chico Mendes de Conservação da Biodiversidade (www.gov.br)

ecosystem in the basin of the Uatumã River and Jatapu River. Nhamundá municipality includes a portion of the 19,500.00 ha of the Nhamundá Environmental Protection Area[16] (APA in the Portuguese version).

The RDS Uatumã is crossed along its entire length by the Uatumã River. The predominant vegetation is the *Terra Firme* Forest, with there also being areas of Igapó, Baixio, Campinas and Campinaranas. The reserve is one of the remnants of the environment that was lost with the construction of the Balbina Dam[17]. The creation of the reserve was motivated by housing a primate considered rare and endemic to the reserve area and surroundings: the Sauim, *Saguinus martinsi ochraceus*[18]. There are also populations of endangered species of chelonians, which spawn within the reserve. Around 20 riverside communities inhabit the RDS. Access to the area can be done by river in the Manaus/São Sebastião do Uatumã or Manaus/Urucará sections, followed by a ferry boat to the reserve. By land, access is via BR-174, until AM-240. From there, continue to the Morena road (near the hydroelectric dam). Another alternative is to take the AM-010 to Itapiranga, and then take the river along the Uatumã River to the reserve.

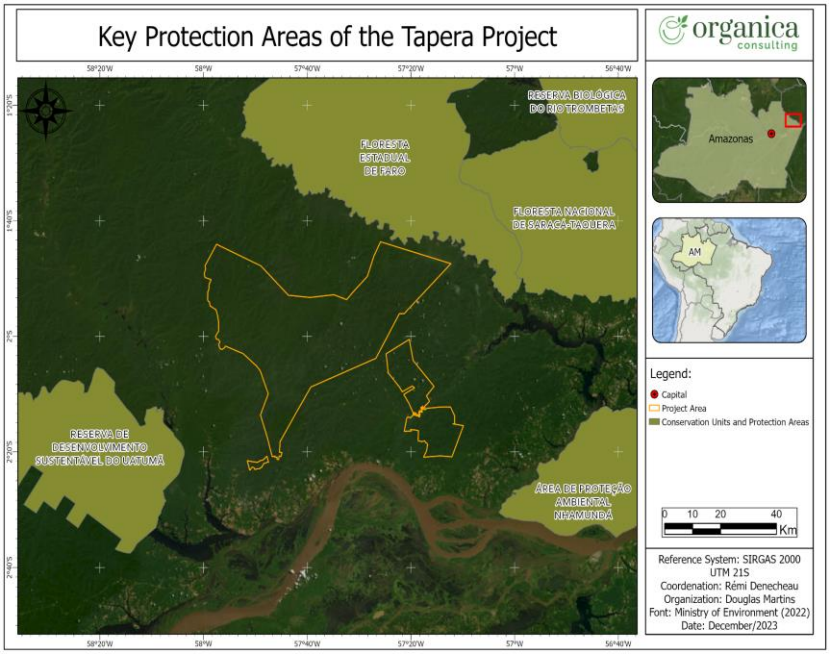
Regarding its economic aspects, agriculture absorbs most of the labour. More than 40 species of agricultural products, including bananas, watermelons, cupuaçu and cassava, are cultivated. Fishing is artisanal, for local consumption, although there is an increase in peacock bass production in the Balbina reservoir. In plant extraction, the main products are rubber and nuts, including the Brazil nut. The main hunts are agouti, wild deer, curassow and caitetu[19]. More than one hundred extractive products are explored, with the greatest intensity being copaíba, cipó-titica, laurel and breu resin. Several species of wood are also used, such as piquiá, paxiúba and mulateiro, as well as babassu and species of palm trees (palheiras). The communities guard a valuable archaeological heritage, the "black indigenous land" and have a special harvest of chelonian eggs.[20]

The APA Nhamundá is located on the fluviolacustrine plain formed where the Nhamundá and Amazon rivers meet. The predominant vegetation is the Lowland Dense Alluvial Rainforest, strongly influenced by the river flooding regime. Species of local flora have adaptations that allow them to withstand

[16] APA de Nhamundá | Unidades de Conservação no Brasil (socioambiental.org)
[17] The Balbina Dam was built from 1985 to 1989 and is managed by Manaus Energia, under the Eletronorte system. The first of five generators began operating in February 1989. The dam has an installed capacity of 250 megawatts and floods a 2,360-square-kilometre area. The dam was established to provide a renewable electricity supply to the city of Manaus but was considered by locals a controversial project from the start, due to the loss of forest and displacement of tribal homes grounds.[3] About 2,928.5 square kilometres of land formerly occupied by the Waimiri-Atroari was removed from the Waimiri Atroari Indigenous Territory and flooded. The dam was also criticised for its expensive construction and maintenance costs. As a result of the methane released from its vast reservoir, proportional to its output, the Balbina Dam emits ten times more greenhouse gases than a coal plant. The dam is the least efficient in Brazil in terms of the area flooded for each megawatt generated.
[18] Saguinus martinsi ssp. ochraceus (Ochraceous Bare-face Tamarin) (iucnredlist.org): Near threatened according to the IUCN endangered species list.
[19] RDS do Uatumã | Unidades de Conservação no Brasil (socioambiental.org)
[20] Source: Conservation Units of the State of Amazonas. Manaus:SDS/SEAPE, 2007

months of flooding and/or submersion. A group of lakes of great beauty stands out, with different colours including blue, green, muddy and black. Regarding biodiversity, it is considered extremely important for the conservation of the aquatic biota of the Amazon. The various lakes and floodplains are an important refuge for paludicola birds such as the *socó-boi* (Tigrissoma lineatum) and the *arapapá* (Cochlearius cochlearius), which were once threatened with extinction in several Brazilian states, and aquatic mammals such as the manatee (Trichechos inunguis), threatened with extinction. Access to the area can be done by air on a commercial or chartered flight, on the Manaus-Parintins section, or by river on the Manaus-Nhamundá and Manaus-Parintins sections. From Parintins to Nhamundá, the stretch is covered by boat or flying boat. 70% of APA is in the municipality of Parintins. The main economic activities are agriculture and fishing. The management of Pirarucu (Arapaima gigas) is already in the research phase. Fish of greater commercial value, such as tambaqui (Colossoma macroponum), jaraqui (Semaprochilodus spp.), curimatá (Prochilodus nigricans), pacu (various Mileinae), matrinchã (Brycon spp.) and pirapitinga (Piractus brachypomus) are abundant in the area. More than 450 families live in the APA, with the potential to develop forestry and agriculture in particular. The area is open to sustainable exploration of native forests, tourist visits and scientific research[21]. Occurrence of several species of chelonians, including the 'Amazonian turtle' (*Podocnemis expansa*).[22]

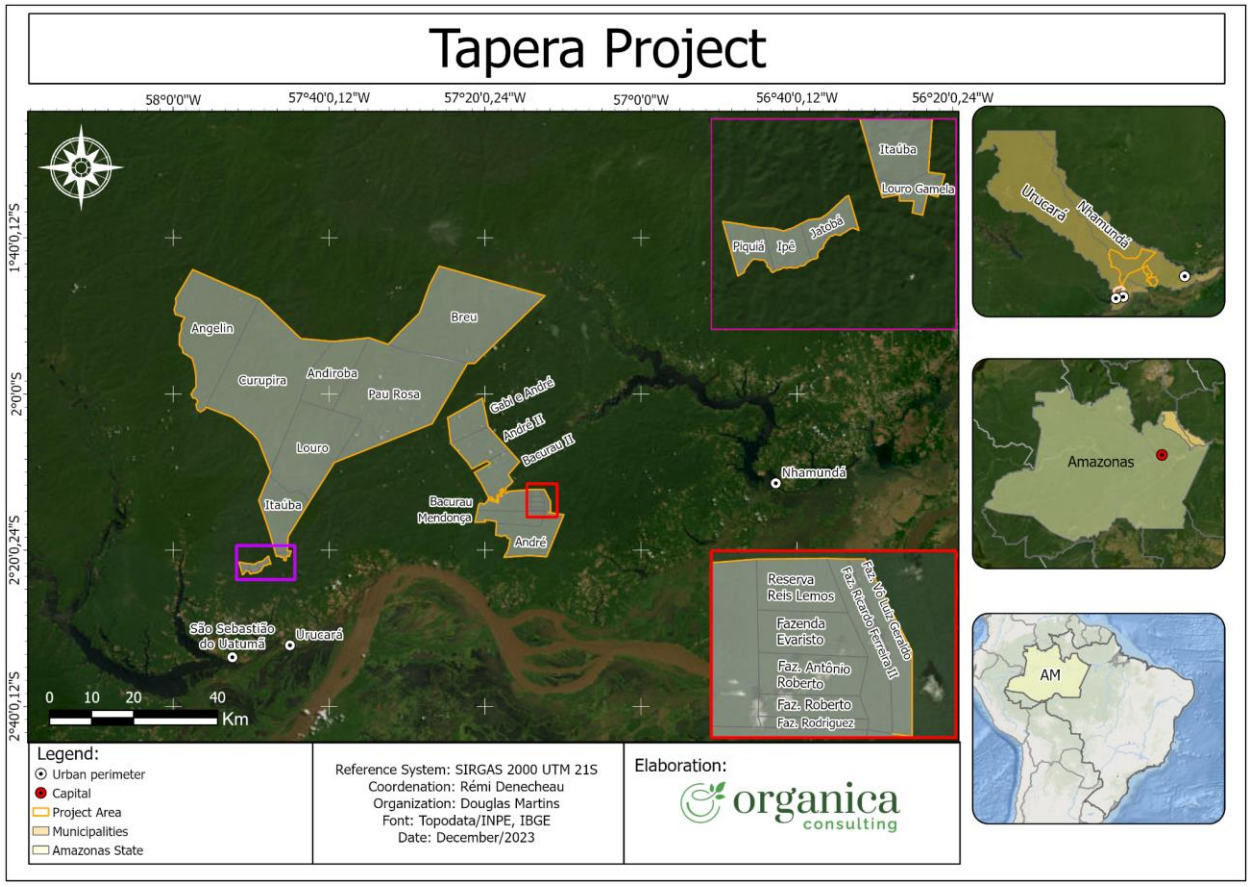
Figure 3: Key protection Areas of the Tapera Project



[21] Conservation Units of the State of Amazonas. Manaus:SDS/SEAPE, 2007)
[22] Protected Areas of the State of Amazonas - Subsidies for the state biodiversity conservation strategy - 2003. Government of the State of Amazonas.

Forest ecosystems in Urucará and Nhamundá municipalities currently suffer rapid levels of planned and illegal deforestation driven by increasing global demand for timber, expansion of agriculture and cattle ranching, and poor enforcement of forest protection laws. The Project will play a significant role in reducing the cumulative rates of deforestation occurring across the region. Mobility of illegal timber companies is enabled primarily by the road network from Urucará township to São Sebastião, as well as bridges allowing access into forested areas. These existing bridges and roads, as well as others constructed through the forest, are used by illegal logging companies to access merchantable trees. Logging typically occurs along roads and rivers.

Figure 4: Location of the Tapera Project

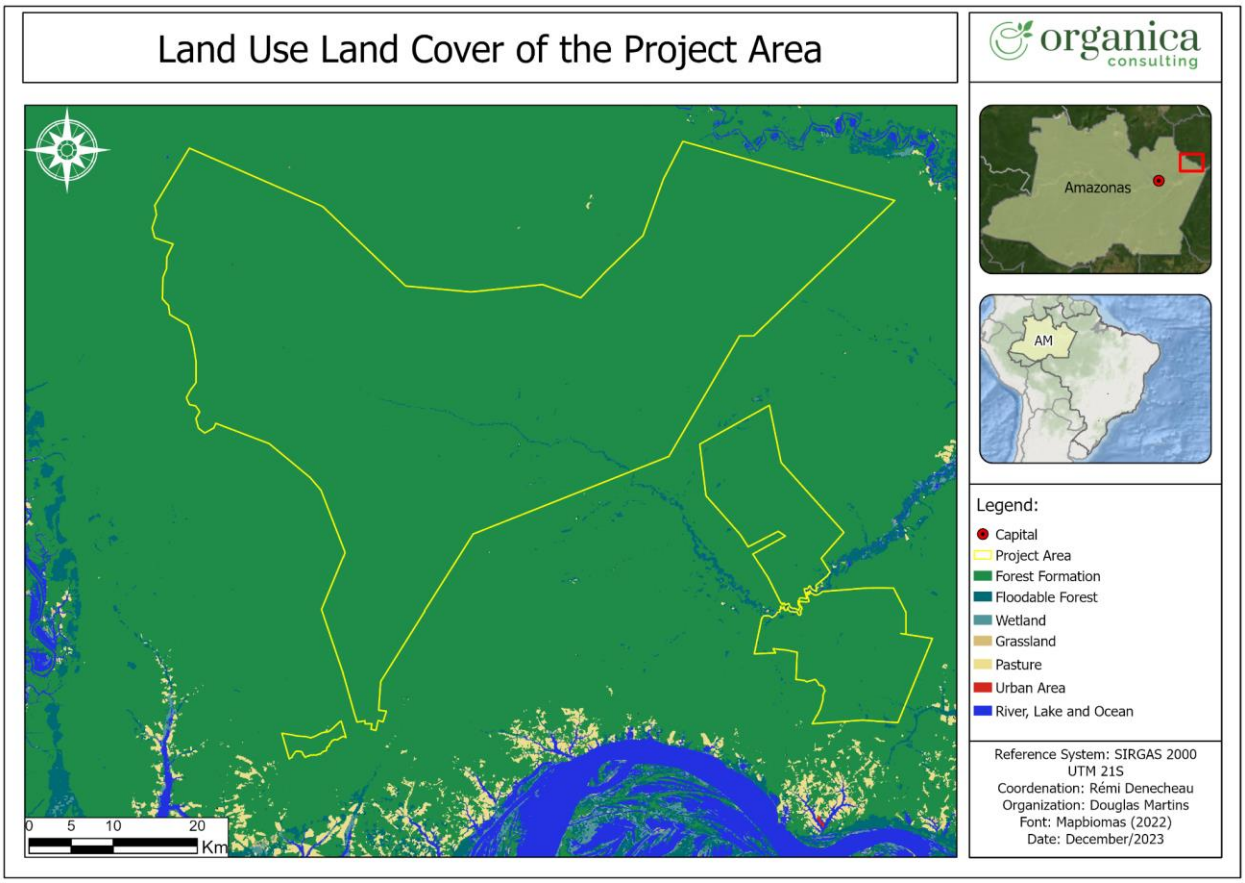


Urucará has about 94.87% of its territory of natural forest formations, 1.54 % of areas dedicated to agriculture and pastures, and 2.34% of area in water bodies (Figure 5). Nhamundá has about 85.91% of its territory of natural forest formations, 7.95% of areas dedicated to agriculture and pastures, and 2.46%

of area in water bodies[23]. The twenty-four properties, as well as the project area, are predominantly composed of forested areas.

The figure 5, seen below, analyses the distribution of various land cover types within and around the project area, which is essential for planning, management, and conservation activities. It is possible to notice the presence of different ecosystems, such as forests, wetlands, and grasslands, as well as human developments like urban areas and pastures. South of the project area, there is presence of pasture, which shows the risk of encroachment in a scenario without the Tapera project.

Figure 5: Types of occupation and land use in the Tapera project region.



The data in Table 7 outlines the specifics of various land parcels within the Tapera APD Project activity area. This data is organised by land parcel ID and includes the size of each parcel in hectares, ownership details, and the geographical coordinates in terms of longitude and latitude.

[23] Available at: http://www.dpi.inpe.br/prodesdigital/prodesmunicipal.php

Table 7: Location of Tapera APD Project activity area

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
1	470,0	Urupolpas	M-0672	-57°50'22,573"	-2°21'42,877"
			M-0673	-57°49'26,584"	-2°21'42,911"
			M-A0322	-57°49'06,971"	-2°22'50,258"
			M-0397	-57°49'12,425"	-2°22'48,382"
			M-0323	-57°49'59,777"	-2°23'01,140"
2	500,5	Urupolpas	M-0689	-57°51'34,114"	-2°21'31,135"
			M-0672	-57°50'22,573"	-2°21'42,877"
			M-0676	-57°49'59,644"	-2°23'01,595"
			M-0690	-57°51'05,943"	-2°23'09,696"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
3	500,7	Urupolpas	M-0668	-57°47'46,085"	-2°20'44,660"
			M-0669	-57°47'27,686"	-2°21'48,326"
			M-0670	-57°48'54,112"	-2°22'41,068"
			M-0671	-57°49'13,193"	-2°21'35,699"
4	11740,2	Urupolpas	M-0316	-57°45'14,189"	-2°18'12,497"
			M-0317	-57°45'21,946"	-2°20'02,615"
			M-0318	-57°46'08,722"	-2°20'25,473"
			M-0319	-57°46'56,357"	-2°20'12,397"
			M-0320	-57°47'40,014"	-2°17'36,963"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0321	-57°49'01,946"	-2°13'35,686"
5	27870,7	Urupolpas	M-A0314	-57°43'44,542"	-2°00'50,006"
			M-0315	-57°35'50,681"	-2°03'15,104"
6	423,50	Odiélio	M-0317	-57°45'21,946"	-2°20'02,615"
			M-0324	-57°44'52,150"	-2°20'06,549"
			M-0325	-57°45'03,759"	-2°20'43,304"
			M-0326	-57°45'05,059"	-2°20'47,422"
			M-0327	-57°45'23,872"	-2°20'41,880"
			M-0328	-57°45'32,462"	-2°21'20,297"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0329	-57°45'51,383"	-2°21'15,901"
			M-A0330	-57°45'48,075"	-2°20'54,480"
			M-0331	-57°46'14,415"	-2°20'54,554"
			M-0332	-57°46'14,468"	-2°20'43,159"
			M-0333	-57°46'45,280"	-2°20'48,388"
			M-0319	-57°46'56,357"	-2°20'12,397"
			M-0318	-57°46'08,722"	-2°20'25,473"
7	50412,1	Urupolpas	M-0024	-57°34'51,970"	-1°52'47,844"
			M-0025	-57°22'14,180"	-1°56'04,558"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0026	-57°26'46,080"	-2°03'47,851"
			M-0027	-57°39'18,217"	-2°08'45,688"
			M-0315	-57°35'50,681"	-2°03'15,104"
			M-0028	-57°39'33,509"	-2°02'06,867"
8	52924,3	Agrofrut	M-0019	-57°48'54,091"	-1°47'50,719"
			M-0020	-57°39'27,417"	-1°53'15,970"
			M-A0314	-57°43'44,542"	-2°00'50,006"
			M-0021	-57°47'31,124"	-2°09'56,625"
			M-0022	-57°52'22,746"	-2°02'58,799"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0023	-57°55'47,977"	-2°01'40,715"
9	14396,0	Nat'Organico	M-0024	-57°34'51,970"	-1°52'47,844"
			M-0028	-57°39'33,509"	-2°02'06,867"
			M-A0314	-57°43'44,542"	-2°00'50,006"
			M-0020	-57°39'27,417"	-1°53'15,970"
10	35158,7	Nat'Organico	M-0139	-57°57'29,785"	-1°44'03,737"
			M-0140	-57°48'51,568"	-1°47'45,659"
			M-0019	-57°48'54,091"	-1°47'50,719"
			M-0023	-57°55'47,977"	-2°01'40,715"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0141	-57°55'55,720"	-2°01'58,216"
			M-0142	-57°56'30,965"	-2°02'17,872"
			M-0143	-57°56'54,977"	-2°01'59,296"
			M-0144	-57°57'04,877"	-2°01'22,503"
			M-0145	-57°56'50,189"	-2°00'56,691"
			M-0146	-57°57'05,561"	-2°00'33,759"
			M-0147	-57°57'29,573"	-2°00'29,079"
			M-0148	-57°57'41,561"	-2°00'02,547"
			M-0149	-57°57'25,865"	-1°59'33,026"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0150	-57°57'04,481"	-1°59'04,874"
			M-0151	-57°57'04,301"	-1°57'44,198"
			M-0152	-57°57'13,193"	-1°56'46,022"
			M-0153	-57°57'23,957"	-1°55'59,077"
			M-0154	-57°57'35,585"	-1°55'24,409"
			M-0155	-57°58'44,993"	-1°54'42,937"
			M-0156	-57°58'50,285"	-1°54'08,089"
			M-0157	-57°59'13,578"	-1°53'42,816"
			M-0158	-57°59'11,202"	-1°52'19,872"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0159	-57°58'57,809"	-1°51'46,500"
			M-0160	-57°58'56,513"	-1°51'01,716"
			M-0161	-57°58'32,357"	-1°50'11,891"
			M-0162	-57°59'43,566"	-1°49'47,987"
			M-0163	-57°59'53,178"	-1°49'10,259"
			M-0164	-57°59'36,473"	-1°48'20,003"
			M-0165	-57°59'42,342"	-1°47'46,379"
			M-0166	-57°59'43,669"	-1°47'44,871"
11	46400,8	Gerliane	M-0172	-57°25'52,285"	-1°43'37,760"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-5503	-57°12'17,590"	-1°47'24,759"
			M-5502	-57°21'19,223"	-1°56'04,485"
			M-0025	-57°22'14,180"	-1°56'04,558"
			M-0173	-57°32'24,959"	-1°53'38,523"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
12	10006,8724	Fazenda André	M-0037	-57°12'18,941"	-2°15'04,147"
			M-0038	-57°09'52,743"	-2°15'27,127"
			M-0039	-57°12'05,554"	-2°20'50,403"
			M-0040	-57°14'21,012"	-2°20'40,875"
			M-0043	-57°17'34,758"	-2°20'54,716"
			M-0044	-57°16'46,034"	-2°18'48,218"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0045	-57°17'22,856"	-2°18'04,323"
			M-0046	-57°18'37,367"	-2°18'04,308"
			M-0051	-57°18'33,213"	-2°16'32,555"
			M-0042	-57°12'50,471"	-2°16'56,525"
13	402,2835	Fazenda Antônio Roberto	M-0047	-57°14'08,529"	-2°13'46,832"
			M-0034	-57°12'18,653"	-2°13'51,718"
			M-0035	-57°12'27,398"	-2°14'30,413"
			M-0048	-57°14'08,051"	-2°14'28,399"
14	227,4598	Fazenda Roberto	M-0048	-57°14'08,051"	-2°14'28,399"
			M-0035	-57°12'27,398"	-2°14'30,413"
			M-0036	-57°12'18,652"	-2°14'53,719"
			M-0049	-57°14'09,024"	-2°14'50,706"
15	408,4966	Fazenda Evaristo	M-0032	-57°14'09,598"	-2°13'04,433"
			M-0033	-57°12'38,930"	-2°13'07,430"
			M-0034	-57°12'18,653"	-2°13'51,718"
			M-0047	-57°14'08,529"	-2°13'46,832"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
16	347,4006	Fazenda Vô Luiz Geraldo	M-0082	-57°12'22,037"	-2°12'13,475"
			M-0083	-57°11'34,785"	-2°13'46,125"
			M-0084	-57°11'34,789"	-2°15'11,087"
			M-0081	-57°11'54,536"	-2°15'07,983"
			M-0080	-57°11'57,375"	-2°13'47,786"
			M-0079	-57°12'39,551"	-2°12'13,605"
17	109,718	Fazenda Rodrigues	M-0049	-57°14'09,024"	-2°14'50,706"
			M-0036	-57°12'18,652"	-2°14'53,719"
			M-0037	-57°12'18,941"	-2°15'04,147"
			M-0050	-57°14'05,594"	-2°15'01,665"
18	396,7924	Fazenda Ricardo Ferreira 2	M-0041	-57°13'00,314"	-2°12'12,919"
			M-0079	-57°12'39,551"	-2°12'13,605"
			M-0080	-57°11'57,375"	-2°13'47,786"
			M-0081	-57°11'54,536"	-2°15'07,983"
			M-0037	-57°12'18,941"	-2°15'04,147"
			M-0036	-57°12'18,652"	-2°14'53,719"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0035	-57°12'27,398"	-2°14'30,413"
			M-0034	-57°12'18,653"	-2°13'51,718"
			M-0033	-57°12'38,930"	-2°13'07,430"
19	7083,6748	André Marcondes II	M-0133	-57°19'34,465"	-2°04'11,331"
			M-0137	-57°16'56,623"	-2°07'08,322"
			M-0138	-57°21'41,015"	-2°09'35,223"
			M-0134	-57°24'23,445"	-2°06'18,973"
20	5978,8631	Fazenda Gabi e Andre Marcondes	M-0132	-57°20'19,433"	-2°00'31,395"
			M-0133	-57°19'34,465"	-2°04'11,331"
			M-0134	-57°24'23,445"	-2°06'18,973"
			M-0135	-57°24'47,361"	-2°03'00,756"
21	4787,2533	Fazenda Mendonça	M-0056	-57°20'58,368"	-2°14'53,680"
			M-0050	-57°14'05,594"	-2°15'01,665"
			M-0037	-57°12'18,941"	-2°15'04,147"
			M-0042	-57°12'50,471"	-2°16'56,525"
			M-0051	-57°18'33,213"	-2°16'32,555"

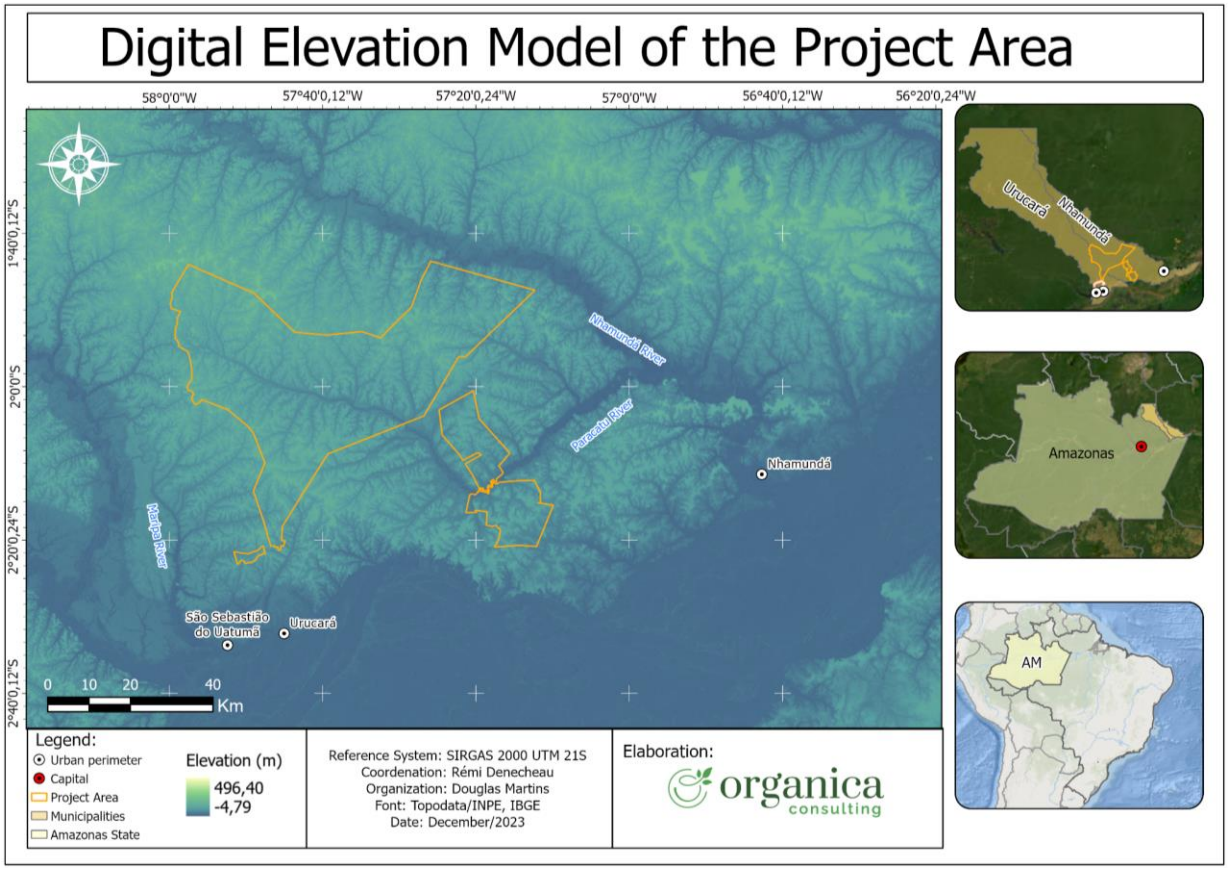
Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0052	-57°18'32,800"	-2°16'20,153"
			M-0053	-57°20'05,458"	-2°16'06,403"
			M-0054	-57°19'55,498"	-2°16'22,468"
			M-0055	-57°21'17,532"	-2°16'26,106"
22	400,8364	Reserva Reis Lemos	M-0041	-57°13'00,314"	-2°12'12,919"
			M-0033	-57°12'38,930"	-2°13'07,430"
			M-0032	-57°14'09,598"	-2°13'04,433"
			M-0031	-57°14'10,616"	-2°12'13,687"
23	4533,4787	Reserva Bacurau 1	M-0031	-57°14'10,616"	-2°12'13,687"
			M-0032	-57°14'09,598"	-2°13'04,433"
			M-0047	-57°14'08,529"	-2°13'46,832"
			M-0048	-57°14'08,051"	-2°14'28,399"
			M-0049	-57°14'09,024"	-2°14'50,706"
			M-0050	-57°14'05,594"	-2°15'01,665"
			M-0056	-57°20'58,368"	-2°14'53,680"
			M-0057	-57°20'49,640"	-2°14'11,586"

Land parcel ID	Size (ha)	Ownership	Code	Co-ordinates[1]	
				Longitude	Latitude
			M-0058	-57°16'56,286"	-2°12'27,080"
24	6557,951	Imóvel Bacurau 2	M-0137	-57°16'56,623"	-2°07'08,322"
			M-0189	-57°15'33,039"	-2°08'39,511"
			M-0190	-57°17'00,223"	-2°10'19,258"
			M-0191	-57°16'26,034"	-2°11'13,159"
			M-0192	-57°19'36,393"	-2°13'11,319"
			M-0193	-57°20'24,769"	-2°11'32,694"
			M-0186	-57°21'23,396"	-2°10'03,051"
			M-0185	-57°19'18,144"	-2°08'53,812"
			M-0184	-57°19'45,369"	-2°08'35,494"

Geology, Geomorphology and Topography

The state of Amazonas is characterised by an extensive Phanerozoic sedimentary cover (covering the last 542 million years) deposited on a Precambrian rocky substrate (spanning from 4.5 billion years ago to the Phanerozoic). Urucará municipality is a low-lying area with average elevation of approximately 58 metres above sea level (m asl). The Project Area has an elevation of approximately 69 m asl (Figure 6).

Figure 6. Digital elevation model of the Project Area



General aspects

The project is located within the Amazon Basin, which is of the intracontinental type. This basin is situated in the Amazon Craton between the shields of Guiana and Central Brazil, covering an area of approximately 500,000 km2, encompassing parts of the states of Amazonas and Pará. To the west, it is bounded by the Solimões Basin through the Purus Arch, and to the east, it is limited by the Marajó Basin through the Gurupá Arch. Its sedimentary stack, along with igneous intrusions, can reach approximately 5,000 m in thickness in some locations of the basin.

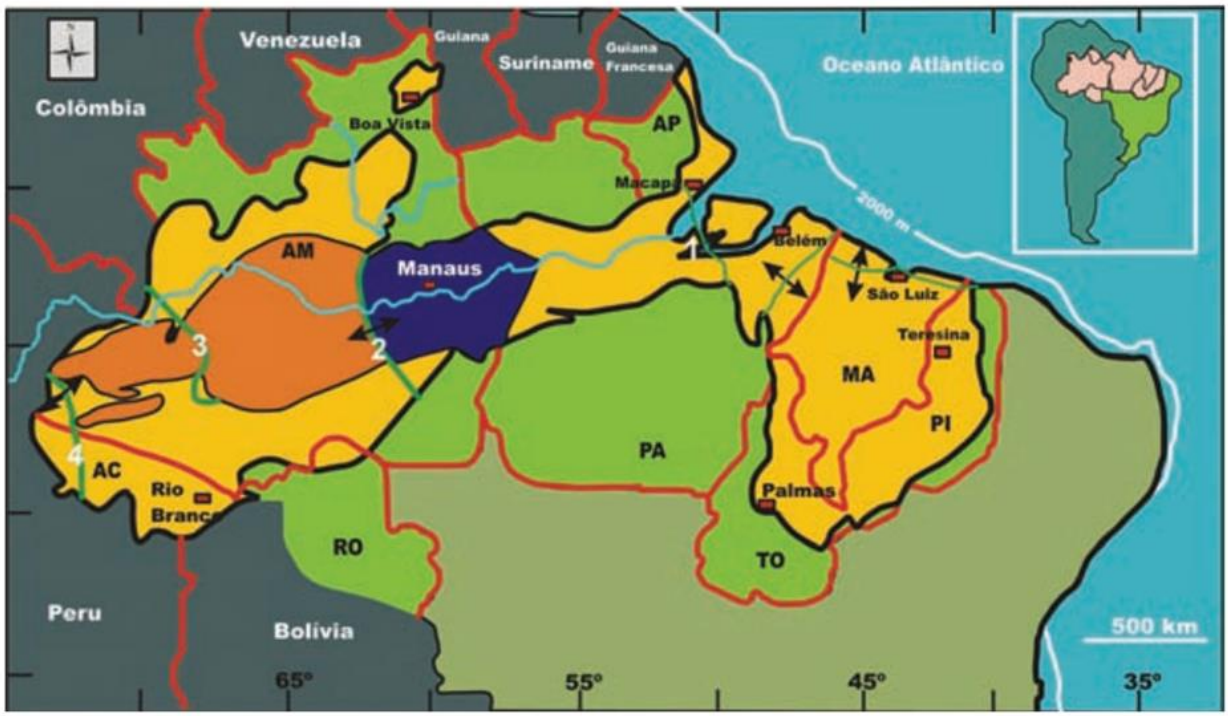
Figure 7. Location of the Amazon Basin where the project is inserted (blue square). (modified from Motta Marcelo Batista, 2020)



Regional geology

The project area is situated within the Amazon Basin, located in the Amazon Craton, and is bounded by two fundamental rock formations: to the north, the Guiana Shield, and to the south, the Brazil-Central Shield. This extensive area, covering approximately 480,000 km2, spans the states of Pará to the east and Amazonas to the west. It is characterised by the Gurupá Arch to the east and the Purus Arch to the west, which delineate the boundaries with the Marajó Trench and the Solimões and Acre basins.

Figure 8. Situation of the Amazon basin (Domínio Médio Amazonas) in the state of Amazonia (in blue) Motta Marcelo Batista, 2020



The evolution of the Amazon Basin resulted from the tectonic movements of the Gondwana mega continent during the Palaeozoic, generating fault systems in the NW-SE, NE-SW, and E-W directions. This formed structural highs and regional unconformities, dividing the basin into structural blocks that gave rise to the Amazonas, Solimões, Acre, and Cachimbo basins. In the Mesozoic, with the separation of the South American and African continents, events of basic magmatism and sedimentation occurred. The reactivation of NW-SE faults led to the deposition of the Alter do Chão Formation in the Upper Cretaceous. During the Paleogene, Andean uplift isolated the Alter do Chão basin, transforming the drainage network into lakes fed by meandering rivers. In the Neogene, the basin underwent reorganisation due to the development of new faults, possibly setting the stage for the deposition of the Novo Remanso Formation. (Riker, Silvio Roberto Lopes, et al, 2008).

Geology of the Tapera Project

The Tapera project is situated within the Middle Amazon region, characterised by four main sedimentary compartments (from base to top) as illustrated in Figure 9.

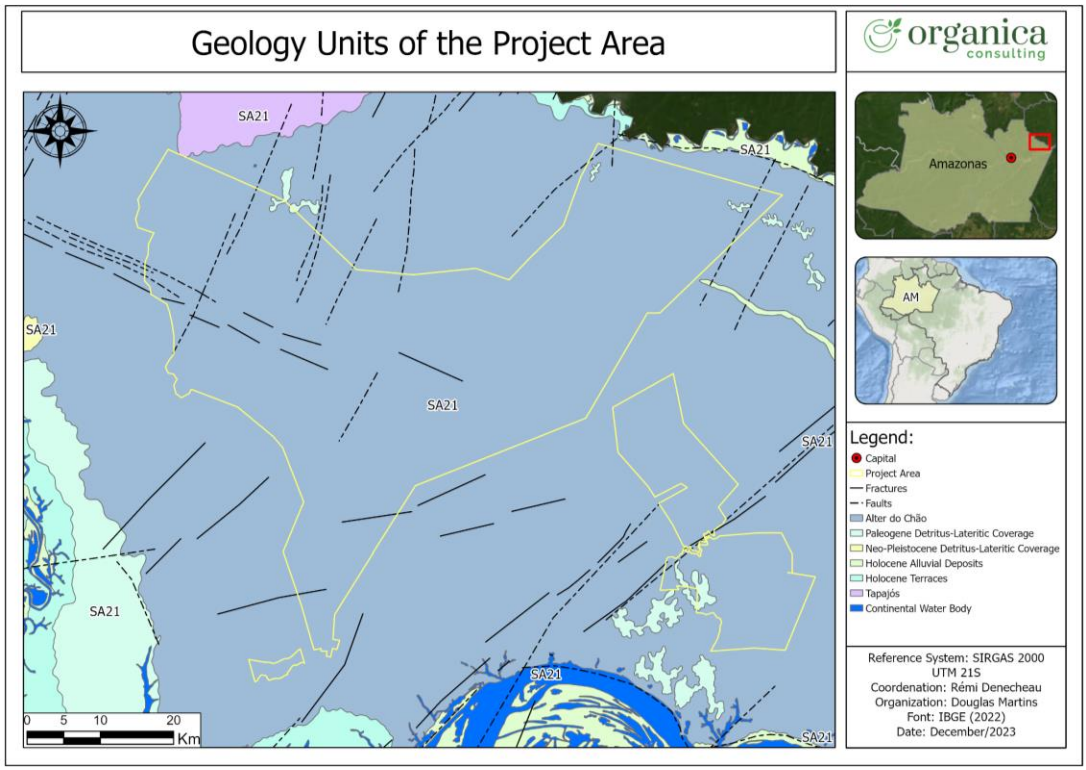
- **Alter do Chão Formation (Upper Cretaceous):** This unit is widely distributed in the project area, serving as the sedimentary basement. The formation encompasses sedimentary facies

represented by feldspathic to kaolinitic sandstones, kaolin, quartz sandstones ("Manaus Sandstone"), and subordinate siltstones, claystones, and conglomeratic sandstones. According to Vieira (2002), sedimentary structures such as trough crossbedding, tabular and tangential cross-stratification, and parallel and cross-lamination are recorded in the sandstones. The area is characterised by structural lines, normal faults, and major fractures oriented NW-SE, NE-SW, and E-W, shaping its regional tectonic context.

- **Alluvial Terrace Deposits (Pleistocene):** These deposits are notable in the study area along the Amazon and Jatapu rivers and the paranás. The terraces exhibit unique lake features with rounded configurations and point bars resembling "fish scale" formations.
- **Holocene Alluvium:** Alluvial deposits occur along the channels of the Amazon and Jatapu rivers and the paranás, forming islands with distinct morphostructural patterns aligning with lakes and paranás. The cutting and filling phenomenon in these alluvial areas reflects the fluvial morphology's unstable conditions, giving rise to the "fallen lands" phenomenon.

The lateritization processes of the Alter do Chão unit occurred in the late Paleogene (Oligocene), with significant development during the Miocene-Pliocene period.

Figure 9. Geology of the region where the Tapera project is located.



Geomorphology of the region where the Tapera project

Figure 10 displays the morphostructural units of the Tapera project, comprising three main components: Phanerozoic Sedimentary Basins and Covers, Quaternary Sedimentary, and Continental Water Body, which includes the major rivers.

The Uatumã-Jani Plateau unit predominates as the primary vegetative cover of the basin. The Amazon Plain (Nascimento et al., 1976) corresponds to the lower areas, typically inundated during river flood seasons, where numerous lakes, paranás, and channels coexist. It corresponds to Pleistocene alluvial terraces and Holocene alluvium (Fig. 11).

Figure 10. Morpho-Structural Domains of the Tapera Project Area

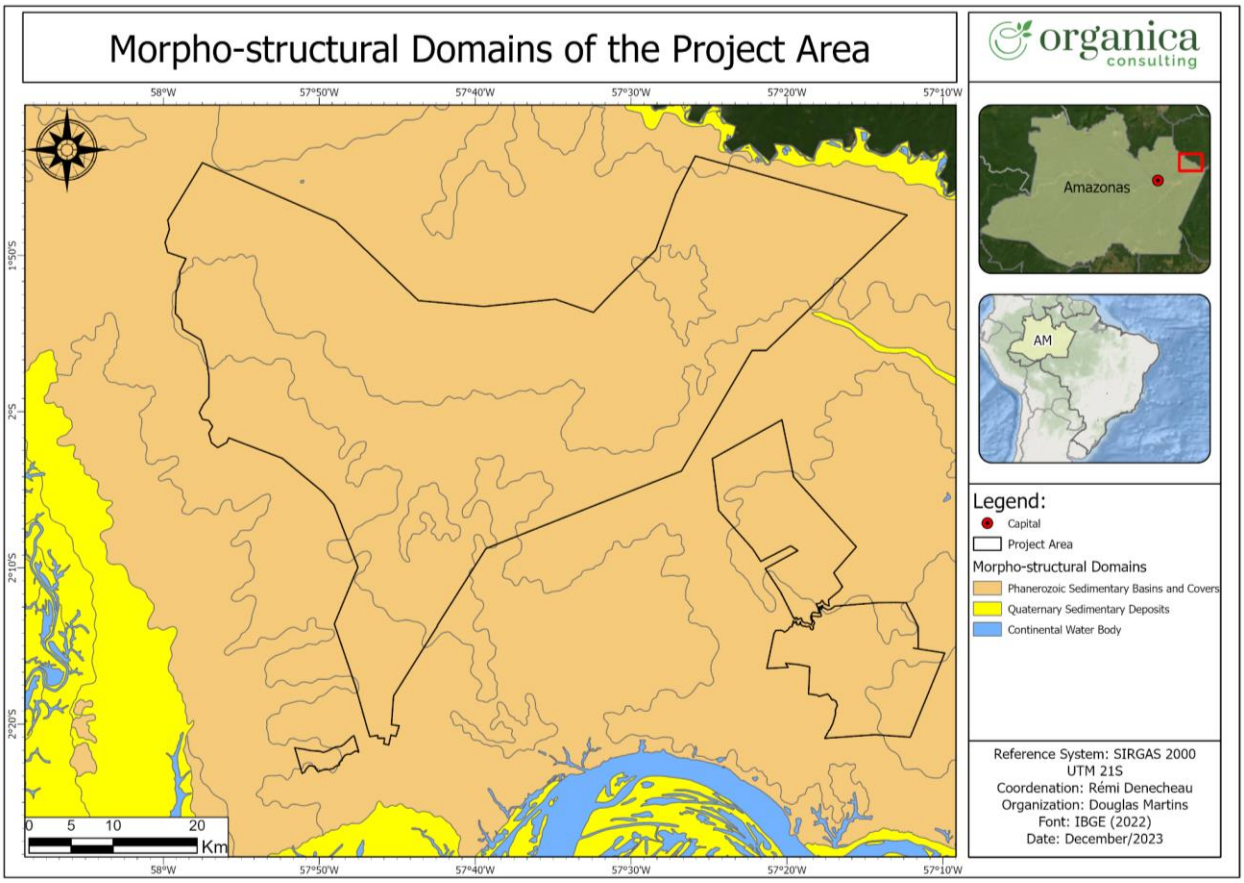
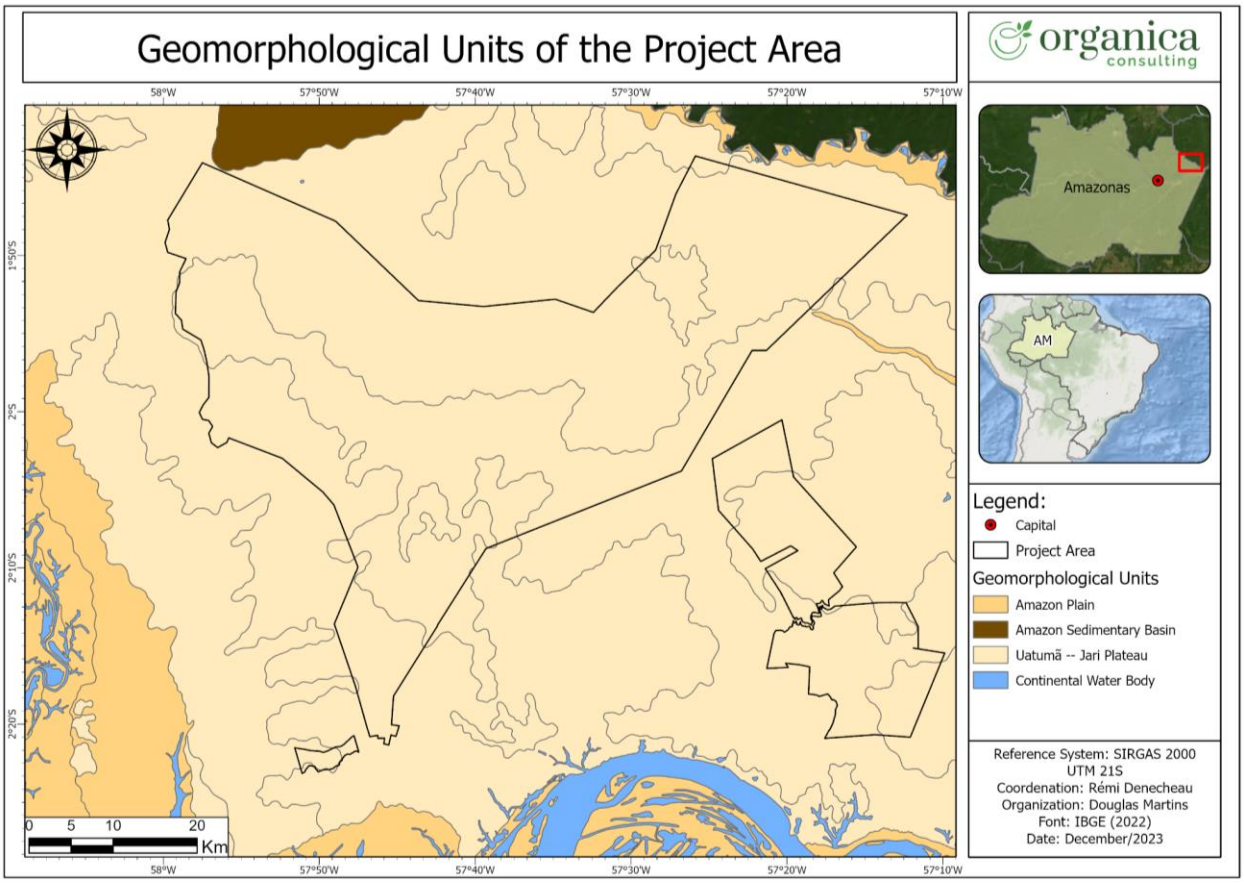


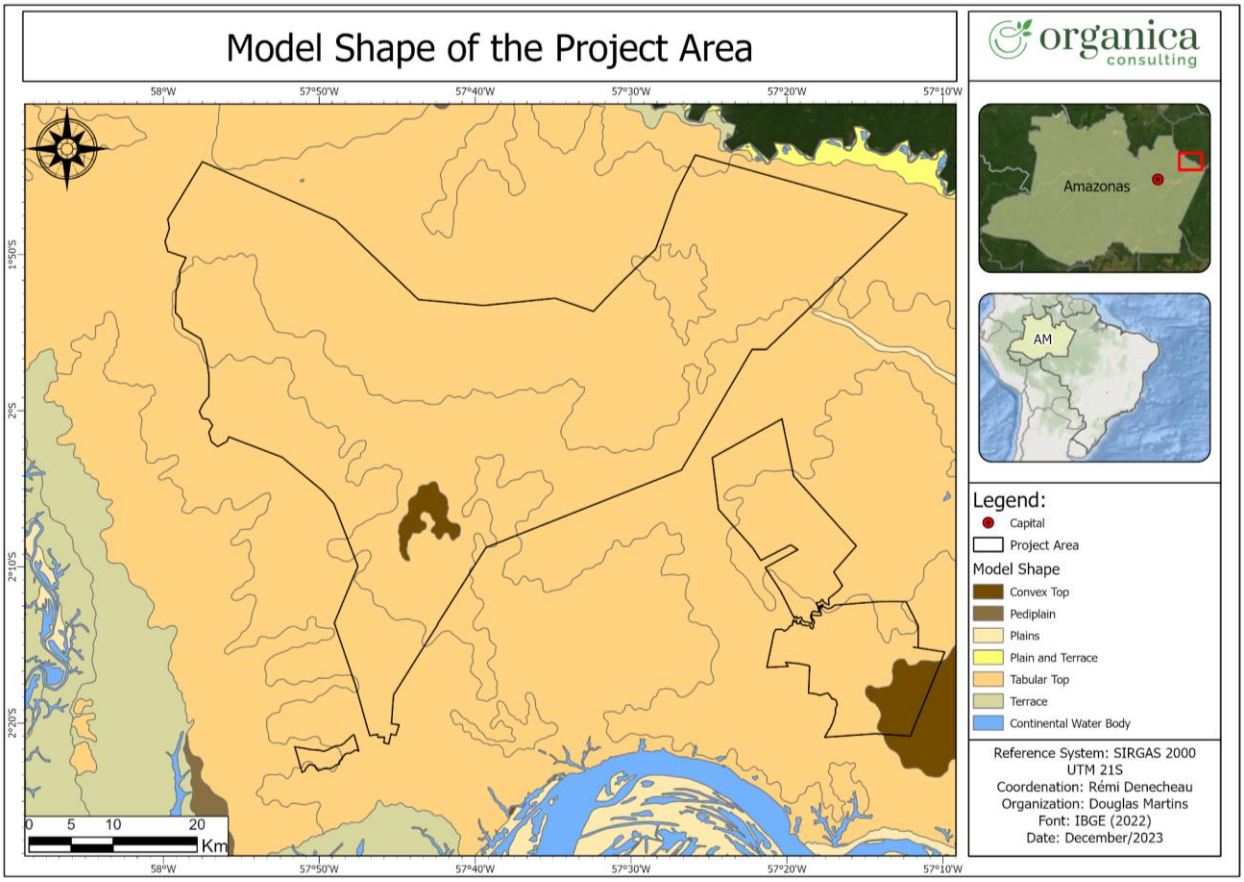
Figure 11. Geomorphological Units of the Tapera Project Area



The Amazon Rainforest thrives in clayey lateritic soils, displaying reddish and yellowish hues due to the presence of aluminium and iron oxides. These soils are characterised by their acidity and the scarcity of essential nutrients such as phosphorus, potassium, calcium, and magnesium. Due to the absence of recent volcanic activity in the region, these soils are notably old and depleted, limiting nutrient replenishment. As indicated in Figure 11, the most common paedogenetic types in the region include Dystrophic Yellow Oxisol (with more than 90% presence in the area), Dystrophic Haplic Plinthosol, Fluvic Ta Eutrophic Neosol, and Continental Water Body, among others. This diversity reflects the unique soil conditions influenced by the region's long geological history and its interaction with natural elements[24].

[24] Available at: https://rainforests.mongabay.com/0502.htm

Figure 12. Model shape of the project area

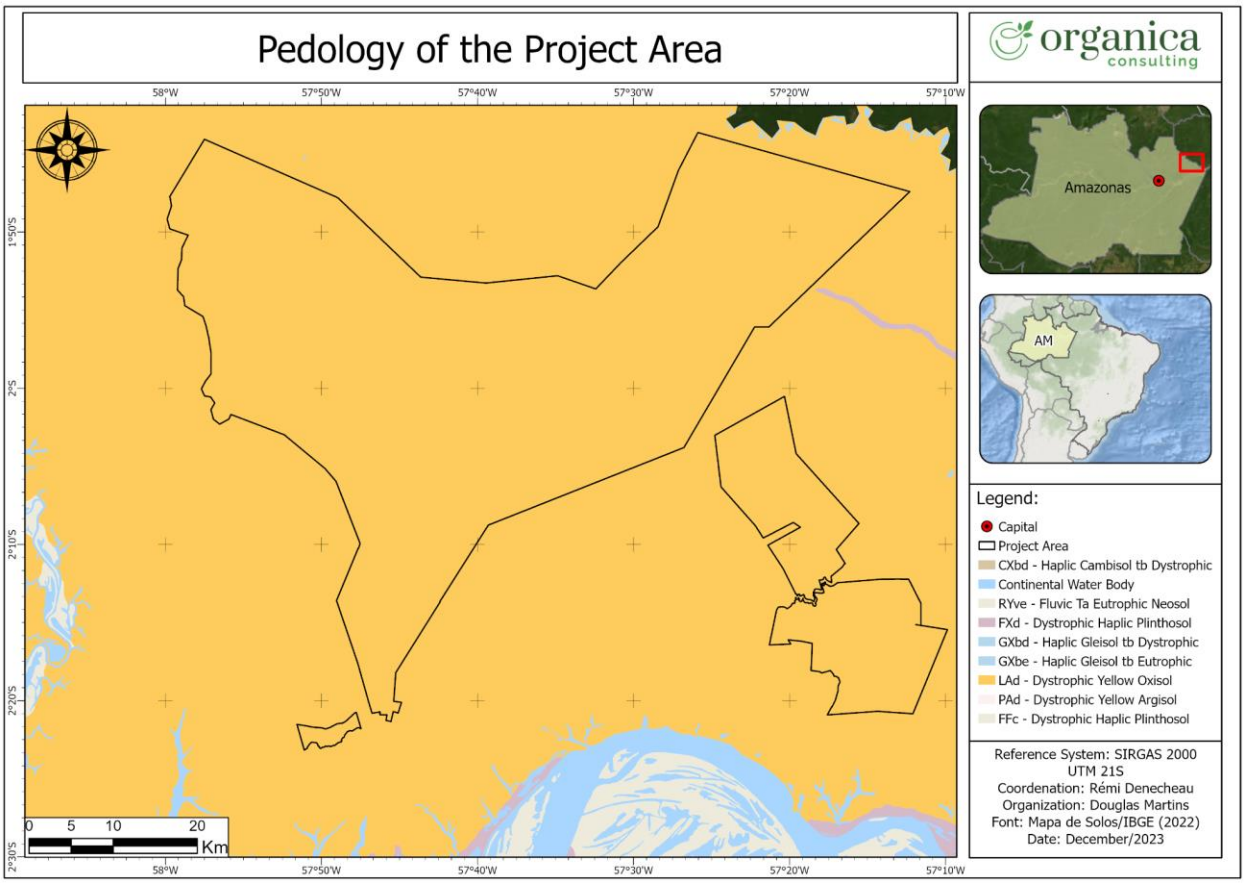


Paedology of the Tapera Project Area

The Amazon Rainforest thrives in clayey lateritic soils, displaying reddish and yellowish hues due to the presence of aluminium and iron oxides. These soils are characterised by their acidity and the scarcity of essential nutrients such as phosphorus, potassium, calcium, and magnesium. Due to the absence of recent volcanic activity in the region, these soils are notably old and depleted, limiting nutrient replenishment. As indicated in Figure 11, the most common paedogenetic types in the region include Dystrophic Yellow Oxisol (with more than 90% presence in the area), Dystrophic Haplic Plinthosol, Fluvic Ta Eutrophic Neosol, and Continental Water Body, among others. This diversity reflects the unique soil conditions influenced by the region's long geological history and its interaction with natural elements[25].

[25] Availabla at: https://rainforests.mongabay.com/0502.htm

Figure 13. Soil types of the region where the Tapera project is located.

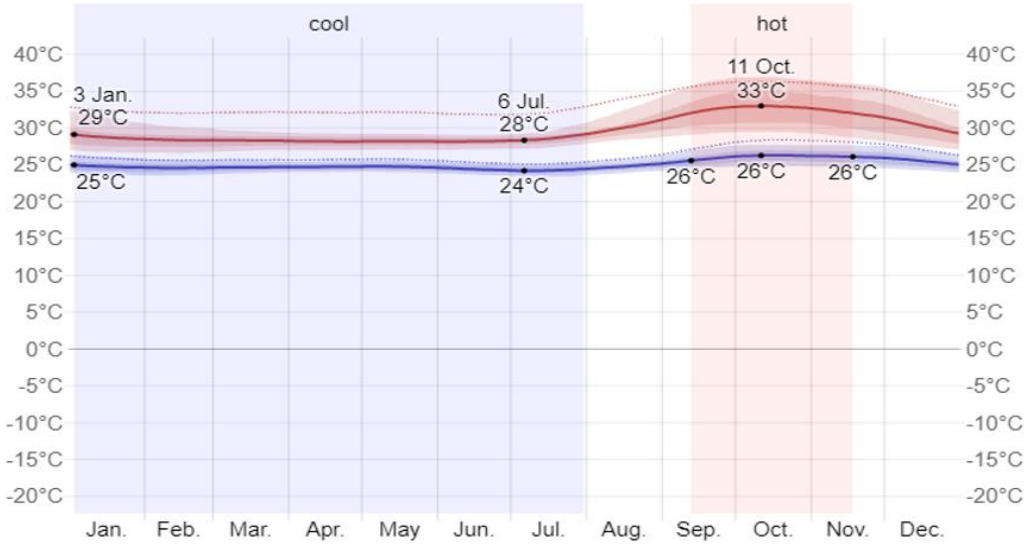


The geology of the Project Area is characterised by sediment deposition of the Adean provenance that changing sea levels have influenced. The formations in this region have been intensively weathered, a common occurrence in humid tropical climates throughout the Quaternary. As a result, flood plains formed in the western Amazonian Lowland corresponded to different Pleistocene sea-level heights. During periods of low sea level, erosion in drainage areas increased, and water levels in the central Amazon River system decreased. During high sea-level stages, valleys were drowned, and lakes formed in the lower reaches of rivers and creeks.

Climate

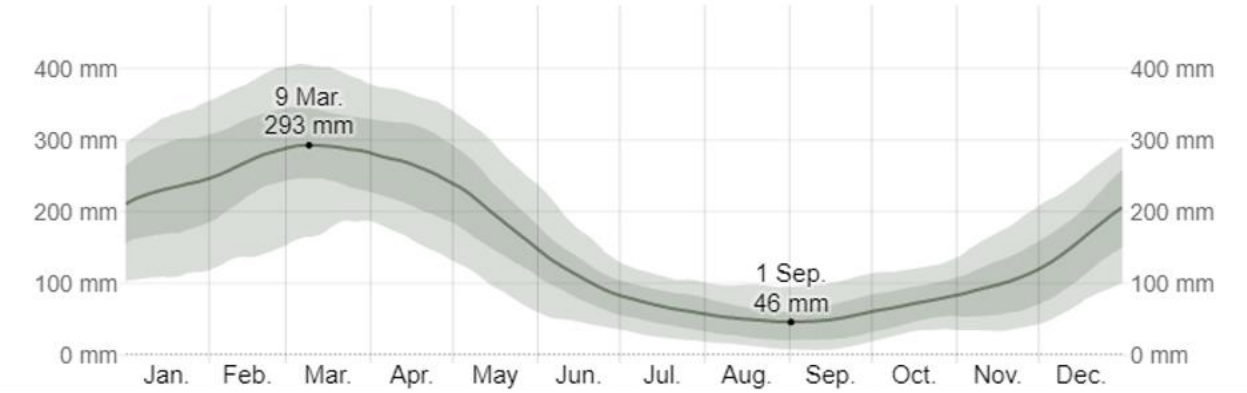
The Project Area is located in a humid tropical environment categorised as a mega thermal and is characterised by continuous high temperatures and an abundance of rainfall. The average temperature throughout the year is 24°C with maximum average air temperatures of 33ºC in October and minimum average air temperatures of 24°C in July. There is only slight temperature variation throughout the year (Figure 15).

Figure 14. Average monthly temperature in Urucará and Nhamundá.



The Project Area experiences extreme variations of seasonal rainfall. The highest average monthly rainfall of 293mm/month occurring in March. Average monthly rainfall is lowest in August and September with average monthly rainfall of approximately 70mm/month during this period (Figure 6). The average rainfall in Urucará and Nhamundá municipalities is approximately 2,400 mm/year. Evapotranspiration is approximately 1,500mm/year due to the hot tropical climate.

Figure 15. Average monthly rainfall in Urucará and Nhamundá



Hydrology

The Project Area is located within the Amazon River Basin. The Amazon Basin is the largest basin on the planet and one of the least understood. Its drainage area covers more than one-third of the South American continent, and its discharge contributes to almost one-fifth of the total discharge of all the world's rivers.

The Amazon River is located approximately 40 km south of the Project Area. At a regional scale, the Project is situated between two major tributaries of the Amazon River: the Rio Negro and River Trombetas. Closer to the Project Area, the Uatumã River, located to the west, has numerous tributaries, such as Rio Jatapu, with a north-west trend. To the east are numerous south-west trending tributaries of the Nhamundá River that separate Amazonas State from Para State. Figure 16 shows the drainage systems within the Project Area and surrounding region. Due to the numerous rivers in the Amazon's lowlands, floods and rising water levels are hydrological hazards in the broader Project Area. Specifically:

- **Floods** –the region cannot be economically protected against floods and the farming systems have adapted to periodic flooding. The floods generally reach their peak in June, and water levels fall to their lowest level at the end of October.
- **Rising river levels** - The Amazon and its tributaries begin to rise in November and by February, when most areas of Urucará are immersed from over-bank river levels.

Figure 16. Hydrographic network of the region where the Tapera project is located.

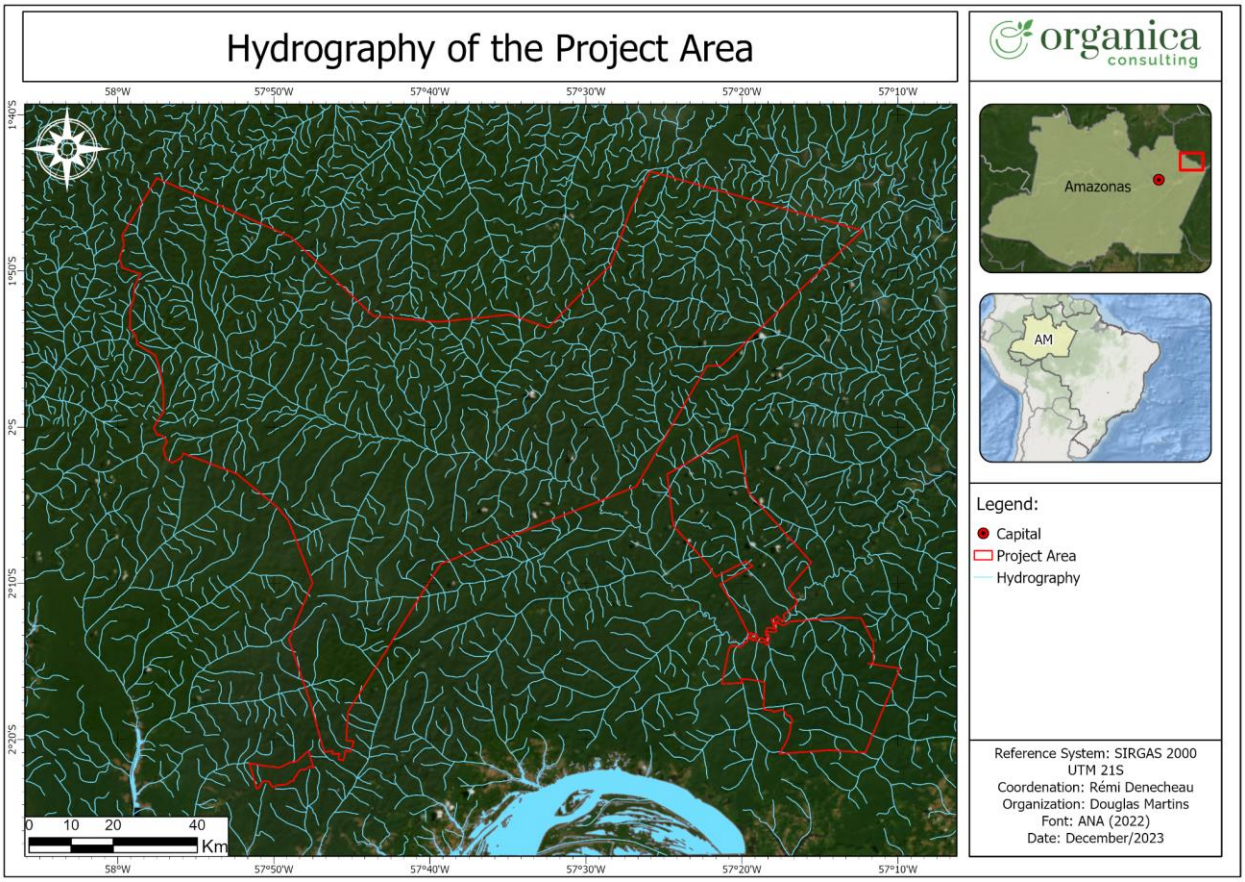


Figure 17. Location of water planning units of the region where the Tapera project is located.

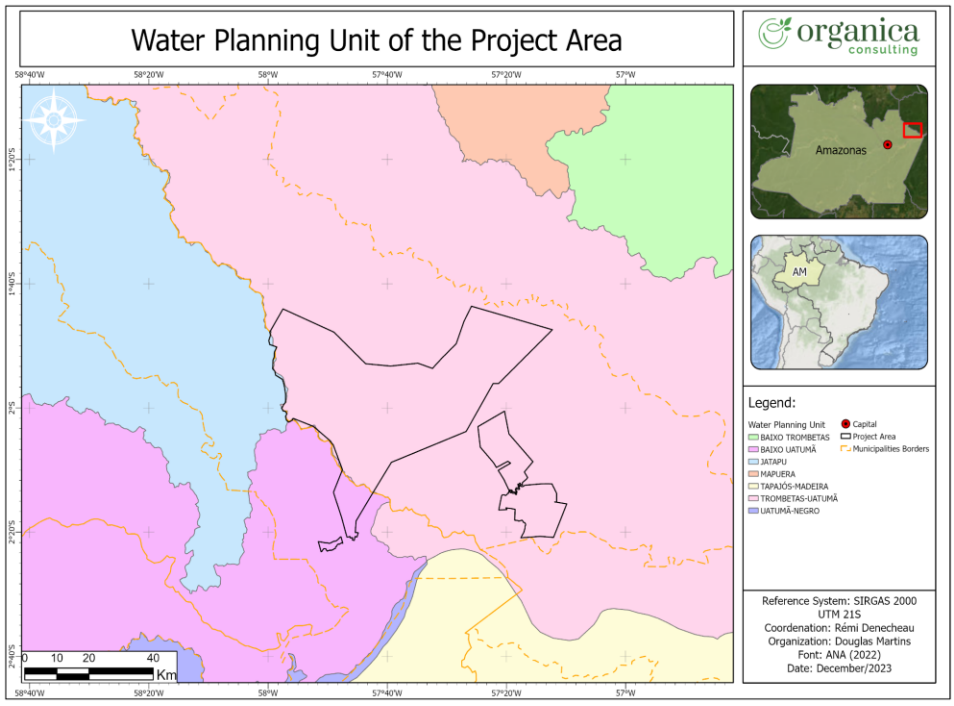
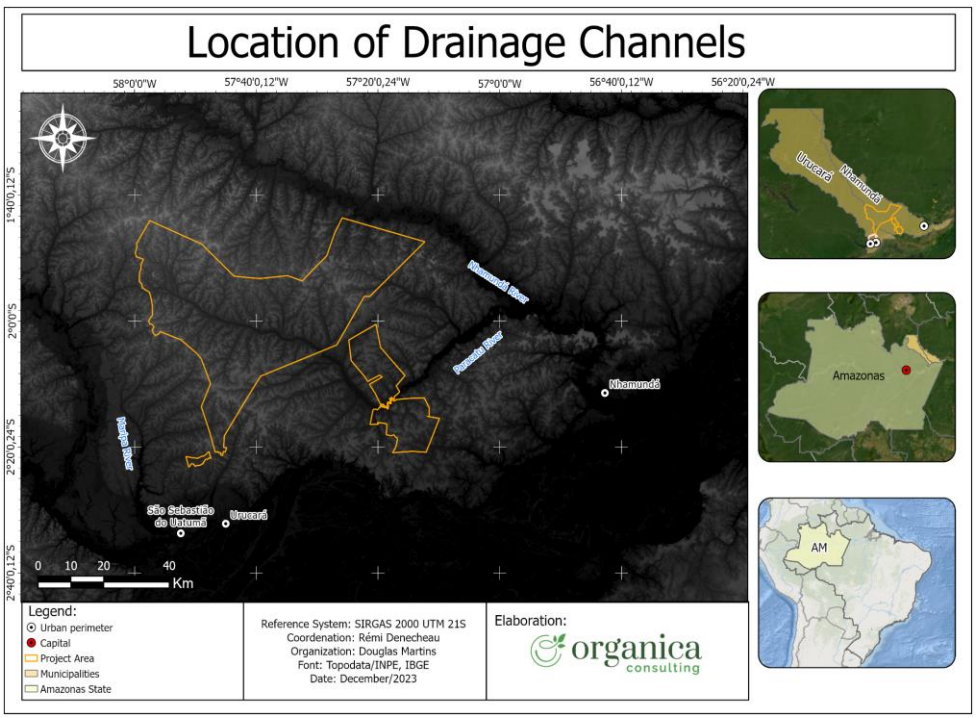


Figure 18. Terrain map of part of the Lower Amazon region immediately north of Urucará showing several NW-trending drainage channels within the Project Area (orange line)

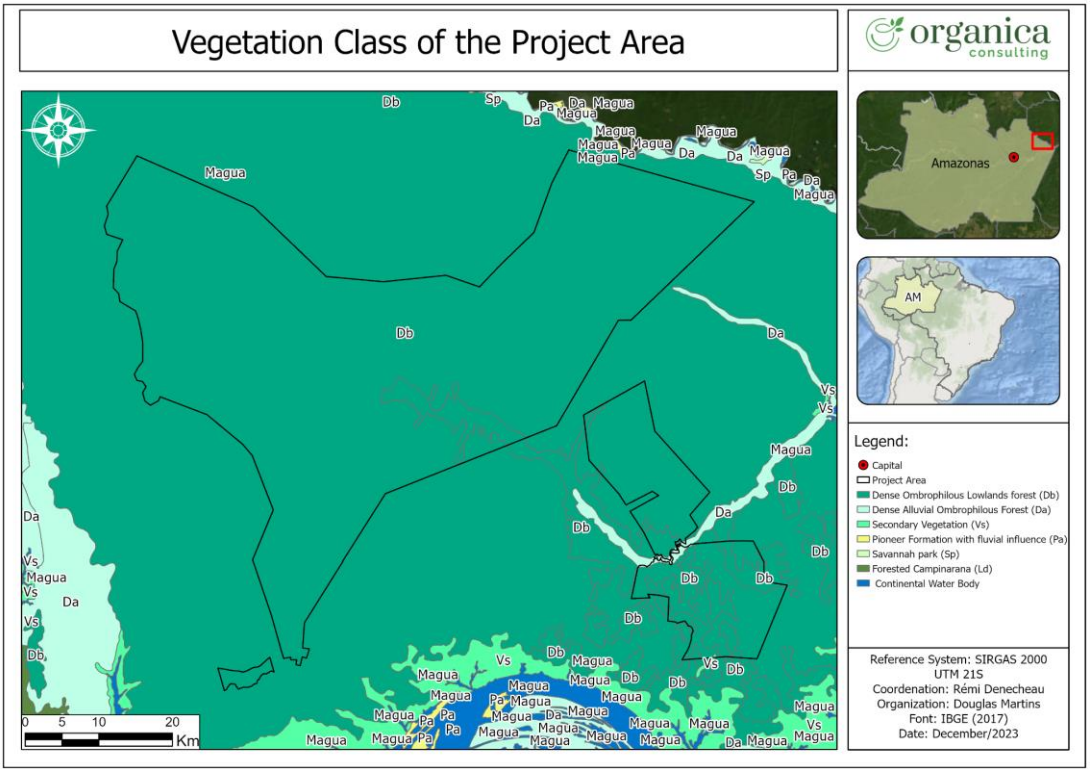


Vegetation Types

The Tapera project area is located in the Amazon Biome, and it contains predominantly Dense and Open Ombrophylous Forests, classified, according to the Technical Manual of Brazilian Vegetation, by the following classes: (i) Lowland Dense Ombrophylous Forest (Lo) (Figure 9; Table 7).

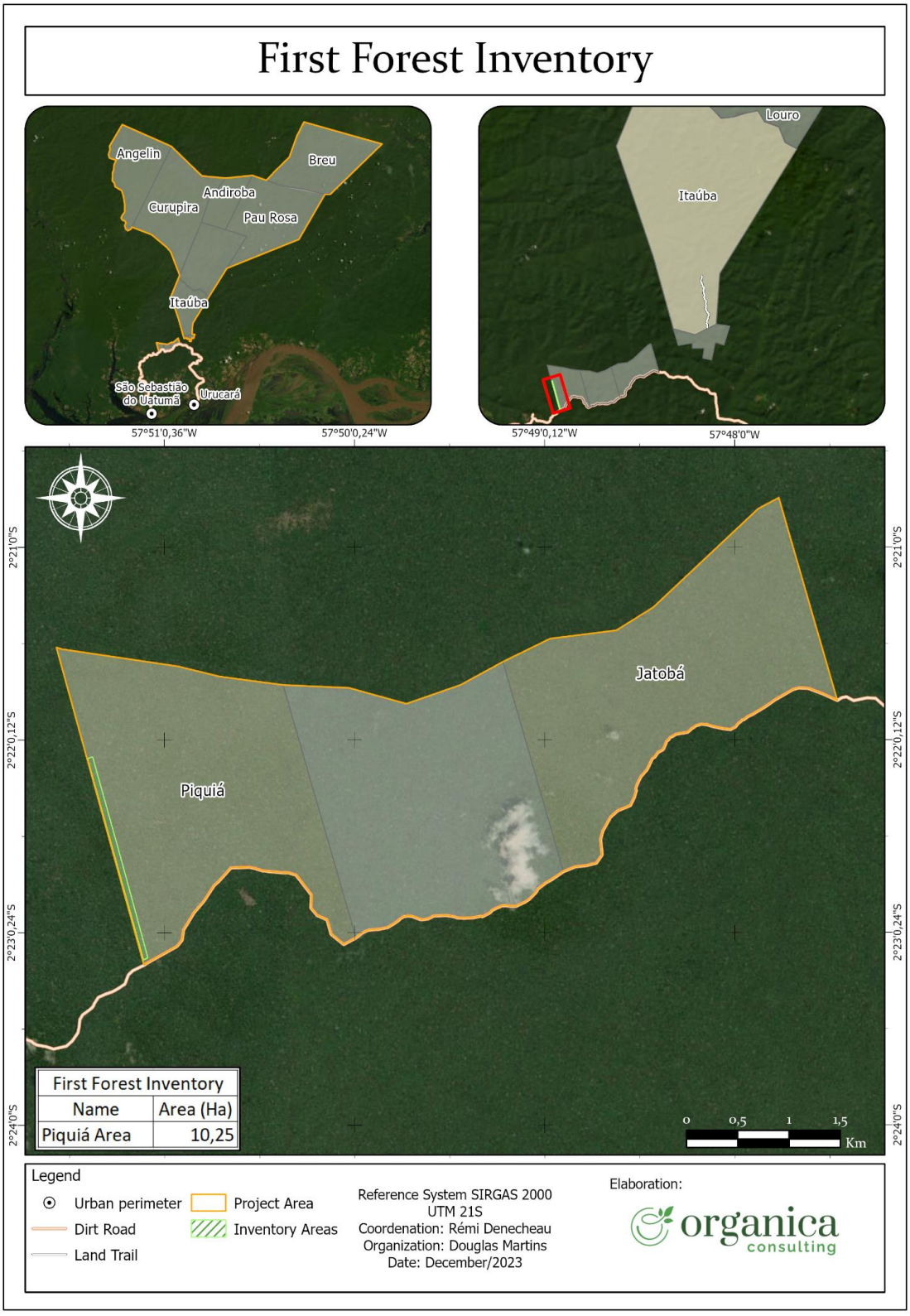
The Dense Ombrophylous Forest[24] is composed of more widely spaced trees, with a low-density shrub layer and characterized sometimes by rosulate phanerophytes, sometimes by woody lianas. The Lowland Dense Ombrophylous Forest is a formation that occurs at altitudes ranging from 5 to 100m and is the most representative vegetation in the project area (100% of the total area).

Figure 19. Vegetation class of the region where the Tapera project is located.



The first forest inventory of the Tapera Project was performed in an area of 10,25 ha at the Piquiá property. The inventory process serves as a foundational tool for sustainable forest management and conservation initiatives within the Tapera Project.

Figure 20. Localization of first forest inventory



The APD Project Area is situated in an area of open tropical rainforest. Initial forest inventories undertaken in 2022 indicate the most common species are *Burseraceae*, *Sapotaceae*, Lecythidaceae and *Fabaceae* (Table 5). The APD Project Area is very remote, and the forest is largely intact. The primary threat to vegetation in this area is illegal logging along the road network and in agricultural areas abutting forest areas. The APD Project Area has not been cleared of native ecosystems within 10 years of the Project start date.

Forest inventories

In the APD area, two forest inventories were conducted in an area of 10 ha, and another one of 13 ha, in which each tree with a higher diameter than 10 cm was identified and quantified. The first one at the Piquiá property and the second one at the Itaúba property.

Table 8.1. Vegetation in the APD Project Area according to inventory 1 (Piquiá) per species

Species	Common Name	Family	Qty, per species	% per species
Protium heptaphyllum	Breu	Burseraceae	435	10,46%
Pouteria caimito	Abiurana	Sapotaceae	370	8,89%
Eschweilera parviflora	Matamatá	Lecythidaceae	290	*6,97%*
Bocageopsis multiflora	Envira Preta/Envira Vermelha	Annonaceae	210	5,05%
Trichanthera gigantea	Canela de Garça	Acanthaceae	174	4,18%
Cordia trichotoma	Louro Amarelo	Ehretiaceae	153	3,68%
Licania floribunda	Caraipé	Chrysobalanaceae	138	3,32%
Ocotea nigrescens	Louro-PStraight	Lauraceae	130	3,13%
Inga sp.	Ingá	Fabaceae	119	2,86%
Virola surinamensis	Virola	Myristicaceae	88	2,12%
Euterpe edulis	Ripeira	Arecaceae	82	1,97%
Eschweilera atropetiolata	Castanharana	Lecythidaceae	79	1,90%
Zygia racemosum	Angelim Bordado	Fabaceae	79	1,90%
Maquira sclerophylla	Muiratinga	Moraceae	69	1,66%

Species	Common Name	Family	Qty, per species	% per species
Parinarium barbatum	Macucu	Rosaceae	66	1,59%
Myrtus spp.	Murta	Myrtaciae	59	1,42%
Swietenia macrophylla King	Mara-mara	Meliaceae	57	1,37%
Talisia esculenta	Pitomba	Pitomba	54	1,30%
Minquartia guianensis	Acariquara	Olacaceae	53	1,27%
Himatanthus sucuuba	Sucuúba	Apocynaceae	52	1,25%
Gibasis pellucida	Noira	Apocynaceae	51	*1,23%*
Cinchona	Quina-quina	Rubiaceae	48	*1,15%*
Cecropia pachystachya	Embaúba	Urticaceae	42	*1,01%*
Chrysophyllum oppositum	Caramuri	Sapotaceae	42	*1,01%*
Socratea exorrhiza	Louro Paxiúba	Arecaceae	41	*0,99%*
Laurus nobilis	Louro Cheiroso	Rosaceae	40	*0,96%*
Pseudopiptadenia psilostachya	Faveira-Folha-Fina	Leguminosae	40	*0,96%*
Xylopia frutescens Aub	Envira Branca	Annonaceae	38	*0,91%*
Inga paraensis	Ingarana	Fabaceae	35	*0,84%*
Aniba canelilla	Preciosa	Lauraceae	34	*0,82%*
Parinari montana	Uxirana	Chrysobalanaceae	33	*0,79%*
Psidium guajava	Goiabeira	Myrtacea	33	*0,79%*
Bastardiopsis densiflora	Louro Gamela	Malvaceae	32	*0,77%*
Protium apiculatum	Breu Vermelho	Burseraceae	29	*0,70%*
Bactris gasipae	Tata Punha	Arecaceae	27	*0,65%*
Buchenavia capitata	Tanibuca	Combretaceae	27	*0,65%*
Goupia glabra	Cupiúba	Goupiaceae	27	*0,65%*
Andira parviflora	Sucupira Vermelha	Fabaceae	26	*0,63%*

Species	Common Name	Family	Qty, per species	% per species
Aspidosperma polyneuron	Pau Caboclo	Apocynaceae	26	*0,63%*
Alibertia edulis	Puruí	Rubiaceae	25	*0,60%*
Ceiba pentandra	Saiuda	Malvaceae	25	*0,60%*
Dimorphandra macrostachya	Paracuúba	Leguminosae	25	*0,60%*
Dipteryx odorata	Cumaru	Fabaceae	25	*0,60%*
Dialium guianense	Jutaí	Caesalpiniaceae	24	*0,58%*
Hymenolobium petraeum	Angelim Pedra	Leguminosae	24	*0,58%*
Anadenanthera macrocarpa	Gipi	Fabaceae	23	*0,55%*
Herrania mariae	Cacaurana	Esterculiáceas	21	*0,50%*
Plinia cauliflora	Jaboticaba	Myrtacea	21	*0,50%*
Simarouba amara	Marupa	Simaroubaceae	21	*0,50%*
Cryptocarya minima	Louro Abacate	Lauraceae	20	*0,48%*
Endopleura uchi	Uxi Liso	Humiriaceae	17	*0,41%*
Mouriri ulei	Socoró	Melastomataceae	17	*0,41%*
Iryanthera grandis	Arurá Vermelho	Myristicaceae	16	*0,38%*
Vismia brasiliensis	Lacre	Hypericaceae	16	0,38%
Lithraea molleoides	Bugreiro	Anacardiaceae	15	0,36%
Astronium lecointei	Muiracatiara	Anacardiaceae	14	0,34%
Mezilaurus itauba	Itaúba	Lauraceae	14	*0,34%*
Couma macrocarpa	Sorva	Apocynaceae	13	*0,31%*
Caryocar glabrum	Piquiarana	Caryocaraceae	12	0,29%
Anacardium excelsum	Cajuaçu	Anacardiaceae	11	0,26%
Annonaceae guatteria	Envira	Annonaceae	11	0,26%
Aspidosperma desmanthum Benth	Araracanga	Apocynaceae	11	*0,26%*
Lecythis lurida	Jarana	Lecythidaceae	11	0,26%

Species	Common Name	Family	Qty, per species	% per species
Maytenus guianensis	Xixuá	Celastracea	11	0,26%
Scheelea phalerata	Bacuri	Arecaceae	11	**0,26%**
Schizolobium amazonicum	Paricá	Fabaceae	11	*0,26%*
Bowdichia virgilioides	Sucupira Amarela	Fabaceae	10	*0,24%*
Couratari guianensis	Tauari branco	Lecythidaceae	10	*0,24%*
Handroanthus albus	Ipê Amarelo	Bignoniaceae	10	*0,24%*
Tachia guianensis Aubl	Caferana	Gentianaceae	10	*0,24%*
Brosimum potabile	Amapazeiro	Moraceae	9	*0,22%*
Didymopanax angustissimum	Morototo	Araliaceae	9	*0,22%*
Ocotea rubra	Louro Vermelho	Lauraceae	9	*0,22%*
Onychopetalum periquino	Envira Vermelha	Annonaceae	9	*0,22%*
Plathymenia foliolosa	Amarelinho	Fabaceae	9	*0,22%*
Annona neoinsignis	Cortiça	Annonaceae	8	*0,19%*
Clarisia racemosa	Guariúba	Moraceae	8	*0,19%*
Couratari spp	Tauari	Lecythidaceae	8	*0,19%*
Manilkara bidentata	Balata	Sapotaceae	8	*0,19%*
Vitex montevidensis	Tarumã	Lauraceae	8	*0,19%*
Osteophloeum platyspermum	Arura Branco	Myristicaceae	7	*0,17%*
Bowdichia racemosa	Sucupira Preta	Leguminosae	6	*0,14%*
Coussapoa asperifolia	Caimbé	Cecropiaceae	6	*0,14%*
Crataeva benthami	Catauari	caparidaceae	6	*0,14%*
Hymenaea courbaril	Jatobá	Fabaceae	6	*0,14%*
Ocotea barcellensis	Louro Mamuri	Lauraceae	6	*0,14%*
Morus	Amora	Moraceae	5	*0,12%*
Protium icicariba	Breu PStraight	Burseraceae	5	*0,12%*
Theobroma subincanum	Cupui	Fabaceae	5	*0,12%*

Species	Common Name	Family	Qty, per species	% per species
Byrsonima crassifolia	Muruci	Malpighiacea	4	*0,10%*
Copaifera guianensis	Copaiba	Fabaceae	4	*0,10%*
Handroanthus avellanedae	Ipe roxo	Bignoniaceae	4	*0,10%*
Hevea brasiliensis	Seringueira	Euphorbiaceae	4	*0,10%*
Rapanea ferruginea	Pororoca	Myrsinaceae	4	*0,10%*
Trattinnickia burserifolia	Breu Sucuruba	Burseraceae	4	*0,10%*
Bellucia dichotoma Cogn	Muuba	Melastomataceae	3	*0,07%*
Brosimum rubescens	Pau Rainha	Moraceae	3	*0,07%*
Calophyllum brasiliense	Muruci	Malpighiacea	3	*0,07%*
Erisma uncinatum	Cedrinho	Vochysiaceae	3	*0,07%*
Eugenia myrciantes	Laranjinha	Myrtaceae	3	*0,07%*
Ormosia paraensis	Tento	Cyperaceae	3	*0,07%*
Parkia paraensis	Arara-tucupi	Leguminosae	3	*0,07%*
Platymiscium Duckei Huber.	Miraúba	Malvaceae	3	*0,07%*
Protium heptaphyllum March	Breu	Burseraceae	3	*0,07%*
Sclerolobium paniculatum	Tachi Branco	Fabaceae	3	*0,07%*
Sterculia Pruriens	Tacacazeiro	Esterculiáceas	3	*0,07%*
Carapa guianensis	Andirobinha	Meliaceae	2	*0,05%*
Cariniana micrantha	Tauari Vermelho	Lecythidaceae	2	*0,05%*
Copernicia prunifera	Copaiba	Fabaceae	2	*0,05%*
Dinizia excelsa Ducke	Angelim vermelho	Leguminosae	2	*0,05%*
Lecythis pisonis	Castanha Sapucai	Lecythidaceae	2	*0,05%*
Ocotea glomerata	Abacatão	Lauraceae	2	*0,05%*
Poecilanthe parviflor	Coraci	Fabaceae	2	*0,05%*
Spondias mombin	Taperebarana	Anacardiaceae	2	0,05%

Species	Common Name	Family	Qty, per species	% per species
Vatairea sp.	Angelim fava	Leguminosae	2	0,05%
Aspidosperma nitidum Benth	Carapanaúba	Apocynaceae	1	0,02%
Bertholletia excelsa	Castanha do Am	Lecythidaceae	1	0,02%
Calycophyllum spruceanum Benth	Mulateira	Rubiaceae	1	0,02%
Calycophyllum spruceanum Benth.)	Mulateiro	Rubiaceae	1	0,02%
Cinchona spp.	Quina	Rubiaceae	1	0,02%
Ficus trigona L.f.	Apui Parazita	Moraceae	1	0,02%
Joannesia princeps	Pelo de Cutia	Euphorbiaceae	1	0,02%
Manilkara guberi	Maçaranduba	Sapotaceae	1	0,02%
Mauritia flexuosa	Diguia	Arecaceae	1	0,02%
Pachira aquatica Aubl	Mungubeira	Malvaceae	1	0,02%
Peltogyne spp.	Roxinho	Fabaceae	1	0,02%
Sacoglottis guianensis	Uxi Torrado	Humiriaceae	1	0,02%
Siparuna guianensis Aubl	Capitiu	Sapotaceae	1	0,02%
Solanum corymbiflorum (Sendtn.)	Maniva de viado	Solanaceae	1	*0,02%*
Thuja Occidentalis	Davida	Cupressaceae	1	*0,02%*

Table 8.2: Vegetation according to inventory 1 per family

Family	Qty. per family	% per family
Burseraceae	476	11,45%
Sapotaceae	422	10,1%
Lecythidaceae	403	9,69%
Fabaceae	358	8,61%
Annonaceae	276	6,64%
Lauraceae	226	5,43%

Family	Qty. per family	% per family
Acanthaceae	174	4,18%
Chrysobalanaceae	171	4,11%
Arecaceae	164	3,94%
Apocynaceae	154	3,70%
Myristicaceae	111	2,67%
Boraginaceae	110	2,64%
Rosaceae	106	2,55%
Leguminosae	102	2,45%
Moraceae	95	2,28%
Rubiaceae	76	1,83%
Meliaceae	59	1,42%
Myrtaciae	59	1,42%
Malvaceae	57	1,37%
Myrtaceae	57	1,37%
Sapindaceae	54	1,30%
Olacaceae	53	1,27%
Ehretiaceae	43	1,03%
Anacardiaceae	42	1,01%
Urticaceae	42	1,01%
Combretaceae	27	0,65%
Goupiaceae	27	0,65%
Caesalpiniaceae	24	0,58%
Esterculiaceae	24	0,58%
Simaroubaceae	21	0,50%
Melastomataceae	20	0,48%
Humiriaceae	18	0,43%
Hypericaceae	16	0,38%

Family	Qty. per family	% per family
Bignoniaceae	14	0,34%
Caryocaraceae	12	0,29%
Celastraceae	11	0,26%
Gentianaceae	10	0,24%
Araliaceae	9	0,22%
Caparidaceae	6	0,14%
Cecropiaceae	6	0,14%
Euphorbiaceae	5	0,12%
Malpighiaceae	4	0,10%
Myrsinaceae	4	0,10%
Calophyllaceae	3	0,07%
Cyperaceae	3	0,07%
Vochysiaceae	3	0,07%
Cupressaceae	1	0,02%
Solanaceae	1	0,02%

Figures 21.a. 21. b. Forest inventory at Piquia property





Figure 22. Localization of Uirapuru Trail inventory (Second Inventory)

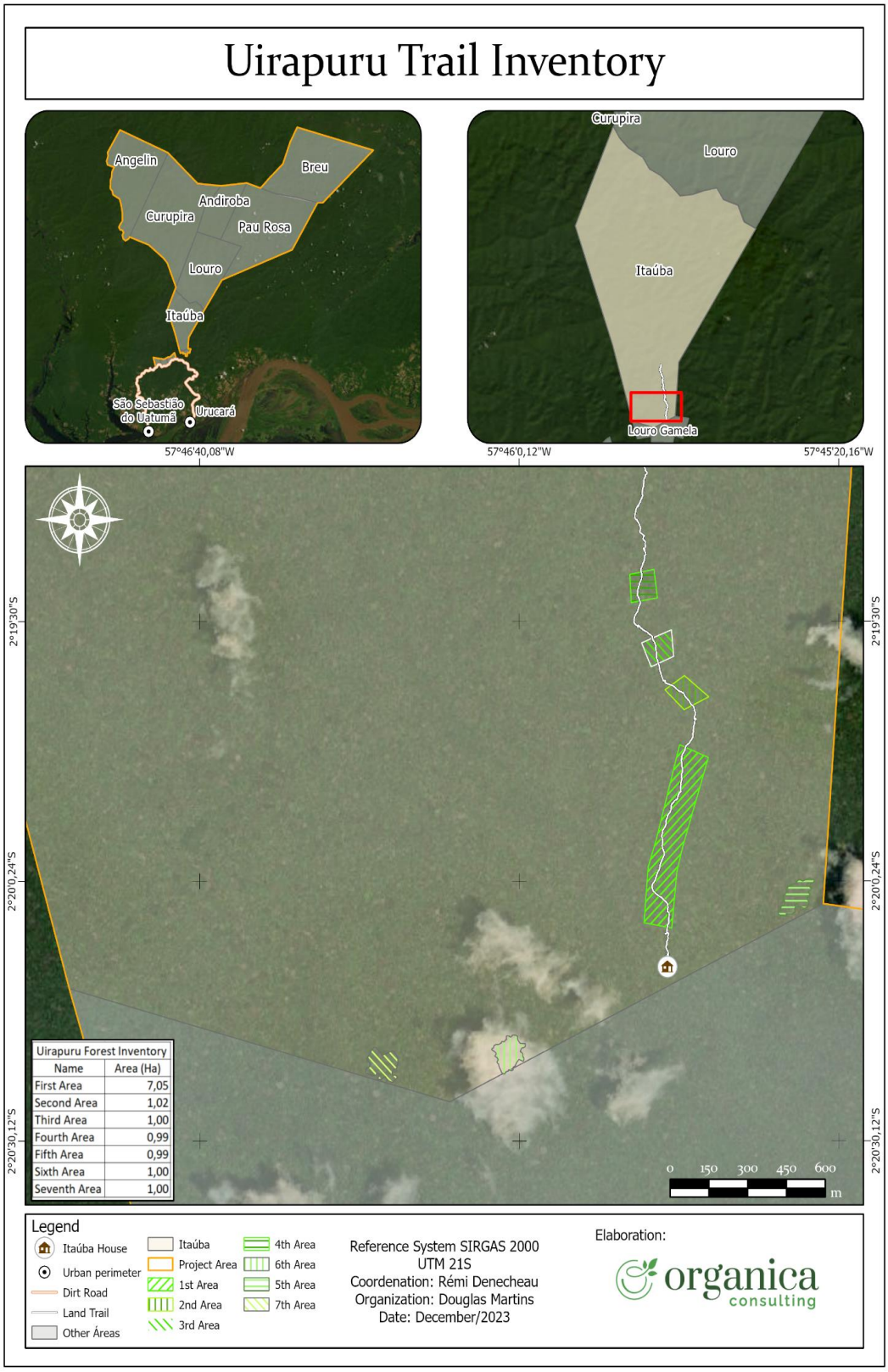


Table 8.3: Vegetation according to inventory 2 (Itaúba) per species

Species	Common Name	Family	Qty. per species	% per species
Protium heptaphyllum	Breu	Burseraceae	488	10,08%
Bellucia dichotoma	Tintarana	Melastomataceae	354	7,32%
Pouteria caimito	Abiurana	Sapotaceae	304	6,28%
Myrsine guianensis	Pororoca	Primulaceae	209	4,32%
Ocotea sp.	Louro	Lauraceae	193	3,99%
Herrania mariae	Cacaurana	Malvaceae	180	3,72%
Virola surinamensis	Virola	Myristicaceae	166	3,43%
Andira parviflora	Sucupira Vermelha	Fabaceae	148	3,06%
Scheelea phalerata	Bacuri	Arecaceae	115	2,38%
Endopleura uchi	Uxi	Humiriaceae	99	2,05%
Gustavia augusta	Murrão	Lecythidaceae	88	1,82%
Bocageopsis multiflora	Envira Preta/Envira Vermelha	Annonaceae	87	1,80%
Euterpe edulis	Ripeira	Arecaceae	86	1,78%
Rapanea Ferruginea	Pororoca	Myrsinaceae	80	1,65%
Ocotea canaliculata	Louro Pimenta	Lauraceae	74	1,53%
Vantanea parviflora	Uxirana	Humiriaceae	72	1,49%
Lecythis pisonis	Castanharana/Castanha Sapucaia	Lecythidaceae	72	1,49%
Coussapoa asperifolia	Caimbé	Urticaceae	71	1,47%
Simarouba amara	Marupá	Simaroubaceae	61	1,26%
Dipteryx odorata	Cumarú	Fabaceae	61	1,26%
Dialium guianense	Jutaí	Caesalpiniaceae	60	1,24%
Minquartia guianensis	Quariquara	Coulaceae	59	1,22%
Attalea maripa	Najazeiro	Arecaceae	57	1,18%

Species	Common Name	Family	Qty. per species	% per species
Aspidosperma discolor	Carapanaúba	Apocynaceae	57	1,18%
Psidium longipetiolatum	Araça Vermelho	Myrtaceae	55	1,14%
Hymenolobium sp.	Angelim	Fabaceae	52	1,07%
Aniba burchellii	Louro Rosa	Lauraceae	51	1,05%
Licania octandra	Caripé	Chrysobalanaceae	50	1,03%
Tachigali glauca	Taxizeiro	Caesalpiniaceae	45	0,93%
Ocotea tabacifolia	Louro Abacate	Lauraceae	40	0,83%
Bertholletia excelsa	Castanheira	Lecythidaceae	40	0,83%
Sorbus domestica	Soveira	Rosaceae	36	0,74%
Brosimum rubescens	Murapiranga	Moraceae	35	0,72%
Caryocar villosum	Pequiá	Caryocaraceae	33	0,68%
Mezilaurus itauba	Itaúba	Lauraceae	33	0,68%
Bowdichia nitida	Sucupira	Fabaceae	32	0,66%
Plathymenia foliolosa	Amarelinho	Fabaceae	32	0,66%
Inga paraensis	Ingarana	Fabaceae	31	0,64%
Annonaceae guatteria	Envira	Annonaceae	29	0,60%
Psidium sp.	Araça	Myrtaceae	27	0,56%
Cinchonopsis amazonica	Quina	Rubiaceae	24	0,50%
Talisia esculenta	Pitombeira	Sapindaceae	23	0,48%
Pouteria guianensis	Abiu	Sapotaceae	21	0,43%
Ormosia paraensis	Tento	Fabaceae	19	0,39%
Artocarpus heterophyllus	Jaqueira	Moraceae	19	0,39%
Nectandra grandiflora	Caneleira	Lauraceae	19	0,39%
Oenocarpus mapora	Bacabeira	Arecaceae	19	0,39%

Species	Common Name	Family	Qty. per species	% per species
Brosimum potabile	Amapá	Moraceae	19	0,39%
Myrtus spp.	Murta	Myrtaciae	18	0,37%
Carapa guianensis	Andiroba	Meliaceae	18	0,37%
Mora paraensis	Paracaúba	Fabaceae	15	0,31%
Vismia brasiliensis	Lacre	Hypericaceae	15	0,31%
Rinorea flavescens	Canela de Garça	Violaceae	14	0,29%
Didymopanax angustissimum	Morototó	Araliaceae	13	0,27%
Maytenus guianensis	Chichuá	Celastraceae	13	0,27%
Osteophloeum platyspermum	Arurá	Myristicaceae	12	0,25%
Parkia multijuga	Arareira	Fabaceae	12	0,25%
Himatanthus sucuuba	Sucubeira	Apocynaceae	11	0,23%
Byrsonima crassifolia	Murici	Malpighiaceae	11	0,23%
Swietenia macrophylla	Maramara	Meliaceae	11	0,23%
Astronium lecointei	Maracatiara	Anacardiaceae	11	0,23%
Sacoglottis verrucosa	Uxi Coroa	Humiriaceae	10	0,21%
Vitex montevidensis	Tarumã	Lauraceae	10	0,21%
Manilkara huberi	Maçaranduba	Sapotaceae	10	0,21%
Ocotea nigrescens	Louro Preto	Lauraceae	10	0,21%
Inga sp.	Ingá	Fabaceae	10	0,21%
Anacardium giganteum	Cajuaçu	Anacardiaceae	10	0,21%
Mouriri guianensis	Socoró	Melastomataceae	9	0,19%
Trema micrantha	Piriquiteira	Cannabaceae	9	0,19%
Clarisia racemosa	Guariúba	Moraceae	9	0,19%
Alibertia edulis	Puruí	Rubiaceae	7	0,14%
Cedrela odorata	Cedro	Meliaceae	7	0,14%

Species	Common Name	Family	Qty. per species	% per species
Virola duckei	Ucuubeira	Myristicaceae	6	0,12%
Couratari oblongifolia	Tauarí	Lecythidaceae	4	0,08%
Ceiba pendrata	Saiúda	Malvaceae	4	0,08%
Aniba canelilla	Preciosa	Lauraceae	4	0,08%
Aniba parviflora	Louro Gamela	Lauraceae	4	0,08%
Cecropia pachystachya	Imbaúba	Urticaceae	4	0,08%
Goupia glabra	Cupiúba	Goupiaceae	4	0,08%
Copaifera multijuga	Copaíba	Caesalpiniaceae	4	0,08%
Zygia racemosa	Angelim Bordado	Fabaceae	4	0,08%
Pera glabrata	Sapateiro	Euphorbiaceae	3	0,06%
Handroanthus serratifolius	Pau d'arco	Bignoniaceae	3	0,06%
Hymenaea courbaril	Jatobá	Fabaceae	3	0,06%
Amburana acreana	Amburana	Fabaceae	3	0,06%
Caraipa densifolia	Tamaquaré	Calophyllaceae	2	0,04%
Bowdichia racemosa	Sucupira Preta	Leguminosae	2	0,04%
Swartzia recurva	Muirajibóia	Fabaceae	2	0,04%
Citrus aurantium	Laranjinha	Rutaceae	2	0,04%
Cecropia sp.	Imbaúba	Urticaceae	2	0,04%
Parkia sp.	Farveira	Fabaceae	2	0,04%
Xylopia frutescens Aub	Envira Branca	Annonaceae	2	0,04%
Parkia decussata	Arara-Tucupi	Fabaceae	2	0,04%
Persea americana	Abacateira	Lauraceae	2	0,04%
Croton Urucarana	Urucurana	Euphorbiaceae	1	0,02%
Tachigali paraensis	Taxirana	Fabaceae	1	0,02%
Bagassa guianensis	Tatajuba	Moraceae	1	0,02%
Geissospermum sericeum	Quinarana	Apocinaceae	1	0,02%

Species	Common Name	Family	Qty. per species	% per species
Joannesia princeps	Pelo de Cútia	Euphorbiaceae	1	0,02%
Cynometra bauhiniifolia	Jutairana	Fabaceae	1	0,02%
Astrocaryum jauari	Jauari	Lauraceae	1	0,02%
Theobroma grandiflorum	Cupuaçu	Sterculiaceae	1	0,02%

Table 8.4. Vegetation according to inventory 2 per family

Families	Qtd	% per family
Burseraceae	488	*13,61%*
Lauraceae	441	*12,30%*
Fabaceae	430	*11,99%*
Melastomataceae	363	*10,13%*
Sapotaceae	336	*9,37%*
Arecaceae	277	*7,73%*
Primulaceae	209	*5,83%*
Lecythidaceae	204	*5,69%*
Malvaceae	184	*5,13%*
Myristicaceae	184	*5,13%*
Humiriaceae	181	*5,05%*
Annonaceae	118	*3,29%*
Caesalpiniaceae	109	*3,04%*
Myrtaceae	101	*2,82%*
Moraceae	82	*2,29%*
Urticaceae	77	*2,15%*
Apocynaceae	*69*	*1,92%*
Apocynaceae	69	*1,92%*
Simaroubaceae	62	*1,73%*
Coulaceae	59	*1,65%*
Chrysobalanaceae	50	*1,39%*

Families	Qtd	% per family
Meliaceae	36	*1,00%*
Rosaceae	36	*1,00%*
Caryocaraceae	33	*0,92%*
Rubiaceae	31	*0,86%*
Sapindaceae	23	*0,64%*
Anacardiaceae	21	*0,59%*
Hypericaceae	15	*0,42%*
Violaceae	14	*0,39%*
Araliaceae	13	*0,36%*
Celastraceae	13	*0,36%*
Malpighiaceae	*11*	*0,31%*
Cannabaceae	9	*0,25%*
Euphorbiaceae	5	*0,14%*
Goupiaceae	3	*0,08%*
Bignoniaceae	3	*0,08%*
Calophyllaceae	2	*0,06%*
Sterculiaceae	2	*0,06%*
Rutaceae	2	*0,06%*
Leguminosae	1	*0,03%*

Figures 23.a 23.b. Forest inventory at Itaúba property



Land use and cover

According to the Environmental Quality dimension of the IPS, In the municipalities of Urucará and Nhamundá, 38.53% and 56.62% of the total areas, respectively, are protected areas (National parks, indigenous lands and others[26]. According to MapBiomas, in 2022 the state of Amazonas had an area of 1.415.292,30 hectares burned by anthropogenic fire. Analysing the data from other years, it can be seen that in 2022, the burned area doubled compared to the year 2021[27]. Analysing the historical series of burned areas between the years 1985 and 2020, the state shows an upward evolution with more intense peaks in 2015, 2016 and again in 2022. Between the years 2021 and 2022, there is an increase in the growth of the burned area above the historical average.

[26] IPS Amazonia 2023

[27] Projeto MapBiomas – Mapeamento de cicatrizes de fogo no Brasil – Coleção 1. Acessed on: 18/12/2023. Available at: https://mapbiomas.org/estatisticas

Figure 24. Accumulated Burnt Area in the state of Amazonas[28]

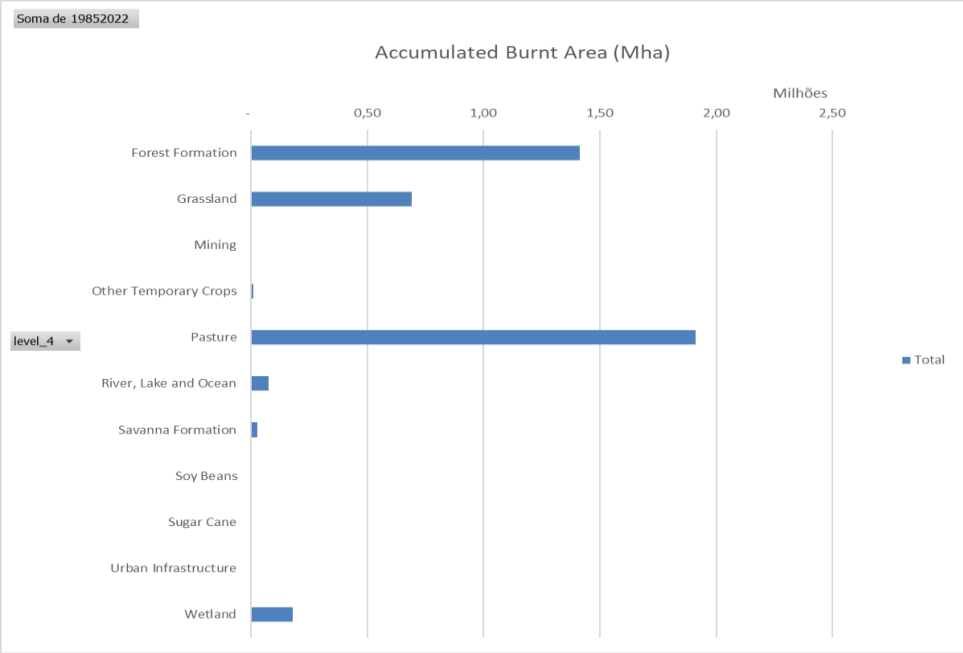
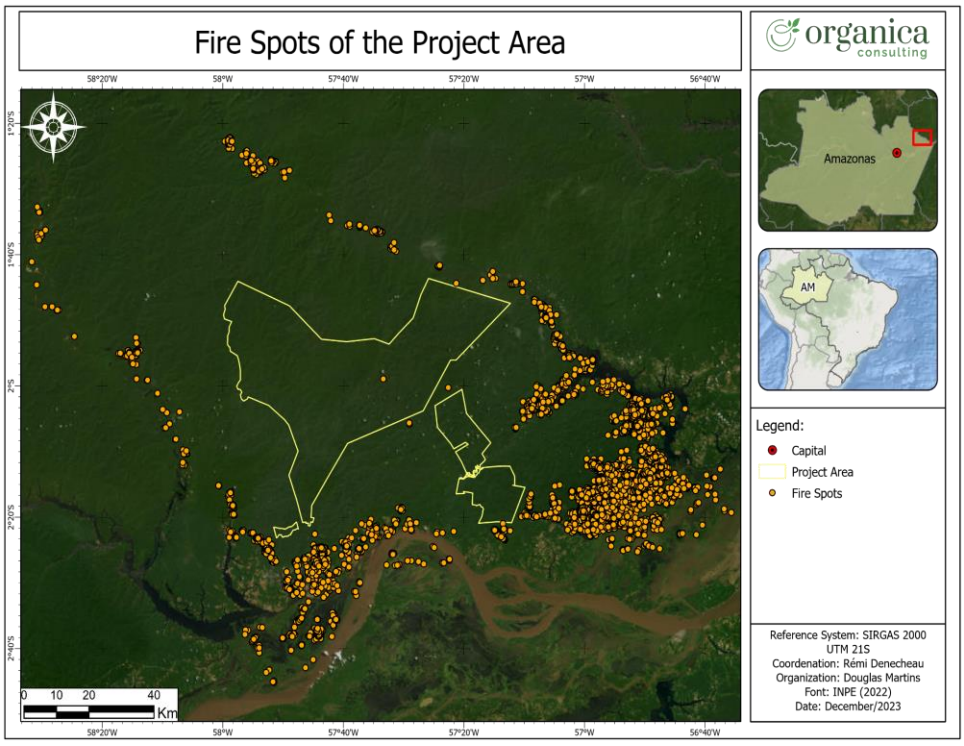


Figure 25: Fire Spots of the Project Area[29]

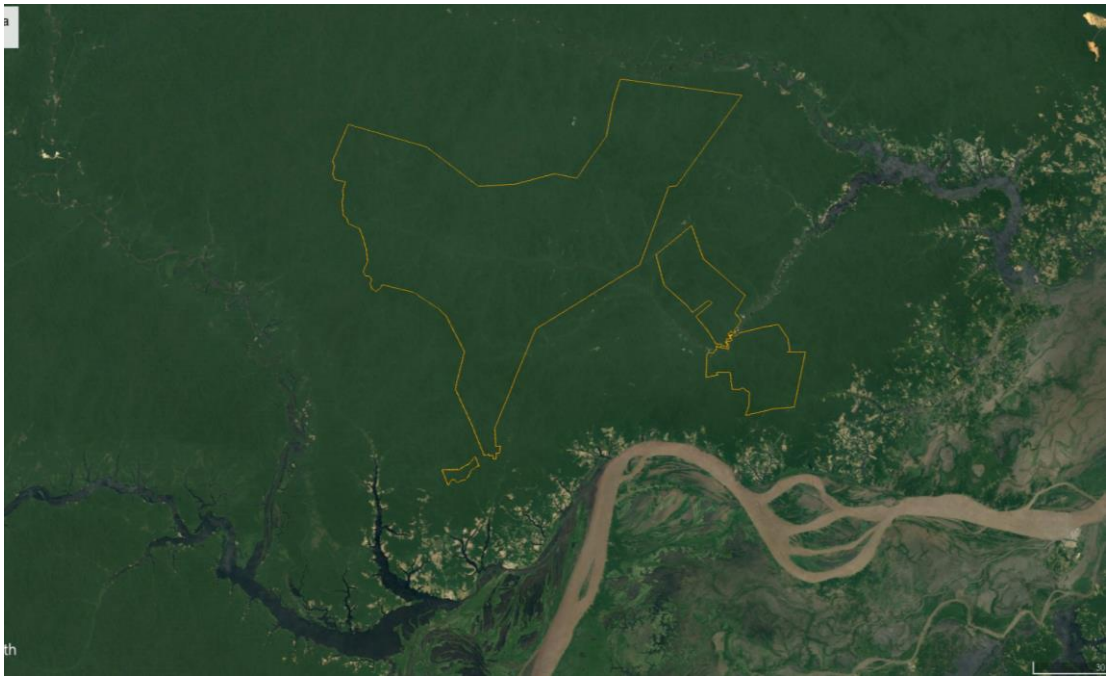


[28] Projeto MapBiomas – Mapeamento de cicatrizes de fogo no Brasil – Coleção 1. Accessed on: 18/12/2023. Available at: https://mapbiomas.org/estatisticas

[29] Available at: http://terrabrasilis.dpi.inpe.br/queimadas/portal/faq/index.html

As shown in Figure 26, there are extensive farms South of the Project site, which suggest risk for deforestation in the future in a scenario without the Tapera Project.

Figure 26. Extensive farms south of the Project site, suggesting encroachment in the future.



2.1.5.Social Parameters (G1.3)

For the analysis of secondary data on the municipalities of Urucará and Nhamundá, three main indices were selected: the 2022 Census from Institute of Geography and Statistics (IBGE), Firjan Municipal Development Index (IFDM), and the Social Progress Index (IPS). One advantage is to group official data around topics, facilitating the capture of the current conditions of the municipality in the areas of business, health, quality of life, and municipal management, among others. Finally, these indices were selected because they cover various aspects of their respective areas, as will be shown below. In this analysis, data from official research institutions were also mobilised, such as the Ministry of Health, National Institute of Educational Studies and Research Anísio Teixeira (INEP), Institute of National Artistic Heritage (IPHAN) and the National Foundation for the Indian (FUNAI). Data from civil society organisations were also mobilised, such as the Socio Environmental Institute, and two projects developed on the initiative of the Climate Observatory, MapBiomas, and the System of Estimates of Emissions and Removals of Greenhouse Gases (SEEG) to address issues that are not sufficiently covered by the indices.

The Demographic Census, led by the Brazilian Institute of Geography and Statistics aims to count the inhabitants of the national territory, identify their characteristics, and reveal how Brazilians live,

producing essential information for defining public policies and making investment decisions by the private sector or any level of government. It also constitutes the only source of reference on the living situation of the population in the municipalities and their internal areas, such as districts, neighbourhoods, and localities, rural or urban, whose realities depend on its results to be known and have their data updated. Information collection was generally conducted through face-to-face interviews (direct interviews – face to face – with household residents) and occurred in accordance with IBGE guidelines, transmitted during the various stages of training, including remote training. This procedure was carried out through contact between the Census Taker and the resident and based on a partnership relationship established between them. In addition to this traditional modality, for the 2022 Demographic Census, the possibility of collection via the Internet was opened. The Census taker could offer this alternative at the request of the residents; or when there were restrictions on access to specific areas, for example, in the case of gated communities; or when any other difficulty was encountered in collecting data in the face-to-face interview format. There was also an increase in collections in Traditional Peoples and Communities, where quilombola communities were researched for the first time. The Census collected information on family, specific population groups, work, income, expenditure and consumption, gender, population, living conditions, poverty and inequality, education, marriage, characteristics of the population, housing, culture, recreation and sport, information society, health, components of demographic dynamics and vital statistics. The 2022 Census sample had five different fractions used according to the total population of the municipality. In municipalities with up to 2,500 inhabitants, the sample fraction was 50%, that is, half of the total households were administered the sample questionnaire. Those with more than 2,500 to 8,000 inhabitants had a sample fraction of 33%. In municipalities with more than 8,000 to 20,000 inhabitants, the fraction was 20%. In those with more than 20,000 to 500 thousand inhabitants, the fraction was 10%. And, finally, in municipalities with a population greater than 500 thousand, the fraction was 5%. The definition of more than two sample fractions was only due to the ease of operation, application, and control, allowed with the use of handheld computers in the data collection operation.

The **IFDM** is an index created from the monitoring of three main sectors**: employment and income, education, and health**. For each sector, statistics are selected from the Ministry of Labor and Employment, Health, and Education, which are grouped and normalised on a scale ranging from 0 to 1, where the closer to 1 the higher the level of development for a given sector. Taking this range as a reference, the index ranks four stages of development: low (0 to 0.4); fair (0.4 to 0.6), moderate (0.6 to 0.8), and high (0.8 to 1). Its main objective is to provide a historical series that allows tracking whether the municipality has shown annual development in each of its aspects and in general. The components of each sector, taken from the IFDM 2018 publication, are shown in Table 8 below.

Table 9. Components of the IFDM Index

Employment and Income	*Education*	*Health*
Generation of formal employment	*Early childhood education service*	*Proportion of adequate prenatal care*
Labour market formalisation rate	*Elementary school dropout*	*Deaths from ill-defined causes*
Income Generation	*Age/grade distortion in elementary school*	*Child deaths from preventable causes*
Real wage bill in the formal labor market	*Elementary school teachers with higher education*	
	Average daily class hours in elementary school	*Primary Care Sensitive Hospitalisation (ISAB)*
Gini index of income inequality in formal work	*Basic Education Development Index (IDEB) results in elementary education*	

Finally, the **Social Progress Index (IPS)** was created from the perception that the most famous indices used to measure development, such as the Gross Domestic Product (GDP) and the Human Development Index (HDI), place excessive emphasis on income component and, therefore, have limitations in capturing a social and environmental dimension of the countries represented. The IPS therefore aims not only to include income, but also to measure the social and environmental performance of territories.

For the IPS, the concept of social progress is understood as *"the ability of a society to meet the basic human needs of its citizens, to establish the essential elements for improving and maintaining the quality of life of people and communities, and to create the conditions for all individuals to achieve full potential".*

The **IPS Amazônia** was the first initiative created to adapt this index, until then performed for countries, to sub-national scale, at the level of states and municipalities. Similar to the IPS Global, the index is aggregated into three dimensions: Basic Human Needs, Foundations for Well-Being and Opportunities − and 12 components namely: Nutrition and Basic Medical Care; Water and Sanitation; Housing; Personal Security; Access to Basic Knowledge; Access to Information and Communication; Health and Wellness; Environmental Quality; Individual Rights; Individual Freedoms and Choice; Social inclusion; Access to Higher Education.

The complementation of the data from official institutions intends to draw the general panorama of the municipality in its population, educational, economic, territorial, services and public administration, and cultural and archaeological heritage aspects. For the contextualization of the municipality with the Brazilian climate and environmental issue, data from the projects were also used: MapBiomas, which aims to annually map the coverage and use of land in Brazil and monitor changes in the territory; and SEEG, an initiative that aims to document and analyse the evolution of greenhouse gases emissions and removals

in Brazil. These two projects were developed on the initiative of the Climate Observatory, a network of Brazilian civil society entities formed with the objective of discussing climate change in the context of Brazil and global warming.

For community-level characterization, the **Sustainable Livelihoods (MVS)** methodology was adopted with auxiliary tools of Rapid Participatory Rural Diagnosis (DRP). The MVS was consolidated in Brazil under the leadership of the United Kingdom's sustainable Development Support Agency (DFID) already in the version adapted to the Brazilian context in partnership with CARE – Brazil (an entity created after the Second World War to contribute to overcoming disasters by vulnerable communities, fighting the causes of poverty and promoting sustainable local development).

Considering that in impact assessments of socio-environmental strengthening projects in communities that are residents and users of areas that provide environmental services, among which are non-wood forest products or those with a high carbon sequestration potential, it is necessary to adopt a methodology capable of describing and measuring the ways of life of local communities and their relationship with the environmental conservation of the territory. This methodology provides an integrating axis of indicators that allows us to mark out and guide what is expected to be accomplished in probable carbon credit projects that should be defined in a participative way and have a positive impact on the conservation of the contracted forest fragments and on the livelihoods of the residents who help in this conservation. In accordance with the certification standards for carbon credit projects such as the CCB, the MVS is understood as a participatory approach, which favours the generation of information with autonomy and criticism by the people, families, and communities to be beneficiaries, making them co-responsible for the process of environmental conservation and generation of carbon credits.

The methodology brings in a theoretical construct that helps to organise the categories of the ways of life of people, families, and communities to look at the situation before, during and after the projects that will be chosen for implementation, considering the material and immaterial factors of these community ways of life and the standards derived from the principles of sustainability. This methodological proposal argues that livelihoods will be increasingly sustainable, healthy, and lasting, when a dynamic and organic balance is reached between the assets that people, families and the community have access to and that drive and are driven by their aspirations and dreams. The assets are distributed over five dimensions that can be in balance or imbalance in direct relation to other interests in dispute within the development of society. The dimensions and indicators that will be used to capture and monitor the livelihoods of communities are presented in Table 10 below.

Table 10. Dimensions and indicators that comprise sustainable livelihoods.

Types of assets / dimensions	*Information to be obtained for baseline description*
Human Dimension	*Family food security*
	Use and appreciation of traditional/local ecological knowledge
	Access to new knowledge
	Satisfaction and motivation with work and life in the territory
	Occupational safety
Social Dimension	*Relations with communities, partners, and institutions*
	Visibility and opportunity for young people
	Participation and appreciation of women in productive activities
	Access to public policies aimed at strengthening their ways of life
Environmental Dimension (or Natural Dimension)	*Access to water for human and animal consumption*
	Access to land suitable for the various traditional uses and their aspirations
	Maintenance of other natural resources of the activity
	Forest conservation and use
	Wildlife conservation and use
Physical Dimension	*Individual production infrastructure*
	Collective production infrastructure
	Individual/family infrastructure for housing, transportation, and welfare
Financial Dimension	*Income*
	Product pricing and working capital, when applicable
	Commercialization
	Access to credit lines and other financial aid policies

Capturing the dimensions of community livelihoods serves as a baseline for creating indicators and subsequent monitoring throughout the project lifetime. The application of the MVS was planned in two

ways in order to encompass the quali-quantitative approach in the data collection process: a) collective application in meetings with community members who were encouraged to make a justified assessment of the five dimensions (human, social, environmental/natural, physical/material and financial), obtaining records viewed by community members about their considerations on the asset base they dispose living in that territory; b) application of a formal questionnaire with the support of the Kobo Toolbox and Kobo Collect[45] applications, through which registration and general characterization and dimension-specific questions were prepared. The use of tables with selected indicators of each dimension of the MVS would help consolidate a baseline assessment in a way that will facilitate future data collection for tracking the positive and negative impacts of carbon credit projects in each territory. Some tools of Rapid Participatory Rural Diagnosis (DRP) were also used according to the need to obtain information in the contacts with the communities, aiming to complete the characterization of ways of life and consolidate the description of use of the carbon credit projects areas. The main ones used were crosswalk, seasonal calendar, maps, and sketches of areas of use and distances, and Venn diagram [8].

Population dynamics

According to estimates by the Brazilian Institute of Geography and Statistics (IBGE), the population of the municipality of Urucará was 18.631 people[30] and Nhamundá was 20.136 people in the year of 2022. When considering the 2010 census, which counted 17.094 people on Urucará and 18.278, both municipalities show an upward trend in population growth[31]. The 2022 census indicated that both municipalities have a young population, with over 50% with less than 30 years of age.

30 IBGE | Cidades@ | Amazonas | Urucará | Panorama

31 IBGE | Cidades@ | Amazonas | Urucará | Panorama

Figure 27. Population Pyramid (age-sex pyramid) showing the distribution by age groups and sex of the population of Urucará [32]

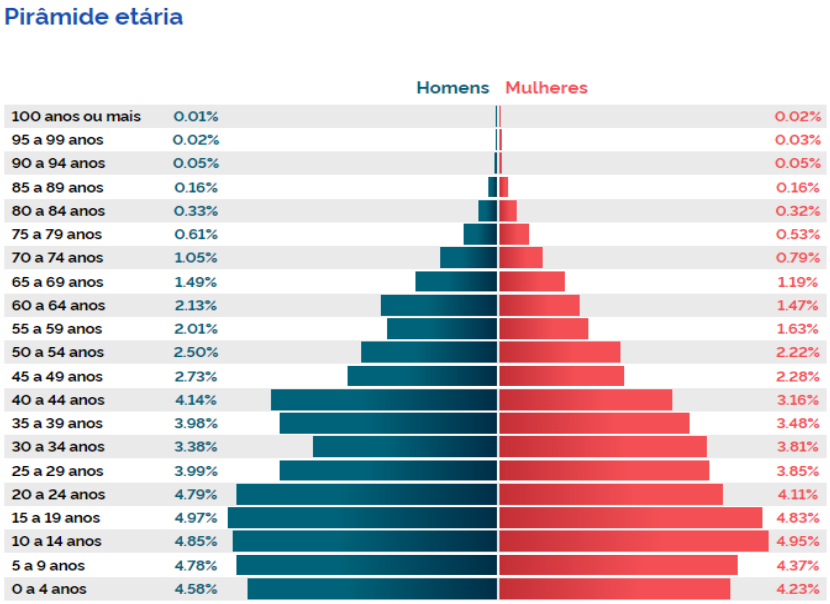
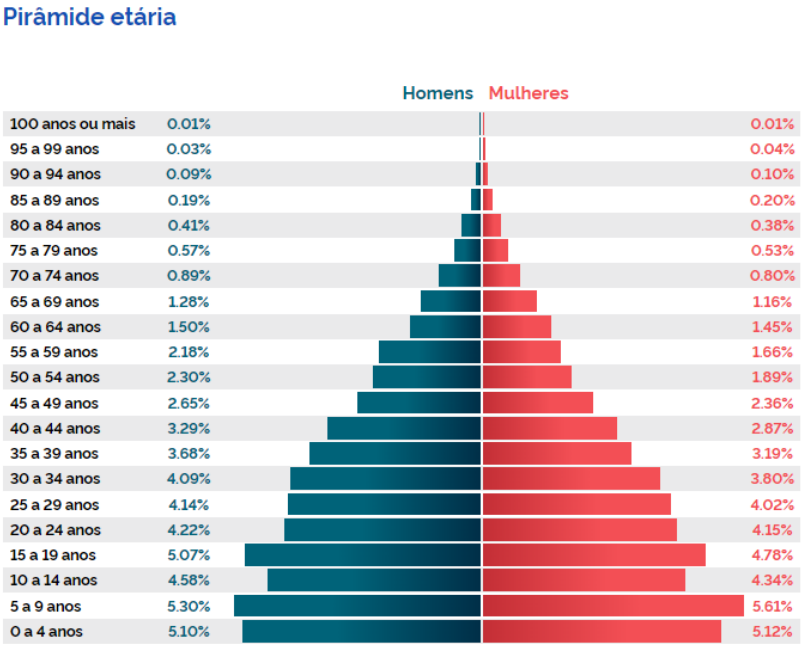


Figure 28. Population Pyramid (age-sex pyramid) showing the distribution by age groups and sex of the population of Nhamundá [33]



32 Panorama do Censo 2022 (ibge.gov.br)

33 Panorama do Censo 2022 (ibge.gov.br)

According to the age distribution of the population of Urucará, the group with the largest number of people ranges from 10 to 19 years old, which corresponds to 20% of the total population[34] on Urucará. In Nhamundá, the population has an even younger profile, with the largest group of people ranging from 0 to 9 years. The observed population pyramid structure with wider bases differs from the pattern presented by Brazilian municipalities and the population pyramid of Brazil, which tend to represent broader bases of young adults than those of young people and children. The population pyramids of Urucará and Nhamundá with the lower age groups wider than those of young adults may be indicative of a high birth rate. The large leap in the young population between 20 and 24 years old to the 25 to 34 age group indicates that Urucará has not generated regular opportunities in the labour market and there are emigrations from these age groups, especially to seek their job opportunities. In Nhamundá, we can see a leap in the age group of 15 to 19 years old to the 20 to 24 group indicates that a majority of young adults are probably emigrating to other municipalities with a more developed labour market. Considering that the economic development of a municipality can act as an attraction for migrants, Urucará and Nhamundá present few economic and financial incentives for populations from other locations.

In self-identification by colour or race, the 2010 Census showed that the population in both municipalities identified itself mostly as brown (parda). The percentage of people who declared themselves brown/mixed ("pardo") was over 80% in Urucará and in Nhamundá.

With a total area of 27.901,962 km², the municipality had a demographic density of 0,67 inhabitants per square kilometre for the year 2022. Urucará has a sparsely distributed population throughout the municipality, and in comparison, with the other Amazonian municipalities, the demographic density of Urucará occupies the 47th position in the ranking of the 62 municipalities[35]. Urucará has a 57,98% of urban population and 42,02% of rural population, which is lower than the Brazilian average of 84% of urban population.

34 Panorama do Censo 2022 (ibge.gov.br)

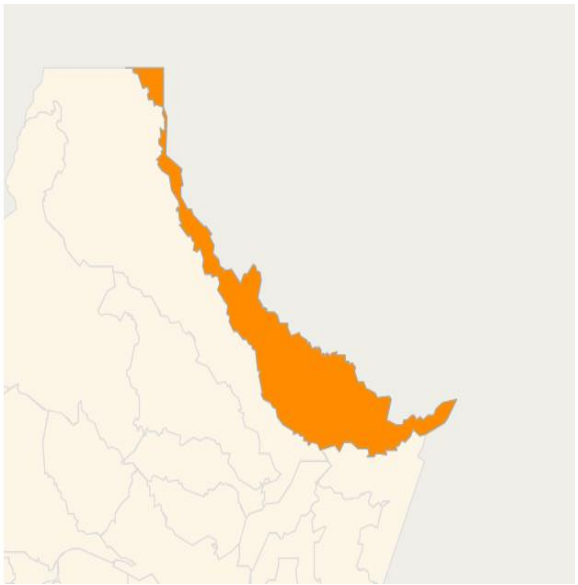
35 https://cidades.ibge.gov.br/brasil/am/urucara/panorama

Figure 29. Map of the municipality of Urucará[36]



The Nhamundá municipality has a total area of 14,107.040 ha and a demographic density of 1,43 inhabitants per square kilometre for the year of 2022[37], following the same pattern of low density present in many other Amazon municipalities. Nhamundá has a higher level of rural population than Urucará, reaching 61,65%[38]. This reflects in the economic indicators that show that Nhamundá has a lower GDP per capita than Urucará.

Figure 30. Map of the municipality of Nhamundá[39]



[36] Urucará (AM) | Cidades e Estados | IBGE
[37] Nhamundá (AM) | Cidades e Estados | IBGE
[38] https://www.estadosecidades.com.br/am/nhamunda-am.html
[39] https://www.ibge.gov.br/cidades-e-estados/am/nhamunda.html

Health

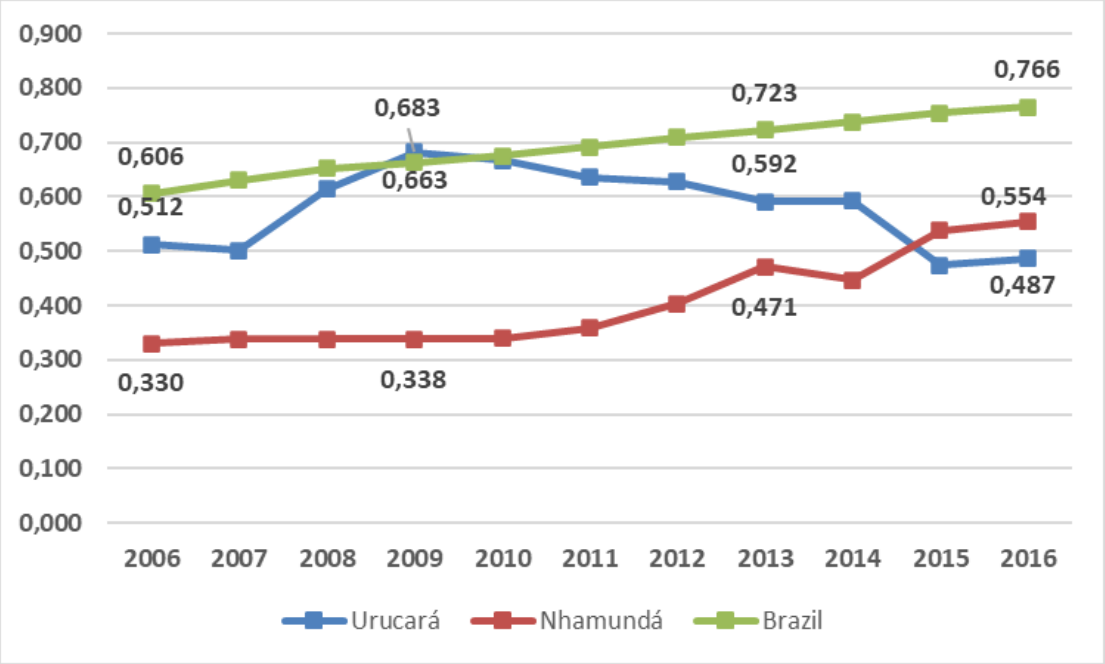
In 2009, the municipality of Urucará had seven health facilities of the Unified Health System and one public hospital[40]. According to DATASUS, Urucará has seven Basic Health Units, one of which is rainwater, three specialty centres, a physiotherapy and rehabilitation clinic, a laboratory and a hospital unit that has specialised diagnostic services and emergency services. In the CENSO 2022, it was detected that the average infant mortality rate in the city is 13.84 per 1,000 live births. Hospitalizations due to diarrhoea are 0.6 per 1,000 inhabitants. Compared to all municipalities in the state, it ranks 31st out of 62 and 42nd out of 62, respectively. When compared to cities across Brazil, these positions are 1902 of 5570 and 3103 of 5570, respectively.

The municipality of Nhamundá has worse parameters than Urucará. According to the data collected in Censo 2022, the municipality has 5 health facilities of the Unified Health System, including one emergency service. The average infant mortality rate in Nhamundá is 9.17 per 1,000 live births. Hospitalizations due to diarrhoea are 1.6 per 1,000 inhabitants. Compared to all municipalities in the state, it ranks 51st out of 62 and 24th out of 62, respectively. When compared to cities across Brazil, these positions are 2975 out of 5570 and 1802 out of 5570, respectively.

Urucará´s IFDM for Health reached a score of 0.4865 points for the year 2016, which is considered a regular development. By presenting an IFDM for health considered regular, the municipality occupied the 5,333rd position in the national ranking out of a total of 5,570, indicating that, in this aspect, it is among those with the worst performance. Nhamundá´s IFDM for Health reached a score of 0.5544 points for the year of 2016, which represents, as it is noted in Urucará´s case, of regular development. The municipality occupied the 5.108th in the national ranking, showing a more developed system than Urucará. In the IFDM historical series (Figure 25), it is possible to verify that Urucará presented a development below the national average (0.765) and the one presented by Nhamundá (0.5544). Analysing the historical series starting in 2005, Urucará shows a decrease in its IFDM since 2009, while Nhamundá had an upward trajectory since 2014.

40 IBGE | Cidades@ | Amazonas | Urucará | Panorama
Índice de Progresso Social (ipsamazonia.org.br)

Figure 31. Historical line of the IFDM for health in the municipality of Urucará, Nhamundá and Brazil



Another relevant index to analyse the profile of these two municipalities is the IPS 2023. Analysing the nutrition and basic health care component of the IPS 2023[29], Urucará had a maternal mortality rate of 75,5 deaths per 100,000 live births for the year 2020 and Nhamundá had a mortality rate of 289,02 per 100,000 live births for the same year. Although Nhamundá presents a higher mortality rate compared to Urucará, still has a level considered low according to data from UNICEF[41]. Both municipalities present levels higher than the Brazilian average of 72 deaths per 100,000 live births[42]. In the nutrition and basic health component, for the same year, mortality due to malnutrition was 12,40 deaths per 100,000 live births in Urucará and 9,33 deaths per 100,000 births in Nhamundá. In Urucará, the malnutrition rate reached 4.89% of the population and deaths from infection reached a total of 6,15 deaths per 100,000 inhabitants. The municipality of Nhamundá has better results in these two aspects, with a malnutrition rate of 3,89% of the population and deaths from infectious diseases in 4,72 deaths per 100,000 inhabitants.

According to the IPS 2021 of Health and Well-Being [30] for Urucará the death rate from diabetes mellitus in 2020 was 18,60 per 100,000 inhabitants in Urucará. Cancer mortality in the same year was 43,40 deaths per 100,000 inhabitants. Circulatory diseases totalled 99,19 deaths per 100,000 inhabitants. Finally, on a smaller scale, deaths from respiratory diseases and suicide accounted for 12,40 and 12,40 deaths per 100,000 inhabitants, respectively. In Nhamundá, the death rate from diabetes mellitus in 2020 was 46,64 per 100,000 inhabitants, more than double of its neighbour municipality. Cancer mortality is at

41 Maternal mortality rates and statistics - UNICEF DATA
42 Maternal mortality rates and statistics - UNICEF DATA

a similar level, with 41,97 deaths per 100,000 inhabitants and circulatory diseases totalled 69,95 per 100,000 inhabitants. Nhamundá also has worse parameters both on respiratory diseases and suicide rates, with 37,31 and 32,23 deaths per 100,000 respectively,

Thus, as represented by the municipality's IFDM - Health, both Urucará and Nhamundá present a precarious infrastructure to serve its citizens. Limitations in the local health care network are due both to the lack of qualified professionals to perform more sophisticated care and equipment and services. This precariousness of the municipalities´ health system is also evidenced by the 2023 IPS data that show high rates of infant mortality and hospitalisation due to diarrhoea among the inhabitants of both municipalities.

Education

In terms of education, in 2022, Urucará had a schooling rate of 94,6% of children aged 6 to 14 years[70]. In comparison with other municipalities in the state, it was in position 8 out of 62. In comparison with municipalities across the country, it was in position 5109 out of 5570. According to IBGE, in 2021 the municipality of Urucará counted 2.800 elementary school enrolments and 1.086 high school enrolments[43]. For the same period, IBGE pointed out that the 35 elementary schools had 176 teachers, while the 3 high schools had 62 teachers.

In the municipality of Nhamundá, in 2010, the school enrolment rate for 6- to 14-year-olds was 94.1%, similar to the one of Urucará. In comparison with other municipalities in the state, it was in position eleven out of 62. In comparison with municipalities across the country, it was in position 5209 out of 5570.[44] According to the Censo 2022, the municipality of Nhamundá had 3.383 elementary school enrolments, 1.150 high school enrolments[45]; 56 elementary schools with 256 teachers; 5 high schools with 79 teachers.

The IFDM for Education at Urucará reached a score of 0,6591 points for the year 2016, which is considered a moderate development[73]. With this score, Urucará occupied the 4494th position in the national ranking, which, as pointed out for the education section, places the municipality among the ones that had average performances at the national level.

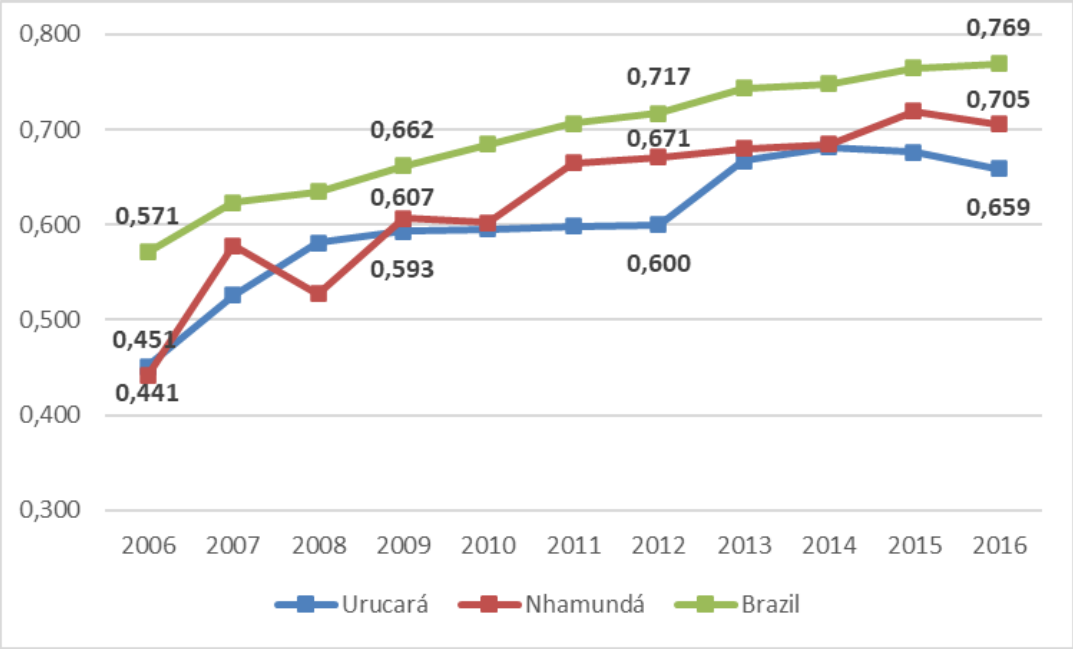
The IFDM for Education at Nhamundá reached a score of 0,705 points for the year 2016, which is considered a moderate development[73]. With this score, Nhamundá occupied the 3.953rd position in the national ranking. Analysing the historical series shown in Figure 26, from 2006 it is noted that the evolution of the Nhamundá is higher than the one of Urucará and has shown an upward trend, however the indicator is quite below the one from Brazil's average. Thus, compared to the national scenario, the municipality is in a low stage of educational development and in an irregular evolution.

43 IBGE | Cidades@ | Amazonas | Urucará | Panorama

44 https://cidades.ibge.gov.br/brasil/am/nhamunda/panorama

45 https://cidades.ibge.gov.br/brasil/am/nhamunda/panorama

Figure 32. Historical series of the IFDM for education in the municipalities of Urucará, Nhamundá and Brazil



For the municipality of Urucará the access to basic knowledge component of the 2023 IPS was 78.44 points. This score is above the average for municipalities in the state of Amazonas and the Amazon. According to the IPS, in 2023, elementary school dropout and failure were 0.3% and 0.5% respectively. The age-grade distortion in elementary school was 11.6%, and in high school was 32.5% in relation to the total number of students.

Analysing the same IPS 2023 indicators for Nhamundá, the access to basic knowledge component was 73,68 points. Elementary school dropout and failure were 2% and 4.9% respectively, showing worse results than the ones of Urucará. The age-grade distortion in elementary school was 13,70%, and in high school was 32,1% in relation to the total number of students.

Income and public management

In 2021, GDP per capita at Urucará was R$12,847.86. In comparison with other municipalities in the state, it ranked 26th out of 62 among the state's municipalities and 4173rd out of 5570 among all municipalities. The percentage of external revenue in 2015 was 89.3%, which placed it in position 47 out of 62 among the state's municipalities and 2347 out of 5570. In 2017, the total revenue generated was R$ 48,232.76 (x1000) and the total committed expenses was R$39,612.24 (x1000). This leaves the municipality in positions 34 and 35 out of 62 among the state's municipalities and in 1954 and 2140 out of 5570 among all municipalities[46].

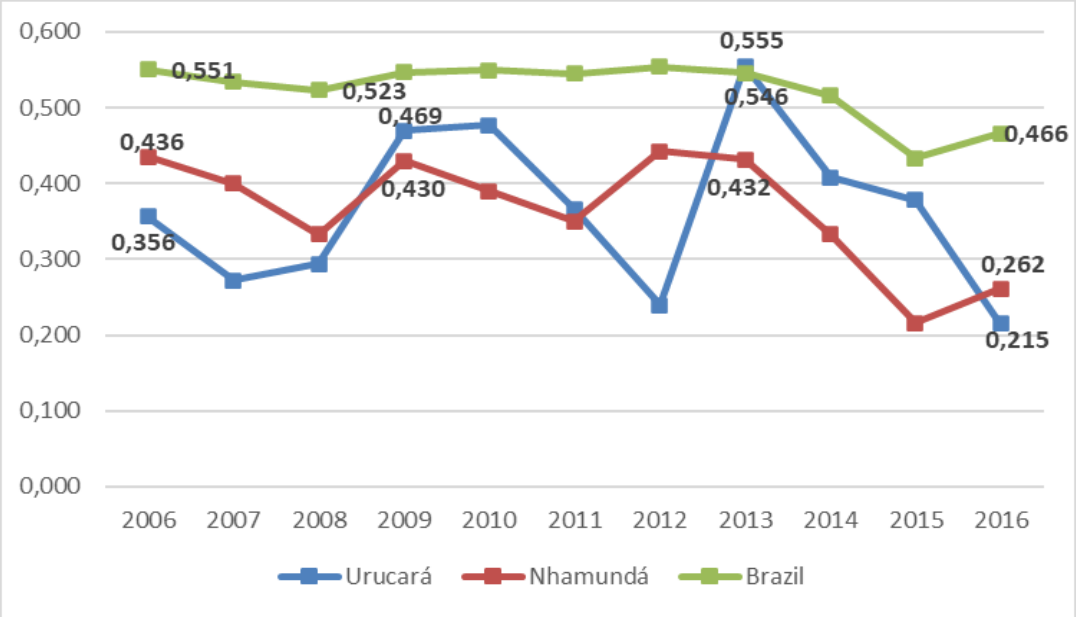
[46] https://cidades.ibge.gov.br/brasil/am/urucara/panorama

In 2021, GDP per capita in Nhamundá was R$9,535.02, showing a lower economic strength than Urucará. In comparison with other municipalities in the state, it ranked 47th out of 62 among the state's municipalities and 5052nd out of 5570 among all municipalities. The percentage of external revenue in 2015 was 96.9%, which placed it in position 10 out of 62 among the state's municipalities and 301 out of 5570. In 2017, the total revenue generated was R$44,772.09 (x1000) and the total committed expenses was R$38,286.61 (x1000). This leaves the municipality in positions 40 and 37 out of 62 among the state's municipalities and in 2107 and 2213 out of 5570 among all municipalities[47].

In 2021, the average monthly salary was 1.6 minimum wages in Urucará and in Nhamundá. The proportion of employed people in relation to the total population was 8.38% in Urucará and 5.44% in Nhamundá.

The evolution of the IFDM indicator for Employment & Income both for Urucará and Nhamundá wavered considering the historical series from 2005 to 2016 (Figure 27). From 2013 onwards, there is a clear downward trend for Urucará and Nhamundá for this specific indicator. This trend is also seen in the national scenario, to a lesser extent.

Figure 33. Historical series of the IFDM for income and public management in the municipalities of Urucará, Nhamundá and Brazil



The percentage of people involved in informal work represents most of the population of Urucará and Nhamundá, with over 90% not engaged in a regular remunerated activity. According to data from IPS Opportunities for 2021[37], when considering the proportion of jobs with higher education in relation to totals, only 13.37% at Urucará and 16,9% at Nhamundá are occupied by people with higher education. Among jobs with higher education occupied by women, the rate is 6.93% and 8,11% respectively in relation to the

[47] https://cidades.ibge.gov.br/brasil/am/nhamunda/panorama

total number of jobs, that is, almost half of jobs with higher education were occupied by women in both municipalities. Thus, the local economy, besides being largely uneven and informal, the existing formal jobs do not require higher education, which, as shown by Rocha et. al. (2017) [38], tend to pay lower wages.

Indigenous peoples[48]

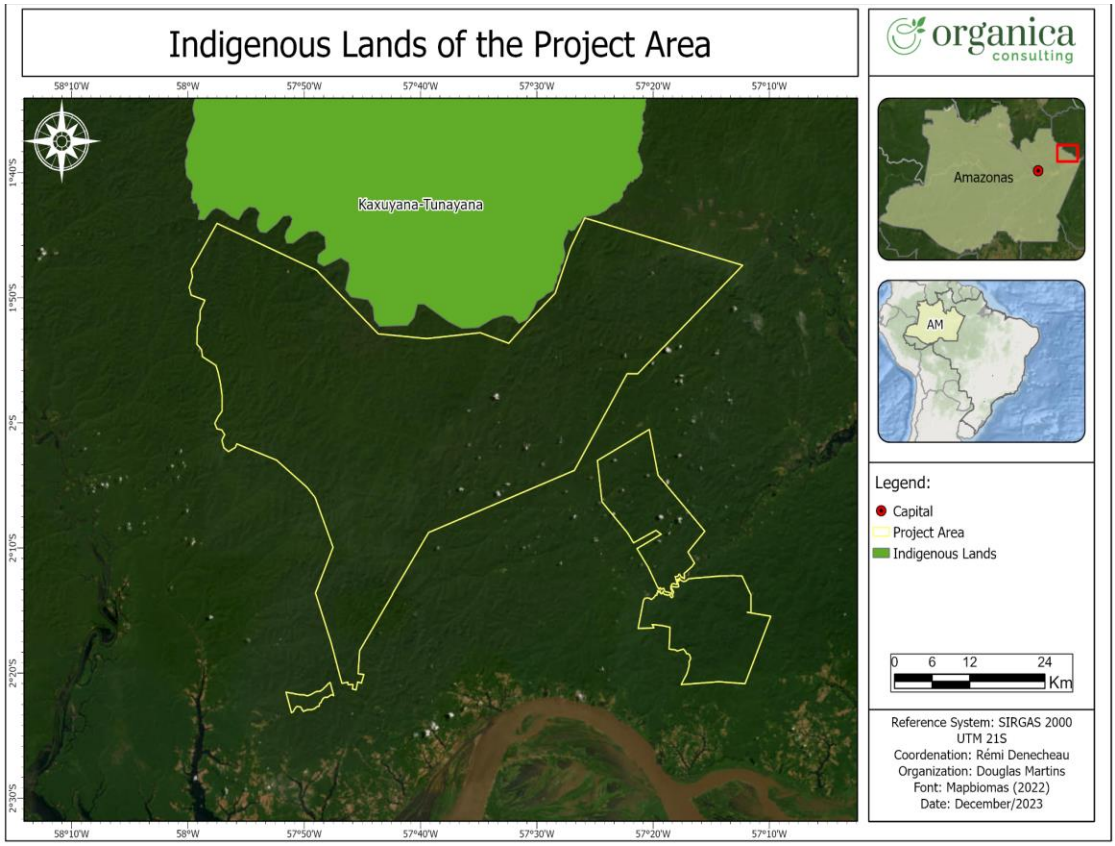
North of the project area, there are indigenous people from the Hixkaryana people. Hixkaryana is a generic name to designate several groups of similar language and culture, who currently live in the valleys of the Nhamundá (Amazonas-Pará) and middle Jatapu (Amazonas) rivers. Hixkaryana encompasses other groups that, most likely, had greater autonomy in the past, and that, even today, in local contexts, call themselves: Kamarayana, Yukwarayana, Karahawyana and Xowyana.

The Hixkaryana language belongs to the Carib linguistic family and is spoken by all the group's members. This language is very similar to the other dialects spoken in the wider region bounded by the valleys of the Trombetas and Mapuera rivers, such as Waiwai, Xereu, Katuena, Karapawyana and Tunayana. Consequently, and because the Hixkaryana established very close relations with these groups in a network of matrimonial and ritual exchanges, these dialects are mutually intelligible.

Today most of the Hixkaryana live by the shores of the middle Nhamundá, a river dividing the states of Amazonas and Pará. There are ten villages located on the Amazonas side and one village on the Pará side. A further two villages are situated on another river, on the Jatapu river, also in Amazonas state. There are many Hixkaryana families mixed with other groups (particularly Katuena, Waiwai and Xereu) who inhabit other localities, especially settlements along the Mapuera river in Pará state. Finally it should be noted that a few Hixkaryana families live temporarily in the cities of Nhamundá, Parintins and Manaus. The total of Hixkaryana residents on the Nhamundá and Jatapu rivers is 942 people.

[48] Hixkaryana - Indigenous Peoples in Brazil (socioambiental.org)

Figure 34: Indigenous Lands near the Project Area



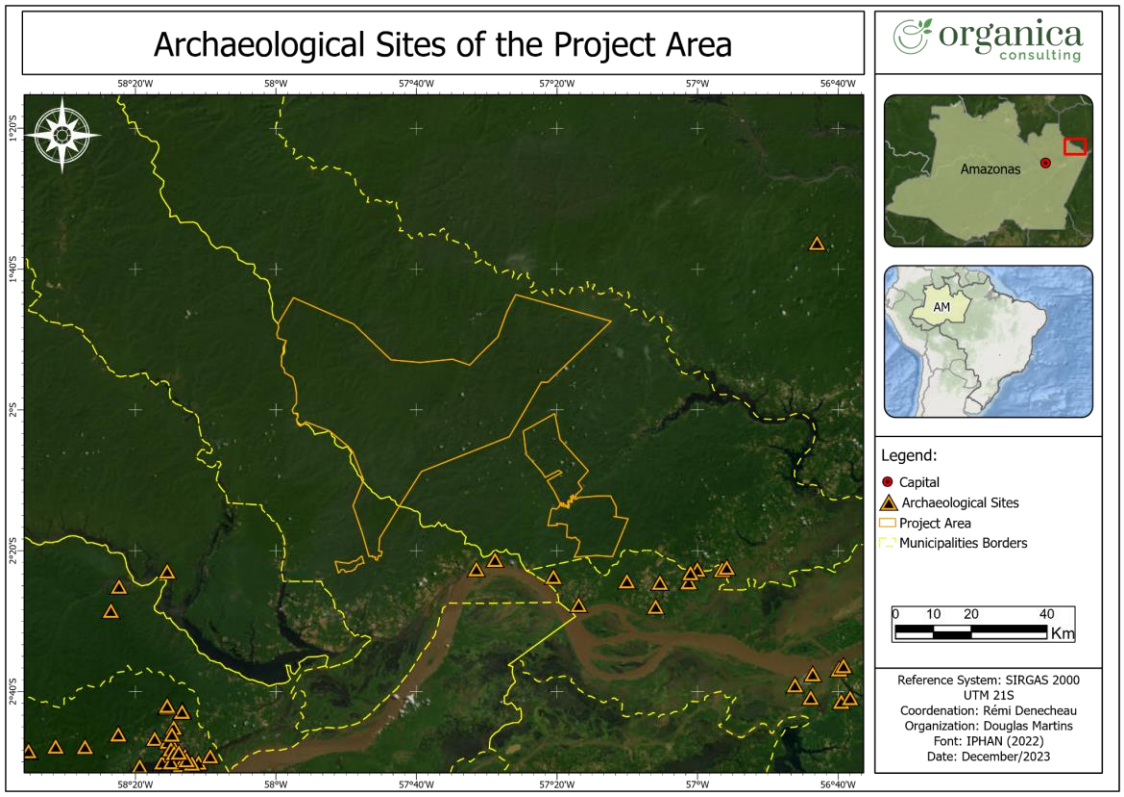
On the Nhamundá river there are residents belonging to two other indigenous groups who, despite originating from other geographic areas and speaking distinct languages, were incorporated by living alongside and/or marrying the Hixkaryana. These are the Kaxuyana and the Karara. The Kaxuyana were originally inhabitants of the Cachorro river, an affluent of the right shore of the Trombetas.

Archeological Sites

The Amazon region recently faced a historical disaster, unveiling four archaeological sites dispersed across different areas of the state of Amazonas, with three sites being previously unknown and of significant importance. In response to this revelation, the National Historical and Artistic Heritage Institute (Iphan) devised an emergency plan aimed at documenting and facilitating inspections and registrations for these cultural assets. Collaborating with various public bodies and social organisations, including the Soka Institute of Amazônia—a volunteer-driven entity dedicated to preserving local cultural and environmental heritage—Iphan orchestrated a series of inspections and educational initiatives. Notably, the third site, situated in the municipality of Urucará, approximately 260 km from the capital along the Uatumã River, features petroglyphs reminiscent of those discovered in Ponta das Lajes, showcasing intricate engravings on stones. Categorised as pre-colonial, these sites provide valuable insights into the historical way of life

of the region's past inhabitants. It is noteworthy that both the Anamã and Urucará sites remain unregistered with the CNSA (National System of Archaeological Heritage).

Figure 35. Archaeological Sites near the Project Area



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

Introducing the Project Zone Map that encompasses 24 properties in the municipalities of Urucará and Nhamundá, in the state of Amazonas.

Figure 36. APD delimitations of the Tapera project.

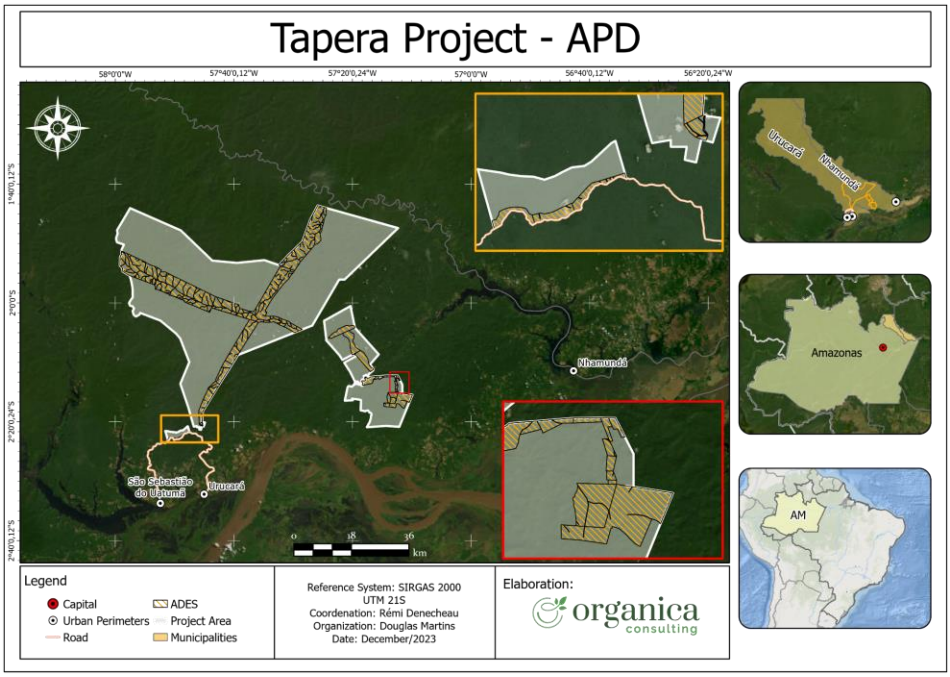


Figure 37. Tapera project zone in the Urucará and Nhamundá municipalities, Amazonas, Brazil.

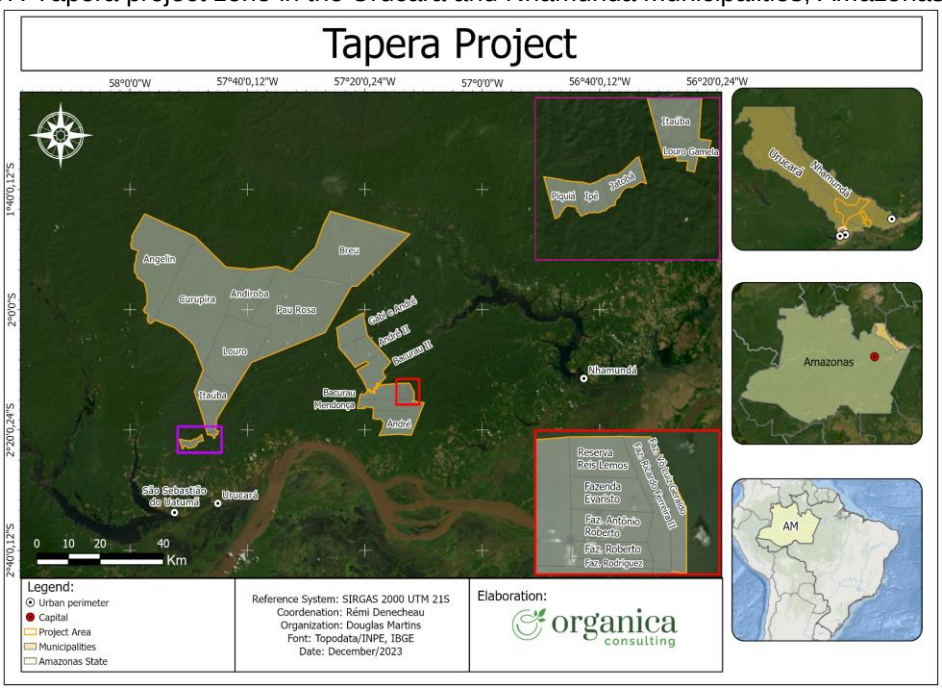
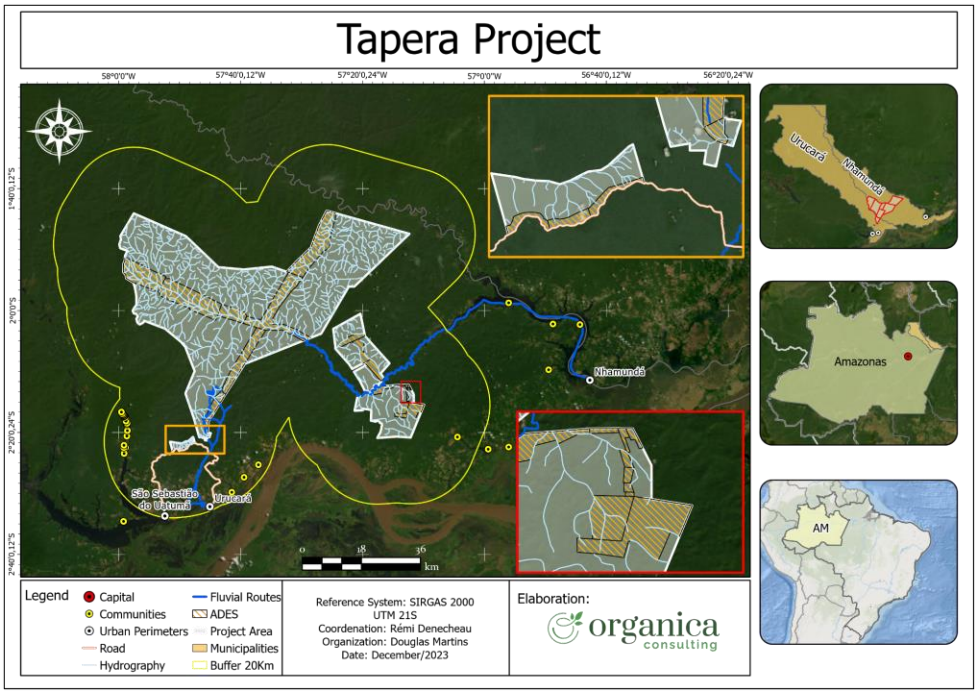


Figure 38: Location of communities south of the Tapera Project where families are distributed close to the project.



2.1.7. Stakeholder Identification (G1.5)

The initial step in developing carbon projects involves identifying stakeholders in two main phases. The **first phase** was executed remotely, involving the review of bibliographic references about the municipality and its region, internet searches, consultations with the landowner, and communication with local intermediaries. The **second phase** entailed on-site activities during field campaigns, utilising rapid participatory diagnostic methods, surveys on sustainable living practices, and semi-structured interviews.

The aim of this stakeholder identification process was to discover entities with either a direct or indirect connection to the territory. This effort sought to uncover organisations or individuals who, despite not residing on or near the project site, might utilise it or contribute to forming a network to support conservation efforts and strengthen sustainable economic chains.

During the first phase, an online search was conducted on September 13 and 14 of 2020. This involved using search engines, mainly Google, combining the municipality's name with categories of interest such as “Urucará”, “Nhamundá”, "NGO", or “association”. This search was augmented by referring to specific sites for business registration, official government websites, and NGOs. The focus was on stakeholders involved in conservation, agriculture, and particularly those associated with the handling of timber and non-timber forest products. This resulted in a list of 44 stakeholders from various sectors active in Urucará-AM and Nhamundá-AM, providing an overview of the organisations in these municipalities and guiding the field team's work and primary data analysis.

Concurrently, satellite images were used to identify potential structures within and around the property. According to the AFOLU Non-Permanence Risk Tool v4.0, this survey covered a 20 km radius from the property. The goal was to identify potential residents near the project area for inclusion in the stakeholder identification stages.

The technical team visited the field between December 16 and December 17, 2020, aiming to meet with community leaders and conduct a socioeconomic assessment of the local communities. A total of 168 individuals were identified in the well-organised communities of Marajazinho, Boa Esperança, and São João, primarily engaged in guaraná production. Additionally, 10 landowners involved in timber exploitation along the Urucará - São Sebastião road, who do not reside there, and 20 river dwellers temporarily living along the Rio Tapera were identified. Notably, these river dwellers occupy areas sporadically without any concentrated housing like villages or communities.

Between December 18 and 19 of 2020, the team visited Urucará and Agrofrut, organising meetings with communities near the project areas. and visited the Marajazinho community in Urucará to discuss the project.

Between December 20 and December 21st of 2020, the team visited Nhamundá, searching for communities nearest the project areas, assisted by M. Joao Bago, a local expert. The community of Apeua, comprising approximately 310 people (77 families), was identified during this process.

Between March 17th and March 18th of 2021, the team travelled to Nhamundá, via São Sebastião, up the Maripá River, and located the Jerusalem community, home to about 68 people. On November 14th 2021, the team met with Urucará's mayor, Mr. Enrico Falabella, and the Secretary of Production, Mr. Peterson Chaves. On November 15th, 2021, they met with the Secretary of Production of the municipality of Parintins, Mr. Sebastião Texeira, to discuss the project's objectives and social impacts, presenting the project stages and activities to be undertaken in the territory. The Parintins Secretary of Production expressed support for the activities and offered to participate in public hearings and provide assistance in the municipality.

The field team visited the project area and spoke to the resident families. Using simple language comprehensible to traditional extractivists, they explained the project's purpose, the rights of the landholders, and the benefits of the project for the region. Activities included individual interviews with riverine families and a meeting with a community group.

In total, 30 riverine families in Urucará, Nhamundá, and São Sebastião were consulted and interviewed individually rather than collectively, considering the distance and mobility challenges. This approach also ensured the safety of interviewees, allowing them to express their views without influence from financially powerful leaders. At the end of each discussion, families were asked if they supported the project's implementation, resulting in 30 approvals.

After resolving all queries, the project received unanimous support from those present. Thus, the Free, Prior, and Informed Consent process was conducted, respecting the rights of all participants.

Figures 39.a, 39.b. Community of Apeua





Figure 40. Community of Nova Jerusalém



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

Based on current data, stakeholders were grouped into the following classes: project proponent, landowners, public authorities, communities and third sector. The description of the stakeholders according to their right, interest and relevance in participating in the project is summarised in Appendix 1: Stakeholder Identification Table.

2.1.9.Sectoral Scope and Project Type

- Project Category: REDD+ (Reducing Emissions from Deforestation and Forest Degradation);
- Project Activity: APD (Avoided Planned Deforestation);

The Tapera REDD+ project is a grouped project.

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

The main objective of the Tapera project is to promote actions aimed at reducing greenhouse gases (GHG) emissions from planned deforestation. In this way, some activities will be proposed, such as the improvement of heritage surveillance, remote monitoring of forest cover, monitoring and deepening of biodiversity studies, in addition to activities to intensify the engagement of communities with the preservation of the forest and forest resources.

Thus, to ensure positive benefits for the three main scopes: climate, community and biodiversity, the project activities were defined based on the reality and local context, always aiming at continuous improvement. The successful implementation of the project's activities guarantees the commercialization of carbon credits, which return as financial resources for the continuation of social development activities and natural resources conservation. A brief description of the activities that make up the theory of change of the Tapera project is presented below:

Maintenance of forest cover:

Maintenance of 55.192,77 ha of forest coverage and reduction of 28.318.039 GHG emissions (tCO_2e) by stopping deforestation. The project proposes, through remote sensing, the periodic monitoring of forest cover, allowing the monitoring of changes in land use/cover, and a better understanding of the agents and vectors of deforestation in the region, as well as serving as support for the heritage surveillance team, making operations more effective and assertive. In this sense, remote monitoring of forest cover is directly related to the containment of deforestation, conservation of natural resources and biodiversity and, consequently, the reduction of GHG emissions. In addition, the project proposes to promote the training of agents, and thus contributing to climate change adaptation and increasing communities' income.

Biodiversity conservation:

By providing for the maintenance of forest cover in the project area, Tapera project also ensures the conservation and protection of the local habitats and species, thus generating expected positive net benefits to biodiversity, in a scenario with the Project.

The activities related to biodiversity for this project include the monitoring of sensitive species, that is, species that are under some degree of threat, and the performance and encouragement of scientific research in the project area, generating information and knowledge about the ecosystem dynamics. In addition, constant monitoring is planned in areas with recognized high conservation value.

Strategies for improving quality of life and technology transfer:

Based on the socioeconomic diagnosis, the result of interviews and meetings held with the participating communities, with the objective of learning about the local reality and the expectations of the target audience, the project identified the main social demands and mitigating actions capable of promoting improvement in the local infrastructure and quality of community life.

With regard to community infrastructure, the project will facilitate the transfer of social technologies, through: a) acquisition and implementation of a community photovoltaic system; b) implementation of a water collection and distribution system; c) logistical alternatives to ensure the flow of non-timber forest products; d) acquisition of equipment for processing non-timber forest products; e) implementation of an internet access system.

The communities involved will also benefit from training and courses aimed at: a) strengthening the forest sub-products chain, adding value to the products and community´s management capacity; b) increase in the income of extractive families, strengthening associations; c) encouraging the training and engagement of young people and women in economic activities; d) training for sustainable forest management of nuts, tonka beans, barks, leaves, and resins. As a result, the project activity will have a positive impact by strengthening the families' autonomy, providing decent conditions for community infrastructure and ensuring better conditions for permanence in the territory.

2.1.11. Sustainable Development

The main objective of the Tapera Amazon REDD+ Project is to avoid planned deforestation (APD) in its instances, composed of 100% of the Amazon Forest. The Project also has the function of establishing a barrier against the advance of deforestation, making an important contribution to the conservation of Amazonian biodiversity and to climate regulation in Brazil and South America.

These measures contribute to several nationally stated sustainable development priorities, such as the objectives from the Brazilian Government related to the UN Sustainable Development Goals (SDGs)42 and the Nationally Determined Contribution (NDC).

In Brazil, the National Commission for Sustainable Development Objectives (CNODS) is responsible for internalising, disseminating, and providing transparency to the process of implementing the 2030 Agenda for Sustainable Development in Brazil. The Commission is made up of eight government representatives (Government Secretariat of the Presidency of the Republic; Civil House of the Presidency of the Republic; Ministry of Foreign Affairs; Ministry of Citizenship; Ministry of Economy; Ministry of Environment; representative of the state/district levels; representative of the municipal level) and by eight representatives of civil society and the private sector. The monitoring of the country's advances in relation to the SDGs established as priorities is conducted by the Institute of Applied Economic Research (IPEA) and the Brazilian Institute of Geography and Statistics (IBGE), which are also permanent technical advisory

bodies. There is no monitoring at the specific level of projects, and progress at the national level can be accompanied by the synthesis report carried out by IBGE and by the IPEA reports.

The Tapera Amazon REDD+ Project main planned contributions to the Brazilian Priority Goals are listed below. These contributions are monitored by the parameters defined by the REDD+ project. The project itself enhances better management of non-timber forest products as, through the carbon credits sales, qualifies investments in the local community training and capacity building programs. Likewise, strengthen ecosystem conservation and preservation. This SDG is monitored in the financial resource.

The Project activities that will contribute to sustainable development including avoided forest conversion, sustainable forest management, and sustainable socio-economic development through the establishment of an agro-industry for processing non-timber forest products (e.g., fruits, oils). The Project makes the following sustainable development contributions:

- **Mitigating climate change:** The Project contributes to mitigation of climate change by GHG reduction and removal. It will have a positive impact on the microclimate of the region by protecting and sustainably managing forest ecosystems that would otherwise be cleared. Forest conservation contributes to less soil reflectivity, reduction in local temperatures, less water evaporation from cleared land. The Project contributes to the United Nations Sustainable Development Goal (SDG) 13 – taking urgent action to combat climate change.
- **Protecting ecosystems and biodiversity:** through APD activities the Project contributes to protecting and sustainably managing forests. The Project contributes to halting land degradation through extensive clearing for agriculture, which threatens the quality of terrestrial ecosystems and reduces biodiversity. Forest conservation contributes to UN SDG 15 – protect and restore terrestrial ecosystems.
- **Promoting sustainable economic development**: The planned development of the agro industry to process non-timber products contributes to improvements in local livelihoods for Agrofrut co-operative members. The development of the agro-industry processing plant will also generate secondary economic benefit through construction, transport, processing and distribution activities. Incomes able to be generated through processing of non-timber forest products are planned to be able to offset income generated through illegal timber harvesting and provide an incentive against illegal activity. This contributes to UN SDG 8 - inclusive and sustainable economic growth.

As outlined in Section 2.1, the Tapera Project also contributes to sustainable development objectives and environmental goals specified in Brazil's regulatory framework, laws, and policies. The

Project also contributes to the national policy agenda of the *Ministério do Meio Ambiente e Mudança do Clima* (Brazilian Ministry for the Environment and Climate Change) which promotes REDD+ Projects as critical to meeting the country's contribution as per the United Nations Framework Convention on Climate Change (UNFCCC) and preserving natural rainforests.

2.1.12. Implementation Schedule (G1.9)

The summary schedule of activities related to the development and implementation of the Tapera project is presented in Table 11 below.

Table 11: Milestones in the project's development and implementation

Date	Milestone(s) in the project's development and implementation
2020	
23/01	Visit to IDAM and Agrofrut in Urucará to initially discuss the project idea. Given climate change impacts on the local's small producers' cultivations, an alternative for the situation felt needed. The idea of a REDD+ project in the region was welcomed and celebrated by the local farmers.
05/02	Field visits to communities that will benefit from the REDD+ project activities. Meeting with stakeholders, mapping priority demands to communities and prior presentation of the scope and activities of the project.
07/02	Visit to check the condition of access of the road and the bridge over Tapera's River. A river monitoring of the project's areas was carried out by Organica Consulting and Agrofrut.
20/02	An ATER (Technical Assistance and Rural Extension) visit and georeferencing activities of part of the road UR-04 and of Tapera group's subdivision farmers' properties were made.
18/06 to 21/06	Visits to Agrofrut as well as reforestation tests with cumaru were carried out, with the planting of 6,000 cumaru trees (*Dipteryx odorata*) in the project's communities.
23/10	Visit to the Agrofrut cooperative to plan the project's activities.
29/10	Signing contract between Organica Consulting, Agrofrut and landowner Dr. André Evaristo Marcondes César, to develop the REDD+ project Tapera Jungle, to start on 01/03/2021, with support from partner enterprises Nat'Organico, Ingrenium and local support from IDAM.
05/11	Hiring of collaborator Rodrigo Batalha, for topography , georeferencing and monitoring services of the areas to be included in the project.
16/12 to 21/12	Visit to communities to align their engagement in the project.

2021	
01/03	Start date of the project.
17/03 to 18/03	Field visit to communities engaged in the project and public stakeholder consultation.
17/03 to 20/03	Visit to Agrofrut, to monitor the installation of equipment for the sub-products project.
22/03	Visit to Agrofrut by Organica Consulting, for training on multipliers for implementing the REDD+ project, and meeting with the mayor and municipal secretaries.
25/03	Visit from Organica to monitor the construction of the warehouse for the project's future partner company, Urupolpas.
17/07 to 19/07	Georeferencing of the Tapera group subdivision, restoration of an access bridge and start of road cleanings.
22/07 to 24/07	Continuation of activities of demarcation of lots in the Tapera group in order to protect them from possible invaders who extract timber illegally.
12/08	A new visit by Organica to monitor the project of sub-products and to discuss the activities of the Tapera project. A visit to monitor the cumaru plantation project was also made.
31/08	A cooperation agreement between Agrofrut, Nat'Organico and Ingrenium was signed, for the acquisition of invaded and exposed areas. Land regularization work was initiated, together with the municipality of Urucara and the government of the state of Amazonas, so that definitive titles for new lands could be issued and registrations made with SIGEF.
19/10 to 22/10	A visit to Agrofrut took place. Support for developing new products from forest by-products was discussed and various pieces of equipment were purchased and built.
14/10 to 15/10	Meeting with political authorities to discuss the objectives and social impacts of the project to the region.
20/11	Organica Consulting visited Agrofrut to monitor the construction of a warehouse to support the by-products project, part of the REDD+ Tapera project.
23/11 to 25/11	Visit and inspection of cooperative members of Agrofrut included in the certification project of organic guarana production. Visit made to the unit of guaraná processing, to verify the application of good production practices.
07/12	Visit to follow up and monitor project's activities.
2022	
05/01	Opening of the company Urupolpas, to collaborate in the management of the Tapera project's activities.

13/01	Field visit to the project's communities and monitoring of the project's activities, in partnership with IDAM, which provides a 4x4 car for inspections of the Tapera areas, allowing regular visits to properties in the region where the project is located.
07/05	Communities visit and monitor activities in the project's areas.
30/05 to 03/06	Inventory activities.
24/08 to 27/08	New inventory activities.
13/09	Support to the Urupolpas team to resolve a conflict situation, as part of their area was being invaded.
06/12 to 14/12	Construction of a support house in the Piquiá area, access bridges and more inventory activities.
2023	
09/01 to 13/01	Visit to the communities, inventory and topography activities.
07/02	Hiring of collaborator Odielio Santos de Nascimento by Urupolpas, to carry out monitoring activities on plots, visits to communities, to manage construction and improvement of access roads, and identify and find solutions to existing conflicts.
08/02 to 14/02	Support with transport logistics for the Agrofrut cooperative team and 2 IBD Inspectors, with inspection visits in the areas of guarana from cooperative members, to verify on-site compliance with organic production specifications.
14/04 to 20/04	Visit to the communities, more inventory and topography activities, construction of one more support house in the Jatobá instance.
30/05 to 04/06	Visits to communities, carrying out road cleaning activities, building of access bridges and monitoring of the region.
08/08 to 26/08	Visit to the communities. An inventory in the Jatobá instance took place, as well as topography and surveillance activities.
27/11 to 04/12	Field visit to the communities, meeting with stakeholders and planning of the project's activities.
06/12 to 12/12	Monitoring and inventory activities.

2.1.13. Project Start Date

According to the requirements established by the VCS Standard version, "*The project start date of an AFOLU project is the date on which activities that led to the generation of GHG emission reductions or removals are implemented (eg, preparing land for seeding, planting, changing agricultural or forestry practices, rewetting, restoring hydrological functions, or implementing management or protection plans)*".

Based on the applicability of methodology VM0007 (section 3.1), which mentions that the REDD+ project for planned deforestation activity is applied where the conversion of forest area to a deforested condition must be legally permitted.

APD activities apply to a forest land area with a legal permit for its conversion to deforested land. As per the Brazilian Forest Code (Article 12, Law No. 12.651, of May 25, 2012), rural landowners in a forested area of Amazonas state must maintain 80% of native vegetation cover as a legal reserve. This provides a legal right to deforest up to 20% of a property area. Therefore, to define the start date of the APD REDD+ Project on 01/March/2021, was adopted.

2.1.14. Benefits Assessment and Crediting Period (G1.9)

The Project crediting period for APD Project activities is 30 years. The APD crediting period starting date is **1 March 2021 and the ending date is 28 February 2051,** as seen in the table below.

Table 12: Events of crediting and verification of the project

Event	Date
Start date	March 1st 2021
End date	February 28st 2051
Total length	30 years
Date of review of the baseline	March 1st 2031
Duration of the monitoring period	3 years (March 1st , 2021, to February 28st 2023)

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

The crediting period for the Tapera Project is marked by the formalisation of the land regularisation proposal, as mentioned in Section 2.1.14. After formalising the budget for the georeferencing of the land, the project begins and, consequently, the first major investments will be made.

The development of activities related to the climate, community, and biodiversity scope, along with the monitoring of parameters related to these scopes, occurs through a second major investment of the project. This investment is made by charging the first credits, which come from the first verification of the project through the VCS certification. In this way, the assessment of changes related to climate, community and biodiversity benefits starts soon after the start of the project's crediting period.

2.1.16. Estimated GHG Emission Reductions or Removals

The estimated GHG emission reductions or removals of CO_2 are presented per year in Table 13.

Table 13. Estimated GHG emission reductions or removals (tCO_2e)

Year	Estimated GHG emission reductions or removals (tCO_2e)
2021	1 048 245,62
2022	1 086 620,24
2023	1 124 994,87
2024	1 163 369,50
2025	1 201 744,13
2026	1 240 118,76
2027	1 278 493,39
2028	1 316 868,01
2029	1 355 242,64
2030	1 393 617,27
2031	1 396 492,72
2032	1 399 368,16
2033	1 402 243,61
2034	1 405 119,06
2035	1 407 994,51
2036	1 410 869,95
2037	1 413 745,40
2038	1 416 620,85
2039	1 419 496,29
2040	1 422 371,74
2041	374 126,12
2042	335 751,50
2043	297 376,87
2044	259 002,24
2045	220 627,61
2046	182 252,98
2047	143 878,36
2048	105 503,73
2049	67 129,10

Year	Estimated GHG emission reductions or removals (tCO_2e)
2050	28 754,47
Total estimated ERs	28 318 039,69
Total number of crediting years	30
Average annual ERs	943 934,65

2.1.17. Risks to the Project (G1.10)

The AFOLU Non-Permanence Risk Tool, v4.0, September 19, 2019, version 4.0, establishes the procedures for conducting non-permanence risk analysis and determining the credit buffer for projects developed under the AFOLU sectoral scope. The score achieved by the project in each of the risk categories (internal, external, and natural) is presented in Table 14. Detailed information on the evaluation of each of the risk factors in each category and subcategory can be found in Appendix 3. All data, rationales, assumptions, and justifications were provided to the validation/verification bodies.

Table 14. Summary of the Non-Permanence Risk Analysis for the Tapera project.

Category	Score
Internal Risk	0
Extern Risk	2
Natural Risk	2
Overall score	4

Other likely risks to the expected climate, community, and biodiversity benefits during the life of the project, as well as their mitigation measures, are described in Table 15.

Table 15. Potential risks to the benefits of climate, community and biodiversity and their mitigation measures.

Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Lack of engagement of the communities involved in the project activities.	Loss of forest cover and degradation of biodiversity in the project area.	Use of participatory methods, ensuring that people are included in decision-making processes.

Illegal deforestation in the project area caused by an external agent.	Deforestation within the project area.	Ground patrols and remote sensing monitoring of the project area to identify illegal deforestation as quickly as possible and take action.

2.1.18. Benefit Permanence (G1.11)

In order to maintain and enhance the climatic, social and biodiversity benefits in the scenario with the project, a set of actions organised in basic social and environmental programs will be carried out. Orgânica Consultoria and its investors have the necessary financial resources to maintain the project activities until the first verification. After that, the project's resources will come from the revenues obtained from the sale of carbon credits.

Climate

The project activities focused on climate benefits aim to decrease deforestation and, consequently, GHG emissions. To this end, systematic monitoring will be implemented in the project area, including river and land patrols as well as satellite surveillance with up-to-date images of the project area. As an exceptional benefit, the maintenance of forest cover protects the watershed network of the project area and contributes to water regulation in the watershed of the project area.

Communities

The residents of the communities included in the project will be protagonists in the process of defining the actions developed. Socio-environmental programs will be developed to reduce the impacts caused by climate change, enabling the improvement of the quality of life of the community. Structured actions will be implemented to provide water security, basic sanitation, electricity, internet access, and professional training. Continuous communication and consultation will be maintained throughout the life of the project to ensure that the activities are causing the expected positive impacts.

Biodiversity

For biodiversity activities and benefits, a fauna diagnosis and forest inventory were carried out. The areas will be monitored systematically with permanent plots to evaluate the dynamics of the vegetation and fauna survey campaigns to evaluate the conservation of biodiversity.

2.1.19. Financial Sustainability (G1.12)

Financing of the project activities is guaranteed by funds from the project proponents from the start date until the first verification. Thereafter, revenues from GHG emissions reductions will be used to

implement programs that will leverage the project's climate, community, and biodiversity benefits. Evidence of the proponents' funds will be made available to the validation and verification body. The Paratucu River, one of the main rivers in the area of the project, is known for its suitability for commercial navigation. This presents a significant environmental challenge for the surrounding regions. In a scenario without the intervention of the Tapera REDD+ Avoided Planned Deforestation project, the areas adjacent to the river would likely face considerable ecological threats. The ease of navigation on the Paratucu River could lead to increased accessibility, making these areas more vulnerable to logging activities and subsequent conversion to pasture lands. Such developments would not only result in substantial deforestation but also disrupt the delicate ecological balance, impacting biodiversity and the local climate. The Tapera REDD+ project, therefore, plays a critical role in this context. By preventing planned deforestation and promoting sustainable land use, the project is essential for maintaining the integrity of the forests along the Paratucu River. Its efforts are crucial in safeguarding these natural areas from the adverse effects of commercial exploitation, ensuring the preservation of the region's ecological health and its valuable natural resources.

2.1.20. Grouped Projects

As Tapera Grouped REDD+ Project is a grouped project, all new project activity instances of the project will adopt the same requirements for the initial instances PAIs#1-**24**, as per the VCS Standard v.4.4, the Project meets the Baseline and Additionality requirements for a grouped Project as below:

- 3.6.10. Grouped projects shall have one or more clearly defined geographic areas within which project activity instances may be developed.
- 3.6.11. Determination of baseline scenario and demonstration of additionality are based upon the initial project activity instances. The initial project activity instances are those that are included in the project description at validation and shall include all project activity instances currently implemented on the issue date of the project description.
- 3.6.12: As with non-grouped projects, grouped projects may incorporate multiple project activities. Where a grouped project includes multiple project activities, the project description shall designate which project activities may occur in each geographic area.
- 3.6.13 - The baseline scenario for a project activity shall be determined for each designated geographic area, in accordance with the methodology applied to the Project.
- 3.6.14. - The additionality of the initial project activity instances shall be demonstrated for each designated geographic area, in accordance with the methodology applied to the project.
- 3.6.15 - Where factors relevant to the determination of the baseline scenario or demonstration of additionality require assessment across a given area, the area shall be, at a minimum, the grouped project geographic area.

Eligibility Criteria for Grouped Projects (G1.14)

As a grouped project, it allows for the inclusion of new project activity instances in the coming years throughout the project's duration after the validation process. This grouped project has one clearly defined geographic area within which the initial project activity instances shall be developed but does not define a capacity limit for this project activity in terms of its total geographic area.

The incorporation of new areas, called "new instances", to the project must follow the following applicability conditions:

- The project activities described in this PD must be the same ones that will be implemented in future areas of the project.
- New instances must comply with the applicability conditions established by the VM0007 methodology.
- New instances must be located within the same sectoral scope which belongs to the reference region of the Tapera Project, within the Amazon biome.
- If, exceptionally, a new instance is located outside the Reference Region, it will be guaranteed that all premises will respect the same conditions of similarity of historical deforestation rates applied in the Reference Region to the initial instances of the project.
- Deforestation agents in future instances must act with the same conduct adopted in current instances.
- A single baseline scenario is determined for the entire designated geographic area (Reference Region), according to the VM0007 methodology, based on the initial instances of the project activity (geodetic polygons including all project instances), which are presented in this PD CCB.
- New instances must have similar characteristics to the initial instance in terms of additionality.
- New instances are subject to the same non-project community and biodiversity scenarios determined for the project.
- New instances are subject to the same stakeholder engagement processes (see section 2.3) and respect for rights to lands, territories and resources, including free, prior and informed consent (see section 2.5).
- New instances must have sufficient information to implement the proposed monitoring plans for each of the project components, i.e. climate, community and biodiversity (see sections 3.3,).

Scalability Limits for the Grouped Projects (G1.15)
Not applicable. There is no scalability limit, since it is possible to include rural properties within the geographic limits stipulated in this document and the participants meet the necessary requirements.

Risk Mitigation Approach for Grouped Projects (G1.15)
Not applicable as there are no limits to scalability.

2.2. Without-project Land Use Scenario and Additionality

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

To determine the land use scenario in the absence of the project, the tool for Demonstration and Assessment of Additionality in VCS - Agriculture, Forestry and Other Land Uses (AFOLU) - VT0001 (v3.0) was used. Based on economic and political trends and usual regional activity, three credible alternative land use scenarios were identified for the project area within this GDP (Output of VT0001 v3.0 sub-stage 1a):

SCENARIO 1: Maintenance of the forest cover of 20% of the property, where land use conversion is allowed by law: it is the maintenance of the area as it is, without any activities and conservation measures, but still being responsible for the costs of the necessary taxes to maintain ownership of the land. Although no economic activity is carried out in the pre-project scenario, the area is exposed to invasions and illegal deforestation, antecedents to livestock, a common practice in the region.

SCENARIO 2: Legal deforestation of 20% of the property (deforestation with allowances), where land use conversion is allowed by law i.e.: forest suppression for pasture (livestock).

SCENARIO 3: Illegal deforestation of over 20% of the property (deforestation without a grant), where the conversion of land use is permitted by law, that is: forest suppression for pasture (livestock) and agricultural purposes or simply for real estate speculation.

The analysis regarding deforestation agents and the probable land use scenarios in the absence of the project were carried out using the baseline scenario as a basis. Considering that the baseline scenario is similar to the conditions existing before the start of the project, this analysis is presented and detailed in section **3.1.4** - Baseline Scenario.

2.2.2. Most-Likely Scenario Justification (G2.1)

The most likely scenario observed in the Tapera project is the conversion of land use and land cover from forest to livestock areas, legally (APD). Legal deforestation of 20% of the property (deforestation allowed by the Brazilian legislation) is considered the most plausible baseline scenario

because the land is expected to be converted to non-forest land and the conversion is legally authorised and documented, following VM0007 v1.7. Furthermore, the identified deforestation agent has a history of agricultural activity on other lands owned by him for economic purposes, which makes “SCENARIO 2” realistic and credible.

2.2.3. Community and Biodiversity Additionality (G2.2)

The Tapera project has as its main objective the conservation of the native Amazon Forest in a region where the pressure for deforestation is mainly due to the activities of conversion of land use from forests to extractive activities, timber production, and pastures aimed at raising cattle. In the absence of the project, the expected scenario would be the advance of deforestation and the degradation of the area. The scenario with the presence of the Tapera project will guarantee the allocation of necessary resources for the conservation and protection of the area destined for the project, guaranteeing several benefits for the community and biodiversity in the region.

Regarding the community, we highlight the implementation of strategies aimed at improving the quality of life of residents of local communities, which would not have occurred in the absence of the project, such as the implementation of a family photovoltaic system, systems for capturing and distributing treated water, toilets with dry pits, internet access, improvement in educational, productive and health infrastructure. In addition, the communities will benefit from training and courses aimed at strengthening the production chain, with training in management diversifying the economy, adding value to the products sold, providing more job opportunities and improving the income of families, all with an inclusive awareness of socially vulnerable groups.

For biodiversity, the main benefits of the project that would not occur in its absence refer to the conservation of vegetation. The maintenance of continuous forest environments guarantees the maintenance of the gene flow of species and ecosystem services in the region, promoting the conservation of fauna and flora. Also, the project will allow for greater knowledge of the local biodiversity, encouraging scientific research in the region through the environmental monitoring planned during its life cycle.

By preserving the forest area used in extractivism and for subsistence and which presents an imminent risk of deforestation, the project tends to strengthen the ways of life of local traditional communities and their economic production.

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

The Tapera project does not intend to use any benefits to communities or biodiversity as offsets.

2.3. Stakeholder Engagement

2.3.1. Stakeholder Access to Project Documents (G3.1)

The installation of a private carbon credit project, which has the potential to generate positive impacts and socio-environmental solutions and is thus offered to the market, is associated with a detailed process of accreditation and control of variables and indicators that should measure and demonstrate its deliverables, accomplishments and concrete achievements for forest conservation and the improvement of the living conditions of the populations associated with it.

In view of the feasibility and the establishment of an efficient and assertive communication with the different stakeholders, the project will focus, over time, on the training of local multipliers, through the dissemination of knowledge and information about the project in all its phases. This will demonstrate a maturing of society itself as it takes ownership of the consequences of the presence of local and territorial commitment to the carbon credit, reversing the logic of deforestation as the only alternative.

The project information will be available in an adequate and public language for the broad knowledge of all stakeholders. The documentation will be freely accessible through meetings between the community and the project's technical staff, in written form through printed versions of the project description, monitoring report, validation and verification report, and virtual, through the VERRA and Orgânica Consultoria.

In order to establish such efficient and assertive communication channels, enhancing the capacity for positive feedback between the Tapera project, the government, the community of which it will be a part, society in general, and the market, communication will be in accordance with the following premises:

- Adopt ways and channels of communication that encourage dialogue;
- Adopt communication languages that consider the different education levels;
- Adopt means of communication that are easy to update, considering the conditions of logistical access and local infrastructure;
- Recognize and value the specificities of the local/regional culture, which will guide the proposed initiatives and activities;
- Establish directed communication, transmitting information in a guided and frequent way to specific segments of the population, according to the definitions of publics of relationship of this Plan, not prioritising only mass media and the digital media of low access due to the precarious situation of the digital infrastructure;
- Always seek to take a stance that takes into consideration the perspectives and points of view of each public relationship, seeking to facilitate, on the proponents' side, the understanding and comprehension about the territory's issues and those related to forest conservation and biodiversity as a means of generating carbon credits.

2.3.2.Dissemination of Summary Project Documents (G3.1)

The project description information will be presented to the communities involved in the form of meetings after the audits performed in the project area in order to disseminate the monitoring results and actively disseminate the information in the communities in a participatory manner. Summary information of the monitoring results will be available on the Verra and Orgânica Consultoria.

2.3.3.Informational Meetings with Stakeholders (G3.1)

As mentioned in section 2.1.9 (Identification of Stakeholders) spanning three communities in Urucará —Marajazinho, Boa Esperança, and São João—comprising a total of 168 residents, the field team embarked on several journeys between 2019 and 2023 to engage with the local population. This included discussions with groups living along the Tapera River, consisting of 20 extractivists, as well as a distinct group of 10 property owners residing along the Urucará to São Sebastião road. Additionally, the project encompasses Nova Jerusalém, a community along the Maripá River, with 17 families (84 inhabitants), and one community in Nhamundá — Apeua— along the Paratucu River, totaling 310 people.

Applying an approach tailored for traditional extractivists, the team conveyed the project's goals, objectives, and the anticipated benefits to the region in easily understandable language. The engagement activities involved individual interviews with riverside families and a dedicated meeting with a community group.

Given the geographical challenges and transportation difficulties faced by the families, individual public consultations were conducted instead of collective ones. This decision also took into account the safety of the interviewees, ensuring that ideas could be expressed without the influence of leaders with financial sway over the community. Following each conversation, families were asked for their support, and all 30 interviewed people expressed their approval, which was duly documented through signed statements.

Meetings with Agrofrut guaraná producers were held at the cooperative, known for guaraná influence within the communities of Marajazinho, Boa Esperança and São João. All producers approved the project

Following thorough clarification of demands , unanimous acceptance of the project was achieved, marking the completion of the Free, Prior, and Informed Consultation, with due respect to the rights of all participants.

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

During meetings held with riverside communities and extractivists in the project region, information on costs, risks and benefits was collected, making use of the methodologies of the Rapid Participatory Diagnosis. The diagnosis aimed to analyse the level of understanding and the current situation in which they find themselves in order to better understand the implementation process of this project. During the

meetings, the concepts of costs, risks and benefits were transmitted to the community, which was encouraged to raise the possible impacts generated by the implementation of the carbon credit project. The consultation was carried out by specialist professionals, who communicated in a way that everyone present could understand. Thus, from the participatory dialogue, the technical staff and the community listed the following issues:

Costs:

- Negotiate and recognize the land borders of possessions and properties;
- Have free time to participate in formal and informal meetings, giving up the application in productive, spiritual or leisure time.

Risks:

- Be threatened by invaders (external agents), when they take a position to protect the project's forest fragments;
- Suffer internal reprisals by leaders opposed to the project due to the interest in developing their livestock activity.

Benefits:

- Improvement of home infrastructure with the implementation of a family photovoltaic system, systems for capturing and distributing treated water, bathrooms with dry pits and internet access;
- Improvement of educational, productive and health infrastructure;
- Financial resource from the Forest Guardians Program;
- New learning that adds value to the products sold and generates new income alternatives, providing more job opportunities and improving families' incomes;
- Strengthening of associations and community management capacity;
- Strengthening the inclusion of socially vulnerable groups in productive activities.

During the community consultations, information about the benefits of the project was provided to community members. No financial costs will be passed on to the communities, as all project activities will be borne by the project proponents. Activities are planned to improve quality of life and have a positive impact. Furthermore, the project will not bring direct or indirect risks to the communities.

An annual monitoring plan will be implemented to quantify and document changes in social and economic well-being resulting from project activities.

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

To inform stakeholders about the validation and verification process, meetings were held with communities to present the project, with the application of questionnaires with directed questions that result

in indicators to assess the impact of the project on people's quality of life. The participants were informed about the entire process of origination of carbon credits, validation and registration, while it was pointed out that an external auditor (validation and verification body) will visit the project area, interact with stakeholders, evaluate project information and activities, and issue evaluation reports.

Annual communication campaigns are the most explicit way to share content comprehensively and are able to mobilise both internal and external audiences on a large scale, and will be carried out before the new verifications. Other institutional stakeholders were communicated about the project by email, where informative material about the it was made available.

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

The date of the auditor's site visit will be communicated in advance to allow stakeholders to plan ahead and be available during the project site visit. Open access by communities and institutional stakeholders to the validation and verification body auditor will be provided.

The proponent will be responsible for all necessary expenses with transportation, food and accommodation to ensure compliance with the audit plan.

2.3.7. Stakeholder Consultations (G3.4)

The project, detailed in section 2.1.9 on the identification of stakeholders, targeted three communities—Marajazinho, Boa Esperança, and São João— in Urucará, totaling 168 residents. The field team conducted multiple engagements between 2019 and 2023, reaching out to various groups, such as 20 extractivists along the Tapera River, 10 property owners along the Urucará to São Sebastião road, and 84 inhabitants in Nova Jerusalém along the Maripá River. Additionally, one community in Nhamunda—Apeua—comprising 310 people along the Paratucu River, were also part of the project's outreach. The team employed a tailored approach for traditional extractivists, conducting individual interviews with riverside families and holding a dedicated meeting with a community group to convey the project's goals and anticipated benefits.

To address the geographical challenges and transportation difficulties faced by families, individual public consultations were prioritised over collective ones. This approach aimed to ensure the safety of interviewees and eliminate potential influence from leaders with financial sway over the community. After each conversation, families were asked for their support, resulting in unanimous approval from all 30 interviewed individuals, documented through signed statements. Meetings with Agrofrut guaraná producers, known for their influence in the communities, took place at the cooperative. All producers endorsed the project, and after thorough clarification of demands, the Free, Prior, and Informed Consultation process concluded with unanimous acceptance, respecting the rights of all participants involved.

2.3.8.Continued Consultation and Adaptive Management (G3.4)

The project has a permanent channel of communication and consultation between project proponents and communities and other stakeholders. Communication happens instantly via email. Prior to each verification, communities and other stakeholders will be contacted and consulted for updates on project activities and results.

The following are considered success factors in the communication of this project:

- **Strategic Factor:** it must provide the exchange of knowledge and essential information for achieving and maintaining carbon accreditation, strategically, in accordance with the guidelines and standards of the control bodies;
- **Integration Factor:** encouraging constant dialogue creates an environment of trust favourable to stable and lasting relationships, through the exchange of experiences and knowledge with the main stakeholders in order to support all lessons learned and corrections in the course of the project, when necessary;
- **Motivation and Satisfaction Factor:** when the proponent's direct and indirect employees have access to information and opportunities to present their opinions with freedom of internal and external participation, raising the levels of co-responsibility among the stakeholders for the best performance of the project.

Establishing the guidelines so that communication and inter-institutional and informal relationships take place in a profitable way, both for the project and for society, is important since communication will be the access route for sharing the knowledge produced. Knowledge is shared based on this experience of contact, promoting structured dialogue between Orgânica Consultoria and extractive riverside communities that, despite not residing in the project area, use the project area for their subsistence.

The activities proposed by the project can be redirected as the results are being evaluated, according to the dynamics of the perception of the stakeholders on the impact of the actions developed.

2.3.9.Stakeholder Consultation Channels (G3.5)

Consultations are held directly with communities, institutions or their legitimate representatives in face-to-face meetings. The project summary was presented by the email address tapera@organica-consulting.com establishing a communication channel open to dialogue.

The project activities were built in a collective and participatory way during workshops and meetings between the technical team and communities. Through the methodological approaches of DRP and MVS, the local needs and specificities of each community were raised in order to shape community aspects of the project.

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

The project values activities that favour meaningful learning for all parties involved, especially those that help employees, project representatives, to make assertive decisions and the communities involved to participate effectively. It is expected that society will be positively impacted, get to know the project well and have the opportunity to express their opinions.

The public meeting and its ritual is the legal and normative tool of this collective participation for communities to decide on their willingness to get involved, at what level this will take place and what are the expectations in terms of benefits. From the mapping of stakeholders, contacts made, people records and questionnaires applied, a specific mobilisation was carried out through telephone contact with the community, in order to participate in the public hearing, in which the current status of the project was presented. For the hearings, there was also mobilisation via a personal invitation through the visit of technicians from Organiza Consultoria in the homes of communities participating in the project.

The articulation of the public hearing provided the presence of harvesters from the streams. In addition, the technical team of Organica Consultoria carried out individual consultations in the project areas, due to the difficulty of mobilisation on- site and possible harassment to be suffered by livestock leaders in the region. In the meetings, the communities were informed about the project and its current stage of development. The possible impacts of the project were also addressed in a participatory manner. Such results were used for the elaboration and consolidation of the socio-environmental programs that will be developed by the project.

2.3.11. Anti-Discrimination Assurance (G3.7)

The fundamental principles that form the basis of our code of ethics and the ESG policy of the proponent company Organica Consulting and the companies and groups involved in this project are shared and common to all of them. The document that governs the fundamental guidelines of this policy and code of ethics has the following main elements: The International Covenant on Human Rights consisting of the Universal Declaration of Human Rights; the International Covenant on Civil and Political Rights and the International Covenant on Economic, Social and Cultural Rights and the International Labor Organisation's fundamental conventions on Rights at Work; Respecting the environment; Acting ethically; Repudiating any form of harassment; Respecting diversity; Promoting the right to freedom; Condemning aggressive or embarrassing attitudes; Repudiate prejudiced or discriminatory behaviour in relation to race, colour, origin, gender, personal aesthetics, physical conditions, nationality, sex, age, marital status, sexual orientation, social position religion and other acts that undermine people's dignity; Valuing the employment of women in institutional staff.

We have a criterion and policy that all contracts signed provide for compliance with ESG policies and respect for human rights, including service providers, suppliers, partner producers and employees, partner producers and employees.

All the technical and managerial staff involved in the project signed this commitment when they were hired and must follow these policies and guidelines, conducting activities in accordance with them, under penalty of dismissal in the event of non-compliance.

With regard to the rural family farmers registered in the project, the commitment arising from their consent by signing the contract or term of commitment at the time of joining the project includes the commitment not to practice discriminatory measures, speeches or actions of any nature: race, color, culture, sexual orientation, physical or mental disability, and not to carry out any practice of harassment or moral and sexual abuse.

Communities are advised to communicate or report unethical and/or illegal conduct, abusive and/or racist behaviour that may generate or cause humiliation. The means for this is the Tapera Jungle communication channel (https://canaltaperajungle.com/).

Through its code of conduct and ESG policy, Organica Consulting aims to work with these principles of integrity, transparency and respect for people, and therefore requires all those who are part of this project to comply with these principles, and may face sanctions or be dismissed from the project if one of these values is not complied with.

2.3.12. Feedback and Grievance Redress Procedure (G3.8)

It is expected that this communication channel will be a mechanism to ensure that the project proponent and all other entities involved in project design and implementation are not involved in or complicit in any form of discrimination or harassment with respect to the project. All complaints will be available to stakeholders and auditors.

The process for receiving, hearing, responding to and attempting to resolve grievances will be performed within a reasonable time period by the Administrative sector of Organica Consulting. This Grievance Redress Procedure has three stages (VCS Standard; item 3.17.18):

1) The project proponent shall attempt to amicably resolve all grievances and provide a written response to the grievances in a manner that is culturally appropriate;
2) Any grievances that are not resolved by amicable negotiations shall be referred to mediation by a neutral third party;

3) Any grievances that are not resolved through mediation shall be referred either to a) arbitration, to the extent allowed by the laws of the relevant jurisdiction or b) competent courts in the relevant jurisdiction, without prejudice to a party's ability to submit the grievance to a competent supranational adjudicatory body, if any (the time to accomplish this stage depends on local jurisdiction delays).

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

The manifestations presented by the communities will be carried out by email or through the complaint channel (reporting channel) with the completion of a digital form. Manifestations will be forwarded for discussion and feedback, under the responsibility of the Organica Consulting. The history of the manifestations will be stored in a database suitable for internal consultation whenever necessary, which will allow the production of knowledge about the main issues raised by the stakeholders, as well as the traceability of the internal conduct of these processes.

2.3.14. Worker Training (G3.9)

The sustainability of extractivism, particularly concerning non-timber products, relies heavily on preserving the surrounding forests. Sustainable management involves extractivists exploring the flora in a manner that sustains the forest, enabling the continuation of traditional activities related to forest products. To ensure the project's longevity and enhance the quality of life in local communities, it is essential to invest in training and reinforcing technical skills while simultaneously valuing traditional knowledge. The Tapera project aims to integrate social technologies into communities and disseminate knowledge generated within these communities. With the application of technical training, the project seeks to fortify the productive chain of extractive activities and provide institutional support to local associations.

For a detailed overview of the proposed technical training and its alignment with the project's goals, please refer to the Activities and Theory of Change table in Appendix 2. The following provides a brief summary of the activities elaborated in the communities engaged in the project.

- Training about Drying Mechanization in Agricultural Production
- Training about Fair Trade Practices
- Training about Agroindustry - Hygiene and Quality
- Training about Practices for Organic Certification
- Training about Irrigation and Solar Energy
- Training for the Use of Agroindustry Machinery
- Training for the Implementation of New Crops
- Training for Machinery Operation - Fruit Processing

- Training for Machinery Operation - Oil Extraction

Figures 41.a.41.b. Training at Agrofrut





2.3.15. Community Employment Opportunities (G3.10)

The project implementation brings new job opportunities for residents of the communities of the regions where the project takes place. The job opportunities will take gender equality as a guideline for the hirings, managing to find an equal balance of opportunities for women and men. It explicitly rejects the consideration of criteria such as race, gender, sexual orientation, colour, religion, age, ethnicity, physical or mental disability, or social class for hiring processes. Concerning the job positions, it will encompass a diverse range of professional areas, such as management, forest engineering and topography.

As a way to encourage professional qualification and promote an improvement in family income and dissemination of knowledge in the region, the Tapera project intends to carry out training for community members.

The hiring contracts will be made by Organica Consulting, but other job opportunities can be effectuated by other partner entities as well, such as Urupolpas and Agrofrut. So far, the elaboration of the Tapera project has resulted in the hiring of three professionals, for the areas of Gis Expertise, Monitoring and Topography. Three more vacancies are in the recruitment process, for the positions of Environmental Engineer, Forestry Engineer and Forestry Technician, to assist in tasks such as technical analysis, field visits, monitoring and inventory activities.

2.3.16. Relevant Laws and Regulations Related to Workers´ Rights (G3.11)

Employees of the Tapera project will be guaranteed employment in accordance with Brazilian labour legislation. In addition, the international agreements ratified by Brazil and issues related to the well-being and safety of workers will be respected. Hired employees will receive training and qualifications on

procedures and technical qualification, promotion of qualification, and safety at work. In addition, hired employees are advised to join the respective unions in the work area responsible for their rights.

The laws and regulations governing the protection of labour law in Brazil are listed below:

- Decree Law No. 5.452, of May 1, 1943;
- Law No. 6,514, of December 22, 1977;
- Convention OIT 012 – Compensation for accidents at work (agriculture);
- Convention OIT 026 – Methods for setting minimum wages;
- Convention OIT 029 – Forced or compulsory labour;
- Convention OIT 042 – On Compensation for Occupational Illnesses;
- Convention OIT 095 – Wage Protection;
- Convention OIT 098 - Application of the principles of organisation and collective bargaining right;
- Convention OIT 099 – Methods for setting the minimum wage in agriculture;
- Convention OIT 100 – Equal remuneration for male and female workers for work of equal value;
- Convention OIT 103 – Maternity Support;
- Convention OIT 105 – Abolition of Forced Labor;
- Convention OIT 106 – Weekly rest in commerce and offices;
- Convention OIT 111 – Discrimination in respect of employment and occupation;
- Convention OIT 113 – Medical examination of fishermen;
- Convention OIT 119 – Protection of machinery;
- Convention OIT 125 – Fishermen's Capability Certificates;
- Convention OIT 127 – Regarding the maximum weight of loads that can be carried by a single
- worker;
- Convention OIT 131 – Fixing of minimum wages;
- Convention OIT 132 – Paid annual leave;
- Convention OIT 135 – Protection of Workers' Representatives;
- Convention OIT 138 – Minimum Age for Admission to Employment;
- Convention OIT 140 – Paid study leave;
- Convention OIT 141 – Organisation of rural workers;
- Convention OIT 144 – Tripartite consultations to promote the application of international labor standards;
- Convention OIT 154 – Incentive to Collective Bargaining;
- Convention OIT 155 – On the safety and health of workers and the working environment;

- Convention OIT 159 – Vocational Rehabilitation and Employment of Disabled Persons;
- Convention OIT 160 – Labor Statistics;
- Convention OIT 161 – On Occupational Health Services;
- Convention OIT 167 – Safety and health in construction;
- Convention OIT 168 – Promotion of employment and protection against unemployment;
- Convention OIT 169 – Indigenous and tribal peoples;
- Convention OIT 182 – Worst forms of child labour;
- Convention OIT 011 - Agricultural Workers' Rights of Association and Union;
- Convention OIT 019 – Equal Treatment of Foreign and National Workers with regard to Compensation for Accidents at Work;
- Convention OIT 080 – Revision of the Final Articles and Constitution of the International Labor Organisation;
- Convention OIT 088 – Organisation of the Employment Service;
- Convention OIT 097 – Migrant Workers;
- Convention OIT 116 – Revision of the final articles and constitution of the OIT;
- Convention OIT 117 – Objectives and Basic Rules of Social Policy;
- Convention OIT 118 – Equal treatment of nationals and nationals in matters of social security;
- Convention OIT 122 – Employment Policy.

2.3.17. Occupational Safety Assessment (G3.12)

To promote occupational safety among employees, the Tapera project will follow all official norms instituted by the federal and state governments. In addition to respecting the labour legislation and the conventions of the International Labor Organisation, the project intends to be guided by the following measures to maintain the occupational safety of its employees:

- Map the risks of the work environment and make all employees aware of it;
- Conduct regular training to ensure that project employees have a safe working environment;
- Training must address the dangers of the work environment such as venomous animals and insects;
- Standardise processes to more quickly and accurately identify errors and what should be done to resolve them;

- The use of Personal Protective Equipment (PPEs) is essential to protect employees from any danger to their health. Mandatory use of PPE (helmets, boots, leggings, ear plugs, gloves, among others) when necessary;
- Record the accidents that have occurred so that it is known which failures cannot happen again;
- Promote a culture of safety among employees of the Tapera project.

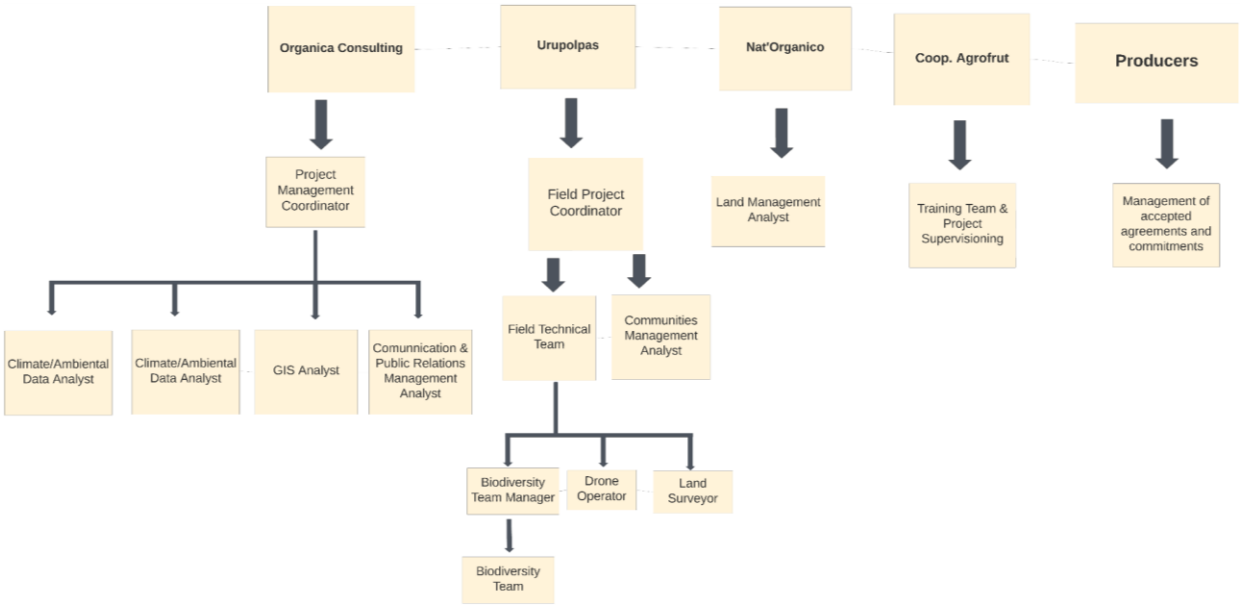
2.4. Management Capacity

2.4.1. Project Governance Structures (G4.1)

The project is managed by the proponent Organica Consulting, under the direction of Rémi Denecheau, who conducts the overall coordination of the project. Among his responsibilities and with the support of his technical team, his main activities are coordinating and carrying out data management, marketing carbon credits and drafting the project's design, implementation and monitoring document (DPA).

The main players involved in the project are: Organica Consulting, Urupolpas, Nat'Organico, Agrofrut and rural family farmers. The structure presented below sufficiently demonstrates the applicant's management capacity in terms of human resources for the implementation, development, and monitoring of the project (Figure 42).

Figure 42. Management structure



The responsibilities of each team part of the Carbon Project are described below:

Organica Consulting

The company proposing the project, located in Fortaleza-Brazil, has experience in providing services to companies all over the world, especially in Europe (mainly France, Belgium, Germany and Portugal). Structured with a qualified, diverse and multilingual team, capable of communicating with businesspeople from different cultures and from different business areas, Organica provides multiple services and is able to find solutions to a wide range of requests from its clients on a global scale.

It has solid experience in developing environmental projects, such as REDD+ projects, and in providing services for forest management. The company is able to provide activities such as forest inventories, while applying innovative technologies for topography using drones and GNSS equipment.

Organica Consulting actively participates in the design, construction and development of the project, acting in all phases of implementation, follow-up and monitoring, and is responsible for selling the carbon credits related to the emission reductions achieved through the project.

The team is made up of a management team, mainly responsible for project management, stakeholder management and stakeholder involvement, as well as the marketing of carbon credits.

Lastly, it also has a technical team responsible for analysing the data collected, be it forest typing, geospatial data for cartographic purposes, forest inventories and biomass, as well as applying the methodology for quantifying carbon credits, analysing inventories to quantify GHG emission reductions and removals.

Urupolpas

A company located in the town of Urucará, 350 kilometres from Manaus, which specialises in forest management as one of its main activities; it has projects to protect existing forest ecosystems by generating carbon credits and collecting and selling natural forest by-products. It works together with producer associations and cooperatives to map their properties and protect the existing forest, giving financial value to forest conservation.

It has a technical field team to manage the communities and collect technical data on forestry and biodiversity. The company works in the areas of land management, accelerating new land deals, structuring and developing sustainable production chains, payments for environmental services, public policies and sustainable rural production. Responsible for financing the stages (prior and execution) of the project.

Urupolpas is responsible for providing infrastructure, vehicles and implements, supplying resources and paying benefit sharing to family farmers within the scope of the project. It is also responsible for surveying georeferencing data in the field, using geodesic GNSS equipment (Leica GG04, Trimble G7+, Drone RTK), responsible for the Socioeconomic Survey, project boundaries, as well as surveying forest inventories.

Figure 43. Urupolpas aerial view



Nat'Organico

Company located in Fortaleza-CE, with extensive experience in environmental sustainability projects and organic agricultural production projects. It works directly with the purchase and sale of natural plant products of organic and sustainable quality.

Its technical team includes specialists in administrative management, sustainability, agronomy and export and import processes. It is also responsible for monitoring, land planning, legal regularisation of forest areas and providing financial resources.

Agrofrut

A cooperative of rural producers with a history of success and sustainable organisation located in Urucará-Amazonas. Throughout its experience, the cooperative has contributed to the social organisation of the region, with economic, social, and sustainable development, through training, collaboration for technical improvements and sustainable management with rural producers.

Agrofrut is also responsible for monitoring the communities, following up on training and sharing information about the communities benefiting from the project among the stakeholders.

Figures 44.a.44.b. Monitoring activities




Family farmers

Family farmers represent the group of individuals with a family farmer profile who own properties in which the area of the property makes up the project area. They share responsibility for conserving the area of native forest on their properties, managing the agroforestry systems implemented in the project and complying with the rules agreed in the project contract.

Table 16. Activities and responsibilities of the companies involved in the project.

Proponent & Project Manager	Technical Field Team	Land Planning Team	Communication Team	Producers
Orgânica Consulting	Urupolpas	Nat'Orgânico	Agrofrut	Farmers
- Proposing company; - Responsible for selling carbon credits; - Responsible for the overall management of the project, in terms of: Planning, Risk Identification and Management, Resource Allocation, Cost Management, Stakeholder Involvement. - Responsible for the methodology and analysis of biomass data through inventories to quantify GHG emission reductions and removals.	- Company responsible for collecting technical data on forest inventories and biodiversity. - Responsible for providing financial resources for the project	- Company responsible for monitoring and planning land and legal regularisation of forest areas. - Responsible for providing financial resources for the project.	- Responsible for monitoring beneficiary communities in the region and following up on training and contact points, as well as providing information to all the communities benefiting from the project.	- The group is responsible for conserving the native forest on their properties, managing the agroforestry systems implemented in the project and complying with the rules agreed in the project contract.

2.4.2.Required Technical Skills (G4.2)

In order to implement the Tapera project, knowledge on development and management of projects related to the conservation of the Amazon biome is required. In addition, carbon measurement and monitoring expertise, development of activities in conjunction with the community and monitoring and evaluation of biodiversity are needed.

The project proponents have the necessary technical skills for its implementation. Section 2.4.3 demonstrates the competencies of the specialised team of Orgânica Consultoria allocated in the project.

2.4.3.Management Team Experience (G4.2)

The management team is composed of qualified professionals (Table 17) who have the necessary technical skills for the implementation and execution of the project.

Table 17. Members of Organica Consultoria who part of the Tapera project management team are, their respective positions and qualifications.

Name	Position and Role in the Project	Technical Qualification and Professional Experience
Davidson do Canto Marques	Forest Engineer	Forest Engineer with extensive experience in sustainable land management, forestry projects, and environmental compliance. Proficient in utilising advanced technologies for data analysis and GIS. Skilled in community engagement, project management, and environmental impact assessments.
Hector Monteiro	Topographer Drone Operator	Experienced Topographer and Drone Operator proficient in geospatial surveying, terrain analysis, and precise measurements. Skilled in utilising advanced drone technology and Geographic Information Systems (GIS) for accurate mapping. Strong project management capabilities and a commitment to maintaining high surveying standards.
Katherine Oliveira	Training for quality in rural properties for community members	Experienced professional in rural property quality training for communities, specialising in sustainable agriculture and rural development. Skilled in designing and implementing effective training programs tailored to community needs. Proven track record in fostering collaborative relationships, delivering workshops, and promoting environmentally conscious agricultural practices

Hendrew Nunes de Souza	Biologist	Biology professional with expertise in ecological principles, biodiversity conservation, and field research. Skilled in laboratory work, data analysis, and statistical methods. Proven experience in environmental monitoring, habitat restoration, and wildlife conservation.
Selma Xavier de Oliveira	Biodiversity manager	Graduating in Geography has a solid foundation in Geography. In addition, specialising in environmental projects linked to biodiversity inventories .
Douglas Martins	GIS Analyst	Bachelor's degree in Geography (2019) and Master's degree in Geography from the Federal University of Rio de Janeiro (UFRJ), in the area of Environmental Planning and Management. Experience in projects to identify and monitor areas of illegal deforestation in the Atlantic Forest and the recovery of APPs and water recharge areas in the Doce River Basin. Mastery and experience in Remote Sensing and Geoprocessing techniques using ArcGIS Pro, QGIS, Metashape and Pix4DMapper software. Experience in building thematic maps of large areas and characterising the physical landscape: hydrography, paedology, geomorphology, Land Use/Land Cover. 6 years' experience as a researcher in remote sensing applied to environmental studies.
Odiélio Nascimento	Climate/Ambiental Data Analyst	Experienced farmer with technical proficiency in Information Technology from CETAM AM, coupled with a solid foundation in Cooperative Management from UNIHORIZONTES-MG
Lucas Abreu	Communication and Public Relations Management Analyst	Public policy manager with experience in communication, marketing, research and public policy evaluation
Rémi Denecheau	Project General Coordinator	Experienced Project Coordinator with a Business Management degree, skilled in overseeing end-to-end project lifecycles. Proven expertise in strategic planning, resource allocation, and efficient execution. Adept at financial management and stakeholder engagement, with a commitment to achieving project excellence.
Sandro Martins	Fundiary regularisation	ExperiencedFundiary Project Coordinator with a

	manager	Business Management background, adept at orchestrating successful field operations. Proven leadership in strategic planning, resource allocation, and problem-solving. Skilled in fundiary regularisation.
Daniel VALE	Finance and Administrative Analyst	Business Management bachelor, with large experience with finances, commercial and administration management.
Adriana Garcez	Project Management Analyst	Project Management Analyst with a Business Management background, skilled in planning, budgeting, and successful project delivery. Proven expertise in implementing methodologies, fostering collaboration, and mitigating risks. Adept at utilising project management tools and focused on continuous improvement
Regiane Dias	Land Management Analyst	Land Administration professional with a Business Management background and experience in land governance, compliance, and administration. Skilled in managing land records, resolving disputes, and optimising land resource utilisation. Proven expertise in coordinating with stakeholders, implementing efficient land tenure systems, and ensuring transparent and ethical practices
Marcio Freitas	Agronomic and Certification Technician	Senior Agronomic and Certification professional with extensive experience in organic, fair trade, FSC certifications, local field manager based in Amazonia (Rondônia) responsible for certification training and obtaining registered labels.

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

Urupolpas, CR Agropecuária and Terra Certa da Amazônia collaborate on the project with the preparation and execution of the forest inventory and fauna diagnosis.

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

Orgânica Consultoria is a private company, an Individual Limited Liability company (EIRELI), which has been operating since 2017 offering services to worldwide companies, especially in Europe (mainly France, Belgium, Germany, Portugal).

Conceived as support for a group of companies focused on the export and transformation of organic products, Organica Consulting has developed and expanded its activities, working today with operations such as forest management projects, marketing, quality management, administration and more.

The contribution of incentive values by client companies - Botanik Source, in exchange for a percentage share in the carbon credits generated, is foreseen as a fundraising measure through a contract. Other clients have already expressed interest in making additional contributions, given the credibility and positive viability of both Organica and the proposed project. Its capital is composed by the sale of finances, marketing and quality control services for a group of 14 companies, in 7 countries.

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

Organica Consulting, guided by robust principles of integrity and corporate ethics, reaffirms its unwavering commitment to preventing corruption and other unethical behaviours in all its operations. We acknowledge the critical importance of maintaining high standards of ethical conduct, not only as a corporate responsibility but also as a moral imperative.

The company adopts and promotes rigorous ethical and legal guidelines across all spheres of its operations. Our employees, partners, and suppliers are instructed to act in compliance with all applicable laws and ethical standards established in the locations where the company operates. We emphasise that non-compliance with these guidelines will not be tolerated and will subject those responsible to disciplinary and legal measures, depending on the severity of the violation.

The company conducts continuous monitoring of its ethical practices and policies, seeking opportunities for improvement and adjustment.

Organica Consulting reiterates its unwavering commitment to promoting an ethical, transparent, and corruption-free business environment. By adopting and implementing these practices, we reinforce our mission to provide innovative and reliable solutions while building lasting relationships based on trust and honesty.

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

Some documents are considered commercially sensitive, for this reason, they are confidential and cannot be published by the project proponents. These documents can be accessed by the third party audit team during the validation process, however they were not included in the public version. Below is a list of commercially sensitive documents:

- Contract between the bidders;
- Documents referring to property rights;

- Registers of community residents;
- Documents proving financial health:
    - Financial statement;
    - Bank statements;
    - Management financial statements.

2.5. Legal Status and Property Rights

2.5.1. Statutory and Customary Property Rights (G5.1)

The project area includes the private properties of Urupolpas, Odiélio, Agrofrut and Nat´Organico and Gerliane, which hold all ownership, access and use rights. The project area comprises the rural properties called **Piquiá, Ipê, Jatobá, Louro Gamela, Itaúba, Louro, Pau Rosa, Curupira, Angelin, Andiroba, Breu, Fazenda Roberto, Fazenda Andre, Fazenda Antônio Roberto, Fazenda Vô Luiz Geraldo, Fazenda Evaristo, Fazenda Rodriguez, Fazenda Ricardo Ferreira 2, Reserva Bacurau, Imóvel Bacurau 2, Fazenda Mendonça, André Marcondes II, Reserva Reis Lemos, Fazenda Gabi & André Marcondes and Fazenda Andre Marcondes III .** The Piquiá, Ipê and Jatobá were the first in the Tapera Project to be inserted whose property belongs to Urupolpas. They are located in the southeastern part of the Urucará municipality, approximately twenty kilometres away, in a straight line from the urban centre of Urucará. Its limits are connected in a west-east direction between them while the northern limit is Igarapé Uaçu, and on the southern limit, there is the São Sebastião-Urucará Road, which is the main access route to these properties. The Piquiá property is located between longitudes 57°51.568'W and 57°49.993'W and latitudes 2°23.061'S and 2°21.519'S and has an area of 500.72Ha.

The **Ipê property** is located at coordinates 57°50.398'W and 57°48.902'W; 2°23.027'S and 2°21.586'S with a total area of 470.65Ha.

The **Jatobá property** is located at coordinates 57°49.221'W and 57°47.461'W; 2°22.684'S and 2°20.744'S. Areas destined for Avoided Planned Deforestation (APD) will be 97.76Ha, 88.08 Ha, and 92.58 Ha respectively.

The **Louro Gamela property** belongs to producer Odiélio Nascimento. Like Piquiá, Ipê, and Jatobá, your location is in the southeastern part of the municipality of Urucará, approximately twenty-two kilometers in a straight line from the urban center of Urucará. Its northern limit connects with the Itaúba property, which is also part of the Tapera Project. Its access route consists partly of the São Sebastião – Urucará Road and partly by land. It is located between longitudes 57°46.940'W and 57°44.869'W; 2°21.338'S and 2°20.044'S, has a total area of 423.50Ha, of which 79.08Ha destined for Avoided Planned Deforestation (APD).

The **Itaúba property**, owned by Urupolpas, is the first of the large areas of the Tapera Project. Your location in the municipality of Urucará, with its northern limit coinciding with the Louro property and

the Nhamundá municipality and its southern limit with the Louro Gamela property. The relevant access route to Itaúba is via the Tapera River. It has a total area of 11740.25 Ha, of which 2309.18 Ha were allocated to avoid planned Deforestation (APD). Its location has the following coordinates: 57°49.032'W and 57°42.401'W; 2°20.424'S and 2°10.230'S.

The **Louro property** is the first largest area located in the central region of the municipality of Nhamundá. Belonging to Urupolpas, the southern limit is the Louro Area, bordering the Curupira Area to the west, the Andiroba Area to the north, and the Pau Rosa Area to the northeast. It has an area of 27870.72Ha and the area of Avoided Planned Deforestation is 5468.18Ha. The location of the property is the following coordinates: 57°47.620'W and 57°35.848;2°13.656'S, 2°00.687'S.

The **Pau Rosa property** is the second largest area located in the central region of the municipality of Nhamunda and also belongs to Urupolpas. The main access route to the area is through the Paracatu River, which crosses the area in an east-west direction. It has a total area of 50412.11 Ha and is highlighted as an Avoided Planned Deforestation area of 9856.71 Ha. Its limits are the Louro area to the southwest, the Andiroba area to the west, and the Breu area on the north-northeast limits. The property's geographic coordinates are 57°39.558'W and 57°22.236'W; 2°08.761'S and 1°52.797'S.

The **Curupira property** is the third large area located in the central region of the municipality of Nhamunda. This property belongs to Cooperativa Agrofrut. The main access route to the area is through the Paracatu River, which crosses the area in an east-west direction. It has a total area of 52924.29Ha and is highlighted as an area of Planned Avoided Deforestation of 10346.15Ha. Its limits are the Angelin area to the west and the Andiroba and Louro area to the east. The property's geographic coordinates are 57°55.800'W and 57°39.456'W; 2°09.944'S and 1°47.845'S.

The **Angelin property** is the first large area located in the central region of the municipality of Nhamunda belongs to Nat'Organico. The main access route to the area is through the Paracatu River, which crosses the area in an east-west direction. It has a total area of 35158.74 Ha and is highlighted as an Avoided Planned Deforestation area of 6844.15Ha. Its limits are the Curupira area to the east. The property's geographic coordinates are 57°59.886'W and 57°48.901'W; 2°02.298'S and 1°44.062'S.

The **Andiroba property** is the second largest area located in the central region of the municipality of Nhamunda and belongs to Nat'Orgânico. The main access route to the area is through the Paracatu River, which crosses the area in an east-west direction. It has a total area of 14,396.02 ha and is highlighted as an Avoided Planned Deforestation area of 2,803.62 ha. Its limits are the Curupira area to the west, the Pau Rosa area to the east, and the Louro area to the south. The property's geographic coordinates are 57°43.742'W and 57°34.866'W; 2°02.114'S and 1°52.797'S.

The **Breu property** is a large area located in the central region of the municipality of Nhamunda and belongs to Gerliane da Paz. It has a total area of 46400.81Ha and is highlighted as an Avoided Planned Deforestation area of 9057.94Ha. Its limits are the Pau Rosa area to the south-southwest. The property's geographic coordinates are 57°32.416'W and 57°12.038'W; 1°56.075'S and 1°43.629'S.

The **Fazenda Roberto property** is located in the municipality of Nhamundá and belongs to Roberto Camargo Quevedo It has a total area of 227,4598 ha and is highlighted as an Avoided Planned Deforestation area of 44,44 ha. The longitudes range from -57°12'18.652" to -57°14'09.024". This narrow range indicates that the property is more elongated along the north-south axis and the latitudes vary from -2°14'28.399" to -2°14'53.719", which is a relatively small variation, hinting that the property is not extensively spread out from east to west.

The **Fazenda André property** covers a substantial area of 10,006.8724 hectares, locate by latitudinal coordinates range from -2°15'04.147" to -2°20'54.716", suggesting a north-to-south spread and coordinates extend from -57°12'18.941" to -57°18'37.367", in Nhamundá municipality. The area's location and size necessitate consideration of environmental impacts, such as biodiversity conservation, sustainable land management, and ecological balance.

The **Fazenda Antônio Roberto property** is located in the municipality of Nhamundá, encompassing 402.2835 hectares, is a significant landholding marked by four distinct geographical coordinates (M-0047, M-0034, M-0035, M-0048). The coordinates suggest a property spanning a compact area, longitudinally ranging from -57°12'18.653" to -57°14'08.529", and latitudinally from -2°13'46.832" to -2°14'30.413".

The **Fazenda Evaristo property** is located in the municipality of Nhamundá, spanning 408.4966 hectares, is characterised by its geographical coordinates, the property's longitudinal range extends from -57°12'18.653" to -57°14'09.598", and its latitudinal range is between -2°13'04.433" and -2°13'51.718". This positioning suggests a property with a fairly linear spread, likely elongated in the north-south direction.

The **Fazenda Vô Luiz Geraldo property,**, with an expanse of 347.4006 hectares, is located in the municipality of Nhamundá. The farm's longitudinal range from -57°11'34.785" to -57°12'39.551" and latitudinal spread from -2°12'13.475" to -2°15'11.087" suggest a varied landscape that could include different microclimates and ecosystems. This variation in terrain and climate could support a range of flora and fauna, making it a vital area for biodiversity. The proximity of these coordinates also points to a possible richness in water sources, such as streams or rivers, which are crucial for maintaining ecological balance and supporting wildlife.

The **Fazenda Rodrigues property**, also located in Nhamundá municipality, covering an area of 109.718 hectares and defined by coordinates by a concise longitudinal range from -57°12'18.652" to -57°14'09.024" and a latitudinal spread from -2°14'50.706" to -2°15'04.147". This geographical layout suggests a compact, yet diverse ecological zone. Positioned within a tropical environment, the farm is likely to experience a range of microclimates, potentially hosting a variety of plant and animal life, which could make it an important area for biodiversity.

The **Ricardo Ferreira 2 property,** located in the Nhamundá municipality, spanning 396.7924 hectares, indicates a substantial and ecologically diverse area. The farm's geographical spread, with longitudes ranging from -57°13'00.314" to -57°11'54.536" and latitudes from -2°12'12.919" to -

2°15'07.983", suggests a landscape with potential for varying microclimates and habitats. This diversity is conducive to a rich array of flora and fauna, emphasizing the potential role in regional biodiversity conservation.

The **André Marcondes 2 property,** encompassing a vast area of 7083.6748 hectares, presents a significant environmental landscape. The coordinates, ranging longitudinally from -57°24'23.445" to -57°16'56.623" and latitudinally from -2°04'11.331" to -2°09'35.223", suggest a large and potentially diverse terrain. This expansive area likely features a variety of ecosystems, each with unique flora and fauna, contributing to the biodiversity of the region. The property size and varied landscape offer an ideal setting for ecological research, conservation projects. Also located in Nhamundá Municipality.

The **Fazenda Gabi e André Marcondes Property**, is located in Nhamundá municipality and encompasses an extensive area of 5978.8631 hectares. The property spans a considerable longitudinal range from -57°24'47.361" to -57°19'34.465" and a latitudinal extent from -2°00'31.395" to -2°06'18.973". This geographic presents a diverse and expansive natural environment, potentially featuring varied ecosystems and likely harbours a rich biodiversity, including a variety of plant and animal species. The land's extensive area and range of coordinates indicate multiple ecological niches, each contributing uniquely to the overall environmental health and biological diversity of the region. The property's substantial size underscores the importance of sustainable land management practices, emphasising the need for conservation efforts to maintain ecological balance and protect natural habitats, ensuring the preservation of its unique environmental characteristics for future generations.

The **Fazenda Mendonça property** covers 4787.2533 hectares in Nhamundá Municipality and span a significant geographic area. The farm's longitudinal range from -57°20'58.368" to -57°12'18.941" and latitudinal extent from -2°14'53.680" to -2°16'26.106" suggest a large and ecologically diverse terrain. This expansive area likely encompasses a range of habitats, supporting a diverse array of flora and fauna, indicative of a robust and dynamic ecosystem. The property's location in a tropical region may offer various microclimates, further enriching its biodiversity.

The **Reserva Reis Lemos property**, with an area of 400.8364 hectares, ranges from -57°14'10.616" to -57°12'38.930" and latitude from -2°12'12.919" to -2°13'07.430", indicating a region with diverse environmental characteristics within a relatively compact area. This area is likely dedicated to the conservation of local ecosystems and biodiversity. The geographical spread of the coordinates suggests a variety of habitats, potentially rich in distinct species of flora and fauna, which are crucial for ecological balance and biodiversity conservation. Also located within Nhamundá municipality.

The **Reserva Bacurau 1 property**, encompasses an area of 4533.4787 hectares, by the coordinates, spanning longitudes from -57°20'58.368" to -57°14'05.594" and latitudes from -2°12'13.687" to -2°15'01.665". As a conservation area located in the Nhamundá municipality, Reserva Bacurau 1 has a potential role in preserving these ecosystems, offering a sanctuary for wildlife and a natural laboratory for ecological research.

The **Imóvel Bacurau 2 property** also located in Nhamundá municipality, sprawling over 6557.951 hectares, is characterised longitudinally from -57°21'23.396" to -57°15'33.039" and latitudinally from -2°07'08.322" to -2°13'11.319". The range of coordinates indicates a variety of habitats, possibly including forested areas and water resources. Imóvel Bacurau 2's size and environmental diversity emphasise the importance of sustainable land management practices.

The properties were certified by the National Institute of Colonisation and Agrarian Reform (INCRA), the Brazilian federal agency whose objective is to maintain the national registry of rural properties. The properties are registered under separate registrations with INCRA (CCIR) and the Brazilian Federal Revenue Service (NIRF/CIB). The land documents that prove the rights of use and ownership of the properties were made available for audit.

2.5.2.Recognition of Property Rights (G5.1)

The project area is in the municipalities of Urucará and Nhamundá, located in the state of Amazonas, and is composed of the 24 properties shown at table 18.

Table 18: Properties integrated in the Project Tapera

Instance	Property name	Owner
Instance 1	Ipê	Urupolpas
Instance 2	Jatobá	Urupolpas
Instance 3	Piquiá	Urupolpas
Instance 4	Itaúba	Urupolpas
Instance 5	Louro	Urupolpas
Instance 6	Louro Gamela	Odiélio Nascimento
Instance 7	Pau Rosa	Urupolpas
Instance 8	Curupira	Agrofrut
Instance 9	Andiroba	Nat'Organico
Instance 10	Angelin	Nat'Organico
Instance 11	Breu	Gerliane da Paz
Instance 12	Fazenda Roberto	Roberto Camargo Quevedo

Instance 13	Fazenda Andre	André Evaristo Marcondes Cesar
Instance 14	Fazenda Antônio Roberto	Antônio Roberto Quevedo
Instance 15	Fazenda Vô Luiz Geraldo	Evaristo Marcondes Cesar
Instance 16	Fazenda Evaristo	Evaristo Marcondes Cesar
Instance 17	Fazenda Rodriguez	Ricardo Jose Rodriguez Ferreira
Instance 18	Fazenda Ricardo Ferreira 2	Ricardo Jose Rodriguez Ferreira
Instance 19	Reserva Bacurau	Ismar Luis Reis Lemos
Instance 20	Imóvel Bacurau 2	Ismar Luis Reis Lemos
Instance 21	Fazenda Mendonça	Aline de Abreu Mendonça Martins
Instance 22	Andre Marcondes II	Marco Q Participacoes Ltda
Instance 23	Reserva Reis Lemos	Alcino Luis Da Costa Lemos Junior
Instance 24	Fazenda Gabi E Andre Marcondes	Marco Q Participacoes Ltda

These properties are owned as per informed in Section 1.6. The legal documents proving the land title and ownership of the properties (Environmental Registry for Rural Properties, Land Registry Certificate, Certificate from the Institute for Agrarian Reform) will be made available to the auditors during the validation process. Orgânica Consultoria, a Brazilian company wholly owned by the Project proponent, is one of the landowners of the area in which APD Project activities will be implemented and is the Project owner. The respective legal documents will be produced for the review of auditors during the validation process.

As per the rules stated at Section 2.3, an enforceable and irrevocable agreement was set between instances owners – the holder of the statutory, properties and contractual right in the land, vegetation or conservation or management process that generates GHG emission reductions or removals –and Orgânica Consultoria, which vests project ownership in the project proponent. Evidence of such agreement will also be made available at the audit. The evidence mentioned in the present section will also be applicable to new instances.

Table 19: Properties SIGEF Numbers

Instance	Property	Sigef Number
Instance 1	Ipê	8a7c67fa-3b20-4621-bd0b-a3763fd93f01
Instance 2	Jatobá	4ae2aedd-a55c-4cab-a12d-82ac9972e641
Instance 3	Piquiá	446c8814-bd86-475a-9acd-116976ca344f
Instance 4	Itaúba	9c8a1d0a-ce66-4583-b77c-7284931f1afa
Instance 5	Louro	4009d9a7-c49a-431d-89f4-ea20922f31aa
Instance 6	Louro Gamela	faed4977-5b8b-49b4-96b4-d141b9583d12
Instance 7	Pau Rosa	970e2cce-c060-4b54-a074-b869f54465ed
Instance 8	Curupira	d97670b2-5a87-473b-8b54-6eb9fc0cbd4e
Instance 9	Andiroba	13f347a5-01b8-4774-b4c9-af5703826cfd
Instance 10	Angelin	d503fda6-1a10-435b-9021-8d1ed627a6e3
Instance 11	Breu	0a806212-2346-451e-b09e-85540e807dff
Instance 12	Fazenda Roberto	- fa6f2726-1312-4a79-8820-1f0a7316f81d
Instance 13	Fazenda Andre	d3f86dd4-249e-444a-865b-d747681ae3b0
Instance 14	Fazenda Antônio Roberto	aa5146ad-3414-47a4-a829-813bfeb48d05
Instance 15	Fazenda Vô Luiz Geraldo	ecdc51b6-331c-4cd3-a860-3cdcb1ce90ce
Instance 16	Fazenda Evaristo	e4bd54c1-9e55-4ff6-bb8f-338af74d05dc

Instance 17	Fazenda Rodriguez	0e634037-3962-47f6-ac4c-fe8c3d63b9ac
Instance 18	Fazenda Ricardo Ferreira 2	9b311857-22b3-462b-b985-b3411076f882
Instance 19	Reserva Bacurau	70a8ed96-b89f-437f-987c-0f755c5b2034
Instance 20	Imóvel Bacurau 2	4573914c-ab2b-4d61-adcd-7dbca5bd5378
Instance 21	Fazenda Mendonça	9c44bc28-ba1a-41bf-b35a-79e049eb1f1c
Instance 22	Andre Marcondes II	92157e0d-07be-4c19-8bb5-0868498499c9
Instance 23	Reserva Reis Lemos	903779cd-2984-49bd-a72b-fbae33f15d3c
Instance 24	Fazenda Gabi E Andre Marcondes	b42f8390-6f99- 4502-b53d-c46448ebf018

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

The necessary consent for the development of the project was obtained from the partners-owners of the project area, willing to voluntarily execute the project, free of vices of consent. The contracts were widely and freely negotiated, being accepted and signed by those who had the legal right to do so, as demonstrated by the signed partnership contracts.

Figure 45. Signing contract between Agrofrut and Organica Consultoria



Riverside communities that use the project area for extractivism of non-timber forest products expressed their consent to be part of the project in public consultations that were conducted after the prior disclosure of the project and the clarification of all doubts of the community.

In order to carry out the public consultations, the project was concerned with meeting four established stages with the aim of making the consultation process more participatory and open to the communities.

Pre-mobilization

Initial contact with the communities, including **Marajazinho, Boa Esperança, São João and Apeua** was established. The community members were informed in advance about the purpose and date of the public consultations.

Figures 46.a and 46.b. Meetings held in Marajazinho and Nhamundá communities.



Meeting in Marajazinho community



Meeting in Nhamundá communities

Mobilisation

Following online engagements and direct community visits, the field team coordinated with residents to establish the consultation dates. To accommodate community needs, multiple public meetings were organised in strategically chosen locations like Urucará and Nhamundá.

These consultations were essential to gather input from various stakeholders, including riverine families, community leaders, and local authorities. The process involved individual interviews and group discussions, conducted using simple language to ensure comprehensive understanding among traditional extractivists.

The Free, Prior, and Informed Consent process for the Tapera Project thus reflects a thorough and respectful engagement with all relevant stakeholders, ensuring their informed agreement and support for the project's implementation. This comprehensive approach underscores the project's commitment to

environmental conservation, sustainable community development, and the preservation of the Amazon rainforest.

Figures 47.a and 47.b. Meetings in Urucará





Execution

Throughout the extensive stakeholder identification and engagement process in 2020, multiple public consultations were organised to formalise consent for the Tapera project. These meetings were crucial for disseminating information about the project's development stages, including its aim to conserve Amazon rainforest and reduce greenhouse gas emissions.

Community members, including those from Marajazinho, Boa Esperança, São João and Apeua, as well as riverine families and local authorities, actively participated in these consultations. They expressed their expectations, perceived impacts, and considerations regarding their involvement in the project. These discussions were vital in understanding the needs and aspirations of the local communities, especially concerning sustainable living practices and the conservation of biodiversity.

To ensure transparency and documentation of the consultation process, detailed minutes were compiled. These minutes included the points discussed, attendance lists, and photographs of the meetings. The documentation was signed by community members and representatives from Organica Consultoria, affirming their consent and engagement.

Furthermore, the minutes and attendance lists from these consultations will be made available for review by validation and verification bodies. This step is crucial to demonstrate the inclusive and participatory nature of the Tapera Project's approach, highlighting its commitment to community involvement and environmental conservation in the Amazon region.

Figures 48.a and 48.b.Visits to communities in Urucará and Nhamundá



Publicization

The outcomes of the Tapera project consultations were meticulously clarified during the meetings and subsequently documented and disseminated across various communication channels, tailored to be accessible and understandable to all relevant stakeholders.

This process ensured the assurance of the traditional practices within the Tapera project area. The agreement reached with the communities guarantees their continued access to the project area, not only for the extraction of non-timber forest products like breu resin, copaiba oil, tonka beans, nuts, but also for sustainable practices such as subsistence fishing and hunting, respecting the ecological balance and seasonal cycles.

This approach is part of the project's commitment to maintaining the delicate balance between environmental conservation and the traditional livelihoods of the local communities in the Amazon, ensuring that the project's development aligns with the needs and rights of those who depend on the forest for their sustenance and cultural practices.

Figures 49.a. and 49.b.Meetings with Organica Consultoria and Agrofrut to publicise the Tapera Project and partners.




2.5.4.Property Rights Protection (G5.3)

Under Brazilian law, it is possible to state that the owner has the full right to use, enjoy and dispose of the assets that make up his property, having the legitimacy to allow the development of the project. Regarding public entities, whether state, federal or municipal, directly or indirectly administered, the certificates analysed indicate the legitimacy of the title and ownership of the properties.

The project does not lead to the involuntary removal or relocation of property rights holders from their lands or territories, nor will it displace traditional livelihood activities. In addition, the proponents maintain constant communication with the stakeholders through the communication channel established to protect the property rights of the owner and the maintenance of the traditional ways of life of riverside communities in the project area.

2.5.5.Illegal Activity Identification (G5.4)

The project consists of a total area of **281,951.52** hectares, where illegal activities can take place that directly involve the land, such as: land-grabbers (*grilagem*); illegal deforestation; illegal mining; illegal land occupation; illegal construction; money laundering; illegal logging.

There may be other illegal activities, which are not directly linked to the land, but which take place within its areas, for example: the use of slave labour to work on the rural properties participating in the project and the use of the project area to carry out illegal activities, such as drug production or trafficking.

In the context of illegal activities within the Tapera Project area, one significant issue pertains to invasions orchestrated by illegal cultivation agriculture in the Piquiá region, specifically for the purpose of clearing land and cultivating marijuana. The project management engaged in negotiations to address this encroachment, successfully reaching a resolution to mitigate the illicit activities. Additionally, the project

faced a distinct challenge with superposition of an old land title (from 1976) on more recent properties occupied since 2003 by members of the Tapera group. This resident of São Paulo (Cristiano) says he purchased this old property title and claimed an expansive area of 2,000 ha. This claim overlapped the rightful possession areas of eight long standing owners affiliated with the Tapera group since 2003. His actions extended beyond mere land occupation; he initiated discussions about the ecosystem on the ASSIS property located on the south side of the road. Subsequently, he further encroached onto the Jatobá property, opening a road to access vacant areas north of Jatobá, clearing land with the intent of registering these territories. Comprehensive drone mapping was conducted to document the extent of this open area, and the conflict with Cristiano was successfully resolved through discussion with the Agrofrut cooperative.

Moreover, another incursion on the Jatobá property involved an individual named Baleado, who unlawfully cleared land for the cultivation of cassava. The project management promptly intervened and resolved the situation with Baleado. Furthermore, the project area has witnessed unauthorised access by hunters trespassing in the Piquiá, Ipê, and Jatobá regions for hunting purposes.

The companies involved in this project have common actions to combat and monitor these illegal activities. Generally speaking, the main actions to combat legal activities are socio-educational, land inspection and property surveillance. The project is periodically monitored through technical field visits to the project areas by the applicant's technical team.

The team must record any occurrence of illegal activity on the participating properties or illegal activity carried out by the producers who own the land. The occurrence record will be controlled by the proponent Organica Consulting.

Figures 50.a. and 50.b. Superposition of properties and illegal ecosystem transition





Table 20. Actions to combat and monitor illegal activities in the Tapera project area.

Preventive Measures General	Preventive actions
Promoting Community Participation	• Involve local communities in land planning and management, promoting active participation. • Encourage the formation of community committees or associations to monitor and protect vulnerable areas from illegal occupation; • Carry out educational campaigns to inform communities about the risks and consequences of illegal land occupation. • Promote awareness of the legal processes and the appropriate ways to obtain land legally.
Education and Awareness	• Carry out educational campaigns to inform communities about the risks and consequences of illegal land occupation. • Promote awareness of the legal processes and the appropriate ways to obtain land legally.
Social and economic assistance	• Develop social assistance programs to meet the needs of vulnerable communities. • Create alternative economic opportunities to reduce pressure on public lands and risk areas.
Cooperation between sectors and governments	• Promote collaboration between different government sectors, such as urban planning, environment, agriculture, and justice, to fully address the issue of illegal land occupation. • Establish partnerships between local, state and federal governments for a coordinated approach.
Technology Monitoring	• Use remote sensing technologies, geographic information systems (GIS) and other tools to monitor changes in land use. • Establish early warning systems to identify possible illegal occupations.
Surveillance	• Strengthen surveillance operations to detect and stop illegal activities.

Strengthening the Institution	• Strengthen the institutions responsible for land management, ensuring that they have adequate resources and trained personnel. • Improve coordination between different government bodies involved in land management.
Immediate procedures and actions when illegal activities are detected	• Sending a specialised team to the scene; • Record the incident and notify all those concerned; • Contact legal representatives; • Notifying the relevant authorities; • Alert IPAAM or the environmental police if environmental crimes are found.
Regularisation of Informal Settlements	• Implement regularisation programs for informal settlements, providing safer conditions and basic infrastructure for communities. • Seek solutions that reconcile land regularisation with respect for human rights and the promotion of decent housing conditions.

2.5.6.Ongoing Disputes (G5.5)

The right to rural land in Brazil is regulated by the Constitution, the Rural Statute, and the Civil Code of 2002 (Law No. 10,406). These legal frameworks address matters related to family, inheritance, possession, and property rights. In the Brazilian context, individuals can secure land ownership through various means, such as purchase, property transfer (e.g., through inheritance), and government allocations.

A noteworthy mechanism for acquiring land in Brazil is prolonged occupation, known as "usucapião," a right recognized since 1916. This legal concept allows individuals to obtain property rights over land through prolonged and uncontested possession. It underscores the importance of consistent and uncontested occupation as the basis for legitimising a property claim.

The ability to resolve the impasses unfolding within the project's boundaries emerges as a notable achievement. In particular, the land dispute with the "Vai Quem Quer" community deserves attention, where we identified that one of the properties associated with the project was territorially overlapping with their areas.

To address this delicate issue, we employed effective strategies, with purchase and sale contracts being the chosen tool to achieve a suitable resolution. This approach allowed us not only to mitigate the conflict but also to establish robust legal foundations to ensure ownership of the lands in question. The problem was considered resolved, consolidating the relationships with the relevant stakeholders and reinforcing the integrity and sustainability of the project as a whole.

2.5.7.National and Local Laws (G5.6)

Currently no laws and regulations prevent or enforce the Project activity or baseline land use scenarios. No law in Brazil prohibits or restricts the execution of REDD+ Projects or prohibits or restricts any commercial transaction of assets generated from the same Projects. Project-relevant laws, statutes and policies are outlined below.

Regulatory framework

Brazil is a member of the United Nations Framework Convention on Climate Change (UNFCCC) and an active member of the International Tropical Timber Organisation (ITTO). The country has ratified the UNFCCC (1995), the Kyoto Protocol (2005), and has established a Designated National Authority under the Clean Development Mechanism (CDM) and has implemented registered CDM Afforestation/Reforestation Projects. Brazil is also a signatory to the Paris Agreement (Paris 2015, COP 2167). The Project complies with this regulatory framework due to its AFOLU scope, which is a recognized method of GHG reductions and removals under the regulatory framework.

National legislation

The Tapera Amazon Project observes the principles established in the Brazilian Federal Constitution, as per Article 225, by contribution towards the achievement of an ecologically balanced environment. An overview of the main national laws regulating the forest sector is provided below. These laws regulate the use and protection of native natural forests and also regulate the management and exploitation of commercial forests derived from reforestation projects.

- **Law n° 12.727 - October 17, 2012**. – this law establishes general norms on the protection of vegetation, areas of Permanent Preservation and the areas of Legal Reserve; Logging, supply of forest raw materials, control of the origin of forest products and control and prevention of forest fires and provides economic and financial instruments to achieve its objectives.
- **Law n° 12.651 - May 25, 2012.** - establishes the New Brazilian Forest Code, including provisions for managing forests and the Legal Reserve.
- **Law n° 7.804 - July 18, 1989**. - amends Law 6.938, dated August 31, 1981, which provides for the National Policy on the Environment, its purposes and mechanisms for formulation and application, Law 7,735 of February 22, 1989, Law 6803, of July 2, 1980, and makes other provisions.

The Project complies with the law requirements of land use and sustainable forest management. According to Law n° 12.651/2012, all rural property in forested areas must maintain 80% of the property area with native vegetation coverage, as a Legal Reserve. This is an area located inside a rural property, with the function of ensuring the sustainable use of the natural resources of the rural property, assisting the

conservation and rehabilitation of ecological processes and promoting the conservation of biodiversity, as well as the shelter and protection of wildlife and native flora.

The Project complies with this law by preventing illegal deforestation of the Legal Reserve in rural properties within the Project Area. Forest surveillance implemented as part of APD Project activities also enables better monitoring of the forest conditions and improves compliance with the currently enforced laws and regulations.

Law n° 12.651/2012 also allows for sustainable management of forests and provides the following opportunities:

- The collection of non-timber forest products, such as fruits, flowers, vines, leaves, roots and seeds, which do not endanger the survival of individuals and of the species collected, is allowed (Article 21).
- Sustainable forestry is forbidden for commercial purposes but it's allowed for use in the property, with a maximum limit of 20 cubic metres/year (Article 23).
- It is not allowed cattle farming or any other agricultural activity.

The Project complies with opportunities for activities within sustainable forest management.

National policy

The Project activity is carried out in compliance with the environmental policies and guidelines from the Brazilian Federal Administration under the standards set at the COP 14 Conference held in Poznan, Poland, in December 2008. These guidelines set a goal of reducing deforestation by 70 percent by the year 2018 and moving to a zero-deforestation goal by 2030. These goals aim to offset the GHG emissions resulting from illegal deforestation. GHG offsets from illegal deforestation is part of the Brazilian Nationally Determined Contribution which Brazil plans to adopt under the framework of the Paris Climate Agreement (COP-21).

The Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm; Plano de Ação para a Prevenção e Controle do Desmatamento na Amazônia Legal) was established to mitigate the escalation in deforestation in the Legal Amazon. This Project activity follows the main PPCDAm premises. The Project will comply with this plan by implementing actions to prevent deforestation, as is the intent of the plan.

Amazon State Laws

- State Law No. 3,785, July 24, 2012, provides for environmental licensing in the state of Amazonas.
- Law No. 3,789, July 27, 2012, provides for forest replacement in the state of Amazonas.

- State Decree No. 32,986, November 30, 2012. Regulates Law No. 3,789/2012, which provides for forest replacement in the state of Amazonas.

At a state level, Amazonas state has public policy measures in place facilitating forest conservation. However, these policies do not offer a definitive regulation or limit to the execution of REDD+ Projects by either public or private enterprises within the state territory.

2.5.8. Approvals (G5.7)

Currently, Brazil does not have a specific authority for the management and approval of projects that generate voluntary carbon credits, so there was no need for such approval. The project proponents gained recognition and approval of project implementation through meetings, community consultations, as well as consultations with other project stakeholders.

Although there is no specific need for approval by any administrative body, the project was designed and will be conducted in accordance with the rules and principles of administrative bodies in Brazil, such as IBAMA, FUNAI, INCRA and ICMBIO. Proponents declare to follow all laws applicable to the country and the state of Amazonas.

2.5.9. Project Ownership (G5.8)

The project area is in the municipalities of Urucará and Nhamundá, located in the state of Amazonas, and is composed by the following properties:

Table 21. Project ownership per property name

Instance	Property name	Owner
Instance 1	Ipê	Urupolpas
Instance 2	Jatobá	Urupolpas
Instance 3	Piquiá	Urupolpas
Instance 4	Itaúba	Urupolpas
Instance 5	Louro	Urupolpas
Instance 6	Louro Gamela	Odiélio Nascimento
Instance 7	Pau Rosa	Urupolpas
Instance 8	Curupira	Agrofrut
Instance 9	Andiroba	Nat'Organico

Instance 10	Angelin	Nat'Organico
Instance 11	Breu	Gerliane da Paz
Instance 12	Fazenda Roberto	Roberto Camargo Quevedo
Instance 13	Fazenda Andre	André Evaristo Marcondes Cesar
Instance 14	Fazenda Antônio Roberto	Antônio Roberto Quevedo
Instance 15	Fazenda Vô Luiz Geraldo	Evaristo Marcondes Cesar
Instance 16	Fazenda Evaristo	Evaristo Marcondes Cesar
Instance 17	Fazenda Rodriguez	Ricardo Jose Rodriguez Ferreira
Instance 18	Fazenda Ricardo Ferreira 2	Ricardo Jose Rodriguez Ferreira
Instance 19	Reserva Bacurau	Ismar Luis Reis Lemos
Instance 20	Imóvel Bacurau 2	Ismar Luis Reis Lemos
Instance 21	Fazenda Mendonça	Aline de Abreu Mendonça Martins
Instance 22	Andre Marcondes II	Marco Q Participacoes Ltda
Instance 23	Reserva Reis Lemos	Alcino Luis Da Costa Lemos Junior
Instance 24	Fazenda Gabi E Andre Marcondes	Marco Q Participacoes Ltda

These properties are owned as per informed in Section 2.5. The legal documents proving the land title and ownership of the properties (Environmental Registry for Rural Properties, Land Registry Certificate, Certificate from the Institute for Agrarian Reform) will be made available to the auditors during the validation process. Orgânica Consultoria, a Brazilian company and the project proponent, provides all support, organisation and guidance to the landowners of the areas in which APD Project activities will be implemented. The respective legal documents will be produced for the review of auditors during the validation process.

2.5.10. Management of Double Counting Risk (G5.9)

The project does not intend to generate or receive any form of environmental or social credit, including certificates related to GHG emissions reductions or renewable energy. Emissions reductions resulting from the implementation of these project activities will not be used to meet emissions reduction targets of any other REDD+ program or mechanism.

2.5.11. Emissions Trading Programs and Other Binding Limits

Not applicable. The Project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism.

2.5.12. Other Forms of Environmental Credit

Not applicable. The project is not registered nor is it seeking registration in any other GHG program besides the VCS and CCB.

2.5.13. Participation under Other GHG Programs

Not applicable. The project is not registered nor is it seeking registration in any other GHG program besides the VCS and CCB.

2.5.14. Projects Rejected by Other GHG Programs

Not applicable. This Project is not requesting registration in any other GHG programs nor has the Project been rejected by any other GHG programs.

2.5.15. Double Counting (G5.9)

Not applicable.

3. CLIMATE

3.1. Application of Methodology

3.1.1. Title and Reference of Methodology

The Tapera Amazon REDD+ Project is applying the Climate, Communities and Biodiversity (CCB) and Verified Carbon Standard (VCS) with the intention of reducing CO_2 emissions from planned (APD) deforestation compared to baseline levels. As required by VM0007[49], project area consists of contiguous, discrete areas covered by forest that meet the definition of eligible forest, which would be an area that has been forested for at least 10 years prior to the project start date. Methodology VM0007 applies to Project activities that prevent conversion of forest to non-forest and of native grassland to a non-native state. The list below refers to the methodologies, modules, and tools used within the project:

Approved VCS Methodology:

[49] VM0007 “Estrutura Metodológica de REDD+ (REDD+ MF)”, v1.6. Available at: https://verra.org/methodologies/vm0007-redd- methodology-framework-redd-mf-v1-6/

- VM0007 “REDD+ Methodology Framework (REDD+ MF)”, v1.7.

Carbon pool modules:

- VMD0001 “Estimation of carbon stocks in the above and belowground biomass in live tree and non tree pools” (CP AB), v1.1”.
- VMD0005 “Estimation of carbon stocks in the long term wood products pool” (CP W), v1.1”.

Baseline module:

- VMD0006 “Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL PL), v1.3”.
- VMD0007 “Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation and unplanned wetland degradation” (BL UP), v3.3”.

Leakage modules:

- VMD0009 “Estimation of emissions from activity shifting for avoided planned deforestation/forest degradation and avoided planned wetland degradation (LK ASP), v1.3”
- MD0010 “Estimation of emissions from activity shifting for avoiding unplanned deforestation and avoiding unplanned wetland degradation (LK ASU), v1.2”.
- VMD0011 “Estimation of emissions from market effects” (LK ME), v1.1”.

Miscellaneous Modules:

- VMD0013 “Estimation of greenhouse gas emissions from biomass and peat burning (E BPB), v1.2”.
- VMD0016 “Methods for stratification of the project area (X STR), v1.2”.
- VMD0017 “Estimation of uncertainty for REDD project activities (X UNC), v2.2”.

Tools:

- “Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (T ADD), Version 01”.
- CDM “Executive Board “Tool for testing significance of GHG emissions in A/R CDM project activities (Version 01)” EB 31.
- AFOLU “Non Permanence Risk Tool”, Procedural Document, VCS, v4.0[50]

PDR.3 Definition of forest used by the Project proponent and its source

This Project uses the United Nations Food and Agriculture Organisation (UN FAO) definition of forest:

[50] 120 AFOLU “Ferramenta de Risco de Não Permanência” VCS Versão 4, Documento Processual. Available at: http://www.vcs.org/programdocuments

"Forest is land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use[51] ."

3.1.2. Applicability of Methodology

The applicability conditions of the VM0007 methodology and its associated modules are detailed in Table 22 below.

Table 22. Applicability criteria for the Tapera project.

Applicability Criteria	Description
All project activities	
All areas of land registered under the CDM or any other GHG program (either voluntary or compliance oriented) should be transparently reported and excluded from the project area. The exclusion of land in the project area from any other GHG program should be monitored over time and reported in monitoring reports.	The Tapera project is not registered in any carbon trading system or program.
All types of REDD activity	

[51] Available at: i8661en.pdf (fao.org)

This REDD+ activity is applicable due to the following conditions: • Land in the project area has been qualified as forest for at least 10 years prior to the project start date; • Baseline deforestation in the project area falls under the category of planned deforestation/degradation (VCS APD category); • Leakage prevention activities do not include: i) Agricultural land that is flooded to increase production (e.g. rice paddies); ii) Intensification of livestock production through the use of feedlots and/or manure lagoons.	Land in the Tapera project area has qualified as forest (following the definition used by the VCS and the Brazilian National Agency definition of forest - SNIF, 2018) for at least the 10 years prior to the project start date. Baseline deforestation in the project area falls into the activity category: planned deforestation/degradation (VCS APD category). Activities to prevent leakage do not include: (i) agricultural land that is flooded to increase production (e.g. paddy rice); ii) Intensifying livestock production through the use of feedlots and/or manure ponds.
Avoided Planned Deforestation	
Avoidance of planned deforestation/degradation activities are applicable under the following conditions: • Where conversion of forest land to a deforested condition must be legally permitted. • Where, prior to the project, unsustainable firewood collection is occurring within project boundaries, the BL-DFW and LK-DFW modules should be used to determine possible leakage.	The activity to prevent deforestation and planned degradation is applicable, considering that the conversion of forest lands to a deforested condition is legally permitted up to the limit of 20% in relation to the total area of the property, as described in section 2.5.7 National laws and locations (G5.6). No logging is carried out within the Tapera project area.
VMD0001 "Estimation of carbon stocks in above- and below-ground biomass in live tree and non-tree pools" (CP-AB), v1.2	
The module allows for the *ex-ante* estimation of carbon stocks in tree and non- tree above and below ground biomass in the baseline scenario (for both pre- and post-deforestation stocks) and	This module is applicable to all forest phytophysiognomies and age classes. The inclusion of the above ground tree biomass pool as part of the project boundary is

in the project case and for the ex-post estimation of the change in carbon stocks in tree above and below ground biomass in the project case.	mandatory according to the REDD-MF module.
VMD0005 "Estimation of Carbon Stocks in the Long-Term Wood Products Pool" (CP-W), v1.2	
This module allows for the *ex-ante* estimation of carbon stocks in the long-term wood products pool in the baseline scenario. The carbon stocks addressed here are those remaining in wood products after 100 years; most of the emissions associated with harvesting, processing and waste of wood and eventual removal of products occur within this timeframe, and this module employs the simplifying assumption that the proportion remaining after 100 years is effectively 'permanent'.	This module is applicable to all cases where timber is harvested for conversion into timber products for commercial markets, for all forest phytophysiognomies and age classes. This module is applicable in the baseline, as the wood products pool is included as part of the project boundary, as per applicability criteria in the REDDMF framework module, specifically: • Timber harvesting occurs before or during the deforestation process, and the timber is destined for commercial markets; • The wood product pool is determined to be significant (using T GIS).
VMD0006 "Estimating Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Planned Deforestation/Forest Degradation and Planned Wetland Degradation" (BL-PL), v1.4	
The module allows you to estimate changes in carbon stock and GHG emissions related to planned deforestation, planned forest degradation, and planned wetland degradation in the baseline scenario.	The module is applicable for estimating baseline emissions on forest lands (usually privately or government owned) that are legally permitted and documented to be converted to non forested lands. Where, pre-project, unsustainable fuelwood collection is occurring within project boundaries, the BL-DFW and LK-DFW modules should be used to determine potential leakage.

VMD0009 "Estimated Emissions from Activity Change to Avoid Planned Deforestation/ Forest Degradation and Avoid Planned Wetland Degradation" (LK-ASP), v1.3	
The module allows estimation of GHG emissions caused by activity change leakage from planned deforestation carbon projects. The module is applicable for estimating leakage emissions due to activity change from legally permitted and documented forest lands to be converted to non-forest lands, including activity change to forested wetlands drained or degraded due to project implementation. The module is also applicable for estimating leakage emissions due to activity displacement from legally authorised and documented non-forested wetlands to be converted and degraded. In these situations, the displacement of baseline activities can be controlled and measured directly by monitoring baseline deforestation or wetland degradation agents or class of agents. This tool should be used for projects in areas where planned deforestation occurs in forested wetlands, regardless of the absence of wetland within the project boundary.	The module is mandatory if the BL- PL Module is used to define the baseline, and the applicability conditions in the BL-PL Module must be met in full.
VMD0011 "Estimation of Market Effects Emissions" (LK-ME), v1.2	
The module allows estimating GHG emissions caused by leakage from market effects related to timber extraction for wood, fuelwood or charcoal in the baseline for carbon projects. It is applicable for calculating market effects leakage from REDD projects that are expected to reduce timber harvest levels substantially and permanently. Where REDD project activities result in reductions in timber harvest, it is likely that production can be shifted to other areas of the country to compensate for the reduction.	The module is mandatory when the deforestation process involves the extraction of timber for commercial markets.

As referenced in the Framework (REDD-MF), the module is mandatory where: The deforestation process involves harvesting timber for commercial markets. Baseline is calculated using BL-DFW AND firewood or charcoal is harvested for commercial markets. In all other circumstances, the module should not be used.	
VMD0013 "Estimation of Greenhouse Gas Emissions from Biomass Burning" (E-BB), v1.3	
This module provides a step-by-step approach to estimating greenhouse emissions from biomass and peat burning. This module is applicable to REDD project activities with emissions from biomass burning and REDD-WRC project activities with emissions from biomass and/or peat burning. This module is also applicable to RWE and ARR-RWE project activities with emissions from peat burning.	In the baseline scenario, fire is used to clear land, resulting in emissions of CO_2, N_2O and CH_4. When used in the baseline, accounting must occur both under the baseline and in the project scenario and both in the project area and in the leakage belt. Where fires occur ex-post in areas that coincide with deforested or degraded areas in the baseline, the module should be used to account for greenhouse gas emissions.
VMD0016 "Methods for Stratification of project area" (X-STR), v1.3	
This module provides guidance on how to stratify the project area into discrete, relatively homogeneous units to improve the accuracy and precision of carbon stock and carbon stock change estimates.	Strata are only used for forest classes under deforestation pressure and are the same in the case of the baseline and project scenario. The post-deforestation (conversion) scenario is not stratified, instead the average of the carbon stock values for post-deforestation land uses is applied observing the guidelines of Modules BLUP and BL-PL.
VMD0017 "Estimation of Uncertainty for REDD Project Activities" (X-UNC), v2.2	
The module allows you to estimate uncertainty in baseline estimates and in project estimates of sequestration, emissions, and leakage.	This module is mandatory when using the REDD+ MF methodology.

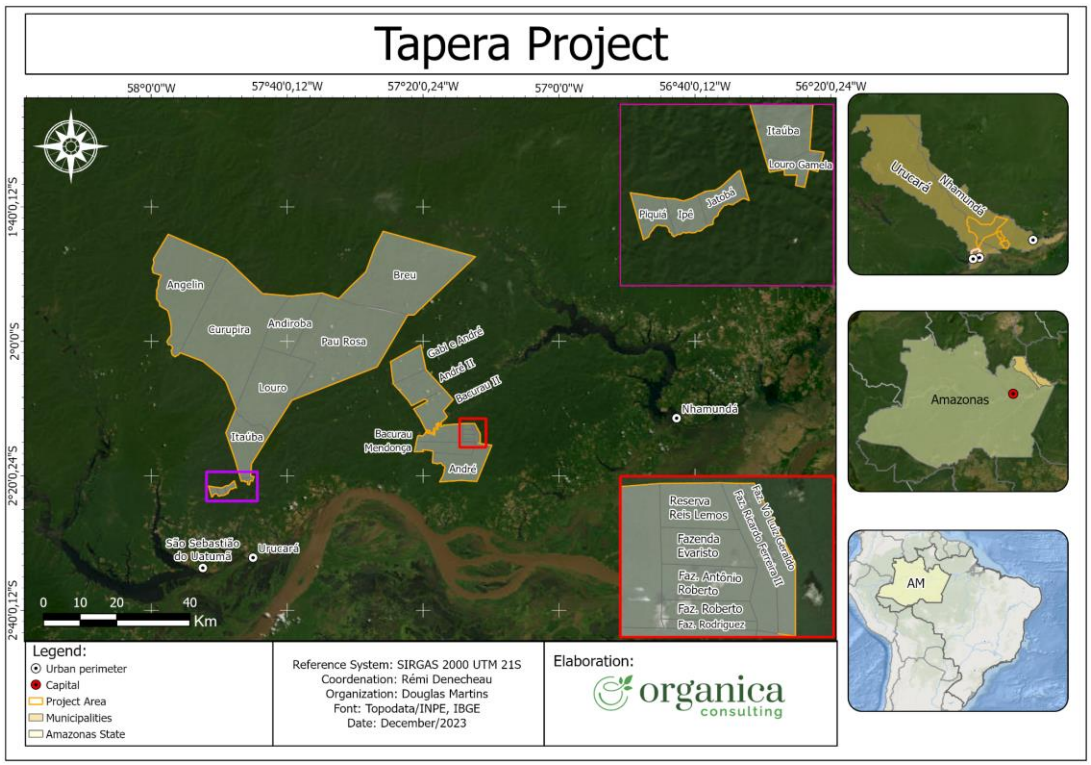
The module focuses on the following sources of uncertainty: • Determination of deforestation and degradation rates; • Uncertainty associated with estimating carbon stocks and changes in carbon pools; • Uncertainty associated with estimating peat emissions; • Uncertainty in assessing project emissions. When an uncertainty value is not known or cannot be simply calculated, the project must justify that it is using an arguably conservative number and an uncertainty of 0% can be used for this component.	
VT0001 "Tool for Demonstrating and Assessing Additionality in Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" (T-ADD), v3.0	
• AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary, performed with or without registration as a VCS AFOLU project, will not lead to a violation of any applicable law, even if the law is not enforced. • The use of this tool to determine additionality requires that the baseline methodology provide a stepwise approach that justifies the determination of the most plausible baseline scenario. Project proponents proposing new baseline methodologies should ensure consistency between the determination of a baseline	• As stated in Section 2.5, the project is in compliance with all relevant laws, statutes and regulatory frameworks. • The approach to define the baseline scenario using this tool was described in section 3.1.4

scenario and the determination of the additionality of a project activity.	

3.1.3. Project Boundary

The project area is located in the municipalities of Urucará and Nhamundá (Figure 51, section **2.1.5**). The total area of the properties amounts to 281.086,73 Hectares and extends along its northern border to the Kaxuyana-Tunayana indigenous land and the Faro state forest. It is bordered to the south by the São Sebastião-Urucará road. To the west is the Maripá River, and to the east is the Nhamundá River.

Figure 51: Map delimitating the area of the Tapera REDD+ Project



GHG Emission Sources

Methodology VM0007 includes the six carbon pools listed in the table below, indicating whether they were included or excluded within the proposed APD project activity, as well as their respective justifications.

Table 23. GHG sources included or excluded within the boundaries of the Tapera project area.

Source		Gas	Included?	Justification/Explanation
Baseline	Biomass burning	CO_2	Excluded	Excluded as recommended by the applied methodology. Counted as carbon stock change.
		CH_4	Included	Included as non-CO2 emissions from biomass burning in the baseline scenario, according to the methodology.
		N_2O	Included	Included as non-CO2 emissions from biomass burning in the baseline scenario, according to the methodology.
		Other	Excluded	No other GHG gases were considered in this project activity.
	Livestock emissions	CO_2	Excluded	Not a significant source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
		Other	Excluded	No other GHG gases were considered in this project activity.
Project	Biomass burning	CO_2	Excluded	No biomass burning increase is predicted to occur in the project scenario compared to the baseline case. Therefore considered insignificant.
		CH_4	Included	Included as non-CO2 emissions from biomass burning in the project scenario, according to the methodology.
		N_2O	Included	Included as non-CO2 emissions from biomass burning in the project scenario, according to the methodology.
		Other	Excluded	No other GHG gases were considered in this project activity.
	Livestock emissions	CO_2	Excluded	Not a significant source
		CH_4	Excluded	No livestock agriculture increase is predicted to occur in the project scenario compared to

Source		Gas	Included?	Justification/Explanation
				the baseline case. Therefore considered insignificant.
		N_2O	Excluded	As above.
		Other	Excluded	No other GHG gases were considered in this project activity.

Carbon Stocks

The carbon stocks included in the project, as well as their justification, are presented in Table 24 below, considering the proposed scope of the PDPA activity.

Table 24. Carbon storage compartments included or not in the Tapera project.

Carbon stocks	Included/Excluded	Justification
Aboveground Biomass	Tree: included	The carbon stock change in this stock is always significant and mandatory according to VM0007.
	Non-tree: included	Stock included in the forest class in the baseline scenario.
Belowground Biomass	Tree: included	Significant carbon stock.
	Non-tree: included	Significant carbon stock.
Dead wood	Included	Not required by the methodology. Included in the project because it represents more than 5% of the trees' woody biomass, therefore significant as indicated by the T-SIG tool.
Litterfall	Excluded	Stock considered insignificant in REDD projects, its inclusion is optional.
Soil organic carbon	Excluded	Recommended when forests are converted to agricultural crop areas. Should not be measured in conversion to pasture and crops.

Long-term wood products	Excluded	The project activities do not include commercial logging.

Temporal Boundaries

A historical reference period from 2009 to 2019 was used to define project eligibility, and deforestation and forest degradation rates for *ex-ante* estimates of GHG emissions under the project scenario, following criteria VM0007 v1.7, section 5.2.1. The start and end dates of the crediting period for the Tapera project are defined in sections **2.1.14** and **2.1.15**, respectively. The re-evaluation of the baseline will be performed considering the period of 10 years after the project start date.

Figure 52. Hypsometry of the Project Tapera Area

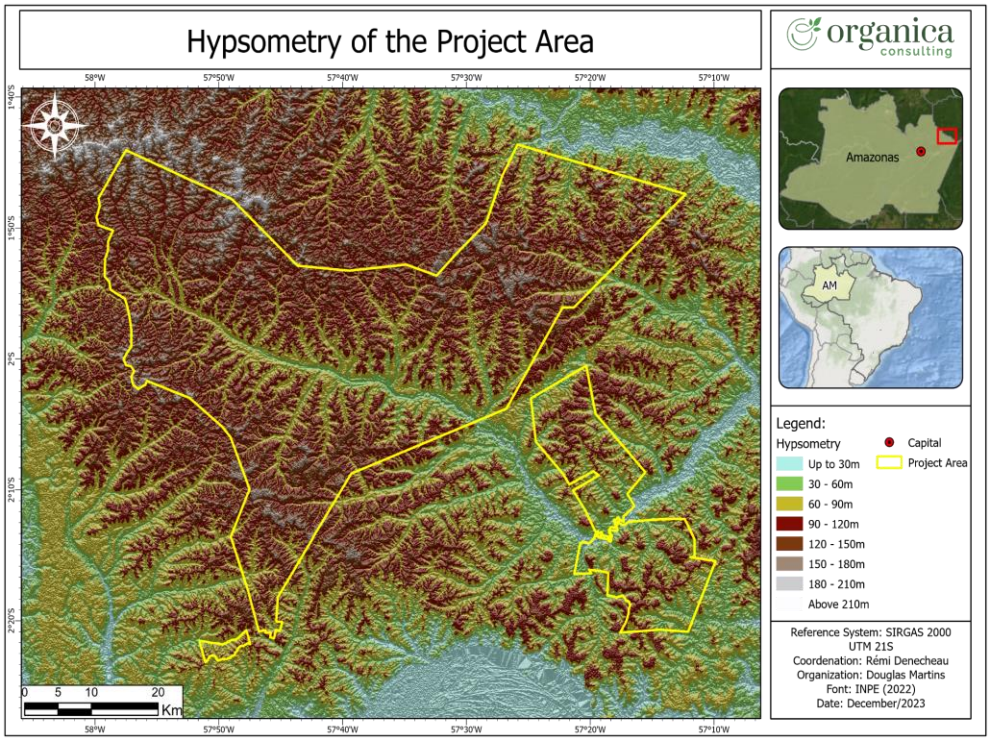


Figure 53. Slope of the Project Tapera Area

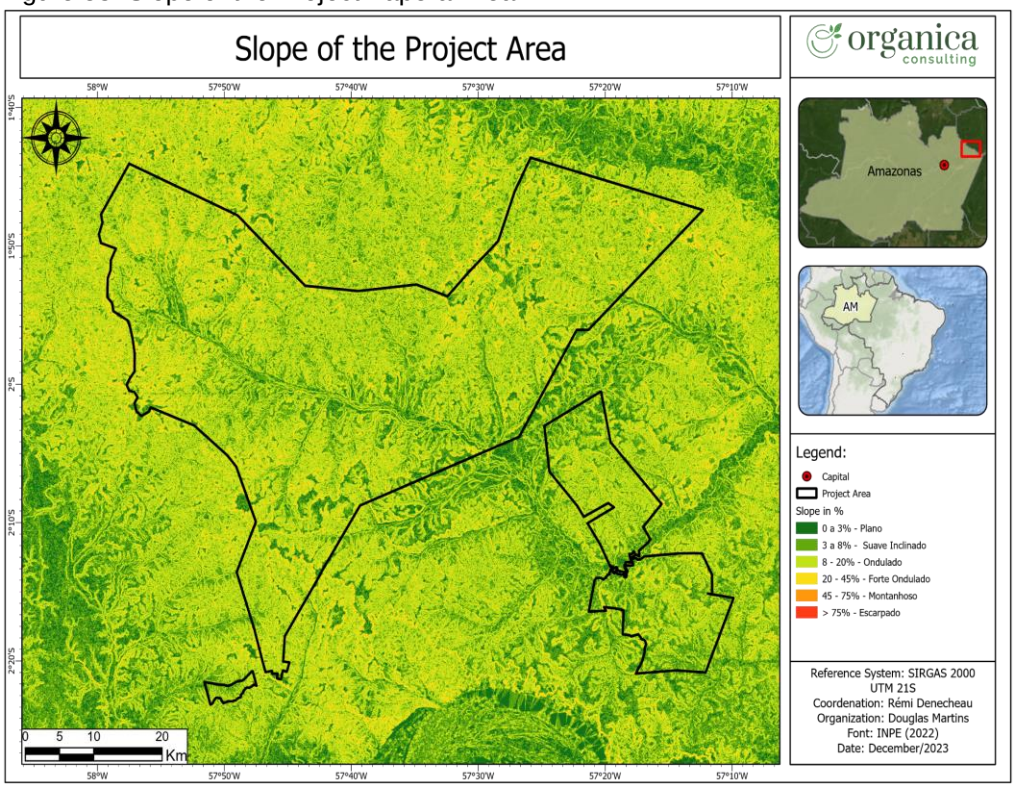
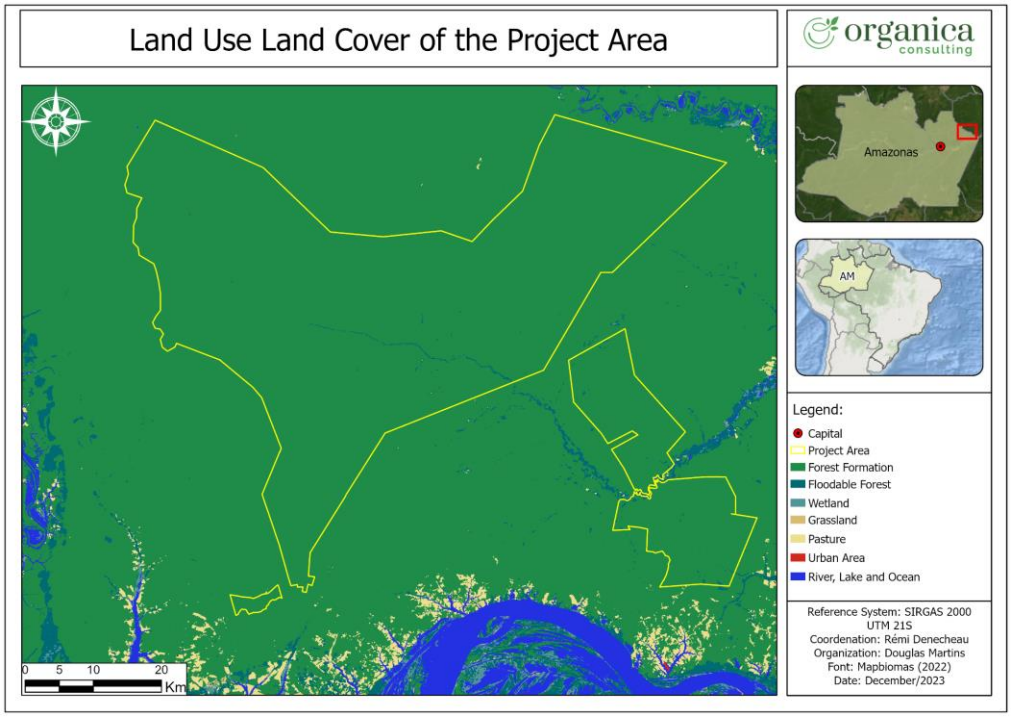


Figure 54: Land use and land cover of the Tapera Project Area.



A list of selected carbon pools considered in the Project boundary are outlined below. Optional pools have been excluded where it is conservative to do so.

Table 25: Carbon pools considered in the Tapera Project

Pool		Required	Justification
AGMT	Above-ground merchantable tree	Yes – baseline scenario includes the harvest of long-lived wood products.	Major pool considered when accounting for emissions from long-lived wood products
AGOT	Above-ground other (non-merchantable) tree	Yes	Major pool considered
AGNT	Above ground non-tree	Optional. The baseline scenario does not include perennial tree crops in the Project accounting areas.	Conservatively excluded
BGMT	Below-ground merchantable tree	Optional	Carbon pool considered

BGOT	Below-ground other (non-merchantable) tree	Optional	Conservatively excluded
BGNT	Below-ground non-tree	Optional	Conservatively excluded
LTR	Litter	No	Always conservatively excluded
DW	Dead wood	No	Conservatively excluded
SD	Standing dead wood	No	Conservatively excluded
LD	Lying dead wood	Optional	Conservatively excluded
SOC	Soil organic carbon	Optional	Conservatively excluded
WP	Long-lived wood products	Yes – as AGMT is selected	May be significant reservoir under the baseline scenario

3.1.4. Baseline Scenario

For the Tapera project, the conversion of forest land to non-forest land in the baseline scenario is considered to be given from the perspective in the component: Avoided Planned Deforestation (APD). The landowners are not able to bear the efforts and costs to maintain long-term surveillance of the project boundaries to avoid planned deforestation. The Tapera project assumes the conversion of forest cover limited to 20% of the property area, based on the legal permissibility of the Forest Code - Law 12.651/2012[52]. In this scenario the area equivalent to the 20% of the property would be subject to clear cutting, followed by conversion to non-forest uses. Thus, the project falls into the category of AFOLU REDD projects for Avoided Planned Deforestation (APD).

Agent of Planned Deforestation

According to the VMD0006 Section 1.1, the agent of deforestation is an already defined individual, organisation, or corporation in the simplest scenario. For this first project activity instances in the Tapera grouped Project, the deforestation agents are the landowners. For the inclusion of new instances in the Tapera project, the agent must be a defined individual, organisation, or corporation.

Figures 55.a and 55.b. Images of deforestation.

[52] New Brazilian Forest Code. Available at: https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm. Accessed on 13/01/2023.






Legal permissibility for deforestation

According to the Forest Code (Law 12.651, Brazil (2012b)) the landowner must maintain at least 80% of the native vegetation coverage as a Legal Reserve.

CHAPTER IV

FROM THE LEGAL RESERVE AREA

Section I

From the Delimitation of the Legal Reserve Area

Art. 12. Every rural property must maintain an area with native vegetation cover, as a Legal Reserve, without prejudice to the application of the rules on permanent preservation areas, observed the following minimum percentages in relation to the area of the property, except for the cases provided for in art. 68 of this Law:

I - located in the Legal Amazon:

a) 80% (eighty percent) of the property located in a forested area;
b) 35% (thirty-five percent) in the property located in a *Cerrado* area;
c) 20% (twenty percent), in the property located in an area of *campos gerais*;

The properties of the Tapera project are in a forested area in the Legal Amazon, which requires the conservation of at least 80% native vegetation.

CHAPTER V
FROM VEGETATION SUPPRESSION FOR ALTERNATIVE LAND USE

Art. 26. The suppression of native vegetation for alternative land use, both in the public and private domains, will depend on the registration of the property in the CAR, what art. 29 deals with, and prior authorization from the competent government department of SISNAMA. (Law 12.651, Brasil (2012b))

All the properties in this project are in legal compliance with the requirements described above and stated in Section **2.5.7.**

Selecting the most likely baseline scenario for the project - APD

The APD component of the Tapera project avoids deforestation of 55.192,77 ha of planned deforestation between 2021 and 2051. This component relates to forest land that may legally receive authorization to be converted to non-forest land by project proponents, which will not occur as a result of the Tapera project activity. According to the Brazilian Forest Code, proponents can suppress up to the prescribed legal limit of 20% of the property. The request for vegetation suppression has been officially submitted. The process is currently underway, having been duly filed, now we are awaiting a response from the relevant authorities. This step indicates that the request has been formally logged, and the team is in the process of following the necessary procedures to obtain approval and any pertinent guidelines.

Deforestation area

According to the methodology, the deforestation area (Planned) is defined as an immediate threat of deforestation specific to the site, which can be demonstrated by the legal permission for deforestation, since every rural property must maintain an area of native vegetation as the Legal Reserve (RL)[53], in addition to the Permanent Preservation Area (APP)[54], observing the minimum required according to the biome. The percentage required by law is 80% for properties located in the Legal Amazon. Thus, deforestation in the Legal Amazon of a maximum of 20% of the area of the property is legally permitted. The authorizations for alternative land use present a series of conditions that must be met in accordance

[53] Área de Reserva Legal - Portal Embrapa. Accessed on: 22/12/2023

[54] <https://www.embrapa.br/codigo-florestal/entenda-o-codigo-florestal/area-de-preservacao-permanente#:~:text=Conforme%20defini%C3%A7%C3%A3o%20da%20Lei%20n.%2012.651%2F2012%2C%20%C3%81rea%20de,solo%20e%20assegurar%20o%20bem-estar%20das%20popula%C3%A7%C3%B5es%20humanas >. Accessed on 22/12/2023

with the state's environmental legislation. The prohibition of logging in APPs stands out among the conditions of the licence. Besides the legal permissibility for deforestation, the suitability of the project area for forest conversion into another alternative land use was evaluated considering factors such as soil, climate (see section 2.1.5) and, finally, access to relevant markets and the main economic activity of the region. The municipalities of Urucará and Nhamundá are economically based on extractivism and family agriculture. About 96,76% of the municipality's territory is composed of natural forest formations, 2,21% is composed of water bodies and the and the remainder is made up of land dedicated to agriculture, non-vegetated areas and non-forest formations[55]. The municipality of Nhamundá is 89,75% composed of natural forest formations, 7,08% is composed of water bodies and the remainder is made up of land dedicated to agriculture, pastures, non-vegetated areas and non-forest formations[56]. The Paratucu River, which borders the project area, is an important means of navigation and is suitable for transporting agricultural, timber and livestock production. Therefore, it is assumed that the project area is inserted in an economic matrix dominated by livestock activity, being the main economic activity in the region.

Deforestation rate

The deforestation rate (D%planned,ei) is defined according to the management plan, or by the analysis of proxy areas presented in Table 26. In the case of the project under study, there is a management plan defined for the project areas (PA), with a planned rate of deforestation of 5%. To verify coherency and have a comparison with between the planned 5% rate defined in our management plan and the proxy analysis method, we sought to identify proxy areas among the municipalities adjacent to the municipality where the project areas are located, located in the state of Amazonas, such as, Urucará and Nhamundá.

The region presents the same pattern in the advance of deforestation, and the proxy areas can be considered adequate for the quantification of the rate of planned deforestation estimated for the baseline, according to the tool "VCS VMD0006 - Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation". For the determination of the proxy areas, the land use and land cover class chosen for the project baseline was pasture. For the analysis of the Risk of Abandonment (Risk of Abandonment, section 1.5, VMD0006, Version 1.3), properties were selected with land use classified as "Pasture" according to the MapBiomas 8.0 collection updated for the year 2022, considering that none of the selected areas had restoration or revegetation by specific activities or abandonment, remaining the land use chosen for the baseline comparison due to the recent update date of the MapBiomas base.

[55] Plataforma - MapBiomas Brasil Accessed on: 14/12/2023

[56] Plataforma - MapBiomas Brasil

We selected only areas of private properties that are registered in the Rural Environmental Cadastre (CAR), with a duly registered legal reserve. The base registries were accessed in the month of December 2023.

After initial filtering by baseline land use, by property registration in official government databases, each proxy area was selected based on the following criteria, according to the cited tool:

- Land conversion practices must be the same as those used by the baseline agent or agent class.
- Land conversion practices are the same as those used by the baseline agent and are similar in large-scale clearings in the same region, usually involving mechanised clearing and burning;
- Post-deforestation land use should be the same in the proxy areas as expected in the project area under business as usual.
- As detailed above, the areas were chosen according to the post-deforestation land use type, classified as "Pasture" by MapBiomas for the year 2022 according MapBiomas.

The proxy areas should have the same type of management and land use rights as the proposed project area in business as usual. All the chosen proxy areas are privately owned, just like the project areas.

If suitable sites exist, they should be in the immediate project area; if an insufficient number of sites exist in the immediate project area, sites should be identified elsewhere in the same country as the project; if an insufficient number of sites exist in the country, sites should be identified in neighbouring countries.The source consulted was the CAR[57] base (SICAR, 2023).

Deforestation agents in proxy areas must have deforested their lands under the same criteria that project lands must follow (legally permitted and suitable for conversion).

Only legally deforested areas were considered, with proportions within the legal limits. The proxy areas were analysed for Legal Reserve (LR) and Permanent Protection Area (PPA) areas registered in the CAR, and only deforestation in areas outside of legally protected areas was accounted for.

[57] Platform for public access to environmental cadastre data of Brazilian rural properties. Available at: <https://www.car.gov.br/publico/imoveis/index>. Accessed on: 20/04/2023.

Deforestation in the proxy area must have occurred in the 10 years prior to the baseline period. The areas were deforested between 2010 and 2020, in the 10 years prior to the project start date, March 2021. The source consulted was PRODES[58] (INPE, 2022). The following conditions were met:

- Forest types around the proxy area or in the proxy area prior to deforestation must be in the same proportion as in the project area (± 20%). The reference source was the BDIA[59] portal (IBGE, 2022), which contains the most detailed official vegetation delineations currently available.
- Soil types suitable for the land use practice used by the deforestation agent must be present in the proxy area in the same proportion as the project (±20%). The reference source was the BDIA portal (IBGE, 2022), which contains the most detailed official pedology delimitations currently available.
- The ratio of "gentle" (slope <15%) to "steep" (slope ≥15%) slope classes in proxy areas should be ±20% in the same ratio in the project area. Slope was calculated using the SRTM Digital Elevation Model provided by the Brazilian Agricultural Research Corporation[60] (EMBRAPA, 2023).
- The elevation classes (500m classes) in the proxy areas should be in the same proportion as in the project area (± 20%). The hypsometry was calculated using the SRTM Digital Elevation Model provided by Embrapa. Initially numerous proxy areas were selected and after filtering based on the VMD0006 tool, only those that best met legal deforestation conditions were maintained. With this, we defined 7 proxy areas that meet the legal proportions of deforestation, area size and all the conditions related to the methodological criteria (Table 26).

Table 26. Selected proxy areas, deforestation, deforestation rate, and legal reserve (LR).

Proxy	Property Code (Rural Environmental Cadastre - CAR)	Area (ha)	Deforestation (ha)	APP area	Max Useful Area	Deforestation on Max Useful Area (%)	Deforestation Rate on full area
1 (Novo Olinda do norte)	AM-1303106-22B52AB02DBB4AC89A6C1A15E323A65A	3204,63	173,16	154,87	606,29	25,54	2,554

[58] PRODES is a mapping of accumulated deforestation in the Amazon, carried out by the National Institute for Space Research available on the Terrabrasilis platform. Available at: <http://terrabrasilis.dpi.inpe.br/downloads/>. Accessed on: 20/04/2023.

[59] BDIA (Environmental Information Database) is the environmental database made available by the Brazilian Institute of Geography and Statistics. Available at: <https://bdiaweb.ibge.gov.br/>. Accessed on: 20/04/2023

[60] EMBRAPA, 2023. "Brazil in relief." Available at: <https://www.cnpm.embrapa.br/projetos/relevobr/>. Accessed on: 20/04/2023.

2 (Manaus)	AM-1302603-46B782883661498CA2901BE4A521EFE5	2491,60	223,4	317,28	453,64	69,94	6,994
3 (Nhamunda)	AM-1303007-02D40A5872324E12A749D908F0967BCD	750,00	36,28	127,30	142,74	89,18	8,918
4 (Nhamunda)	AM-1303007-1872F1F9A9BF47BAA3317D2B2D52C857	130,00	1,68	18,25	25,67	71,09	7,109
5 (Itacoatiara)	AM-1301902-40C461D53D064C91847B351A84C005F9	582,32	0	101,97	116,46	87,56	8,756
6 (Novo Aripuana)	AM-1303304-A4934536EC0C4D0B9F2AE9E7FD210432	37196,73	603,80	1077,58	7318,59	14,72	1,472
7 (Novo Aripuana)	AM-1303304-17776F5114194D5B9E90CDCE1B87B2F0	1523,61	23,01	242,19	300,12	80,70	8,070
Medium deforestation rate of useful area, per year							6,27%

The vegetation and land cover types (Table 21), slope and elevation classes (Table 22), and soil classes (Table 23) found in the project area and selected proxy areas are presented in the tables below.

Table 27. Land cover types

	Area (%)						
Area	Shrub Campinarana	Grassy-Woody Campinarana	Alluvial Open Ombrophylous Forest	Lowland Open Ombrophylous Forest	Submontane Open Ombrophylous Forest	Lowland Dense Ombrophylous Forest	Livestock (pasture)
Project	0	0	0	0	0	100	0
Proxy							

1	0	0	0	0	0	100	0
2	0	0	0	0	0	100	0
3	0	0	0	0	0	100	0
4	4	0	0	0	0	96	0
5	0	0	0	0	0	100	0
6	0	0	0	0	0	100	0
7	0	0	0	0	0	100	0

Table 28. Slope classes and elevations in the project area and proxy areas.

Area	Slope		Elevation			
	< 15%	> 15%	Mean	Minimum	Maximum	Amplitude
Project	76	24	99	8	206	198
Proxy						
1	97	3	39	7	51	44
2	22	77	125	81	154	73
3	66	34	60	4	123	99
4	86	13	76	27	116	89

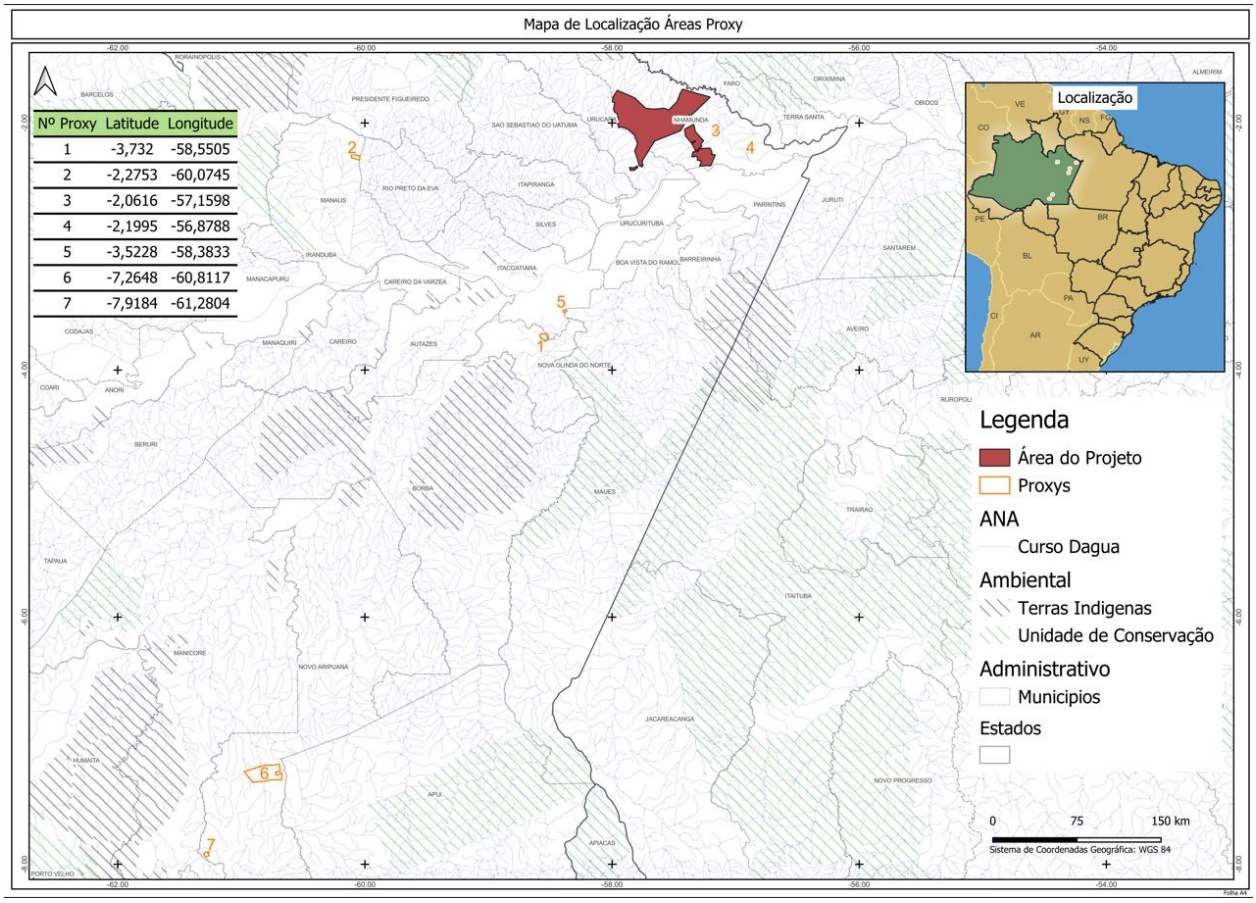
5	97	3	32	6	47	41
6	90	10	92	51	192	141
7	99	1	103	81	124	42

Table 29. Soil classes in the project area and proxy areas.

	Area (%)						
Area	RedYellow Argisol	Haplic Gleysol	Yellow Latosol	Red-Yellow Latosol	Fluvic Neossolo	Haplic Luvisol	Argiluvic Plinthosol
Project	0	0	100	0	0	0	0
Proxy							
1	0	0	99	0	1	0	0
2	0	0	100	0	0	0	0
3	0	0	100	0	0	0	0
4	0	0	100	0	0	0	0
5	0	0	100	0	0	0	0
6	33	0	67	0	0	0	0
7	2	0	98	0	0	0	0

According to data from MapBiomas Collection 8 (MapBiomas, 203), these areas maintained land use for the period 2009 to 2019 over 10 years (Figure X), as shown in the images below. The land conversion practices identified were the same as those used by the baseline agent, and the post-deforestation land use identified was livestock.

Figure 56. Distribution of the 7 selected proxy areas close to the property where the Tapera project is located.



Vegetation in the proxy areas

The three conditions of similarity proposed by VMD0006 are met. The forest type around the proxy area and in the proxy area before deforestation is Lowland Dense Ombrophylous Forest in 100% of the area, as shown in Figures 57(a),(b),(c), (d), (e), (f),(g). The vegetation and land cover types (Table 21), slope and elevation classes (Table 22), and soil classes (Table 23) found in the project area and selected proxy areas are presented in the tables below.

Figures 57.a, 57.b, 57.c, 57.d, 57.e, 57.f and 57.g. Vegetation at proxy areas



Economic activities and accessibility to relevant markets

Deforestation agents around proxy areas have the same characteristics found in the proximity of the project area: nearby highways, refrigerators, warehouses, and nearby communities. This proximity to such markets facilitates agricultural, livestock, and timber operations.

Types of soil in the proxy areas

The type of soil found in the proxy areas is suitable for livestock in the region, the project area is covered 100% of Latosoil, the same soil is present in 100% of proxy areas, and in the same proportion as Tapera area (Figures 58 a-g)

Figures 58.a, 58.b, 58.c, 58.d, 58.e, 58.f, 58.g. Proxy areas type of soil.



Table 30 provides an overview of the soil classes in a project area and various proxy areas. This categorization is crucial for understanding the land's agricultural potential, ecological characteristics, and suitability for several types of land use.

Table 30. Soil classes in the project area and proxy areas

	Area (%)						
Area	RedYellow Argisol	Haplic Gleysol	Yellow Latosol	Red-Yellow Latosol	Fluvic Neossolo	Haplic Luvisol	Argiluvic Plinthosol
Project	0	0	100	0	0	0	0
Proxy							
1	0	0	99	0	1	0	0
2	0	0	100	0	0	0	0
3	0	0	100	0	0	0	0
4	0	0	100	0	0	0	0
5	0	0	100	0	0	0	0
6	33	0	67	0	0	0	0
7	2	0	98	0	0	0	0

The soil classes present in the proxy areas and the project area include Red-Yellow Argisol, Haplic Gleysol, Yellow Latosol, Red-Yellow Latosol, Chromic Luvisol, Haplic Luvisol, and Argiluvic Plinthosol. Analysing the data:

Dominance of Haplic Gleysol in the Project Area: The project area is entirely composed of Haplic Gleysol, as indicated by the 100% representation. This suggests a dominance of this soil type in that specific location.

Variability in Proxy Areas: The proxy areas show more variability in soil composition:

- Proxy Area 1: Dominated by Yellow Latosol (99%), with a small percentage of Fluvic Neossolo (1%).
- Proxy Areas 2, 3, 4, and 5: These areas are similar to the project area, with 100% Haplic Gleysol.
- Proxy Area 6: Shows a significant presence of RedYellow Argisol (33%) along with Haplic Gleysol (67%). This is the only proxy area with a notable presence of another soil type besides Haplic Gleysol.
- Proxy Area 7: Mostly Haplic Gleysol (98%) with a small percentage of RedYellow Argisol (2%).

Implications for Soil Characteristics and Management:

- Haplic Gleysol: The dominance of Haplic Gleysol in most areas suggests that soil management strategies should be tailored to this type. This soil type is typically wet, often found in low-lying areas, and may require specific drainage or irrigation strategies.
- Presence of RedYellow Argisol in Proxy Area 6: The significant presence of RedYellow Argisol in Proxy Area 6 indicates a different soil management approach might be needed for this area, focusing on the characteristics of Argisols, such as their typical clay-enriched subsoil and potential for nutrient leaching.

Comparative Analysis for Environmental or Agricultural Projects:

When comparing the project area to the proxy areas, it's important to note the uniformity of the project area versus the variability in the proxy areas. This can impact environmental assessments, agricultural potential, and suitability for different types of land use.

From this analysis, it's evident that while some proxy areas share similarities with the project area, each has distinct soil characteristics. This diversity in soil types can significantly influence land use decisions, agricultural potential, and environmental management practices in these areas.

Slope classes in proxy areas

The proportion of “soft” slope classes (slope <15%) to steep (slope >/15%) in proxy areas is equal to the ratio in the project area, likewise the elevation classes (500m classes) in these proxy areas are in the same proportion found in the project area. Therefore, 100% of the areas are situated in topographic conditions 100% similar, in slope less than or equal to 15% and at altitudes of 500 metres, as illustrated in Figures 59 (a-g). It is worth mentioning that these conditions are also favourable for the development and management of livestock. This is possible to analyse also on table 29.

Figures 59.a, 59.b, 59.c, 59.d, 59.e, 59.f, 59.g. Slope ranges identified, in percentage, in proxy areas

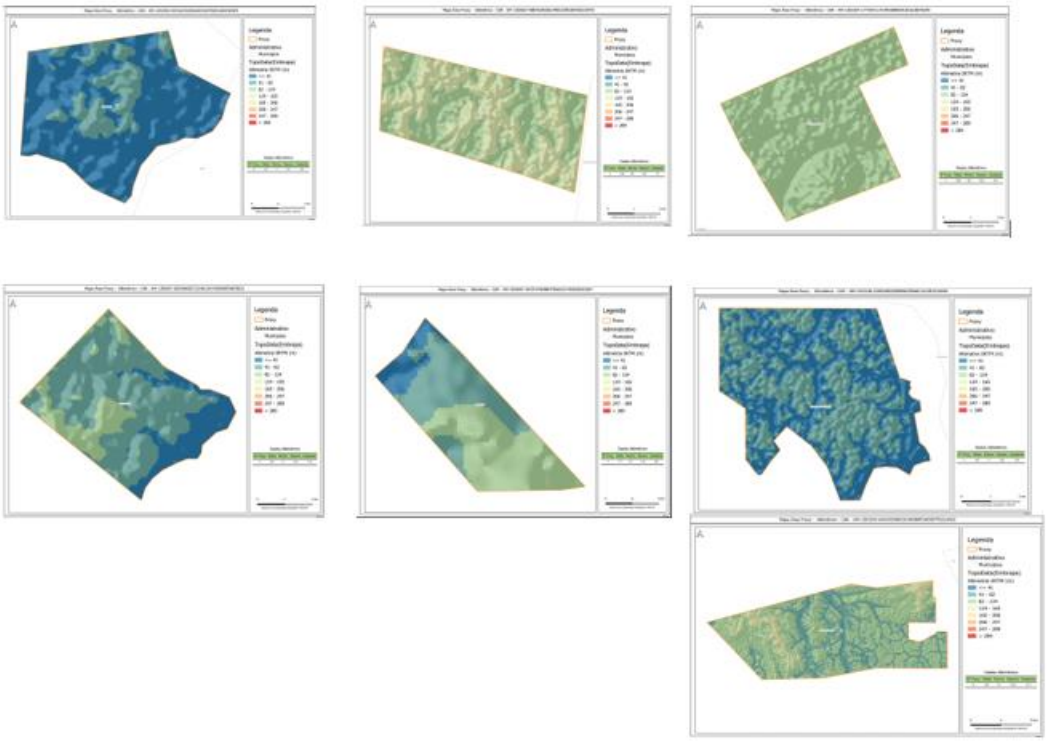


Table 31. Slope classes and elevations in the project area and proxy areas.

Area	Slope		Elevation			
	< 15%	> 15%	Mean	Minimum	Maximum	Amplitude
Project	76	24	99	8	206	198
Proxy						
1	97	3	39	7	51	44
2	22	77	125	81	154	73
3	66	34	60	4	123	99
4	86	13	76	27	116	89
5	97	3	32	6	47	41
6	90	10	92	51	192	141
7	99	1	103	81	124	42

The data from Table 28 presents information on slope classes and elevations in a project area and several proxy areas. While the data for the project area is unspecified (marked 'xx'), the data for the proxy areas is detailed and provides insight into the topographical characteristics of these regions.

Proxy Area 1

- **Slope**:This area primarily consists of gentle slopes (< 15%) comprising 94% of the area, with a minor portion (6%) being steeper slopes (> 15%).
- **Elevation**: It exhibits a mean elevation of 205 metres, with a range from a minimum of 146 metres to a maximum of 249 metres. The elevation amplitude is 103 metres, indicating moderate variation in terrain height.

Proxy Area 2

- **Slope**: Entirely composed of gentle slopes (< 15%), suggesting a relatively flat terrain.
- **Elevation**: The mean elevation is lower at 149 metres, with a narrower range (minimum of 125 metres and a maximum of 160 metres), and an amplitude of only 35 metres, signifying minimal elevation variation.

Proxy Area 3

- **Slope**: Like Area 2, this area is entirely made up of gentle slopes.
- **Elevation**: It has the least variation in elevation among the listed areas, with a mean elevation of 137 metres, a minimum of 118 metres, and a maximum of 145 metres, resulting in an amplitude of 27 metres. This suggests a very flat landscape.

Proxy Area 5

- **Slope**: Mostly gentle slopes (97%), with a small presence of steeper slopes (3%).
- **Elevation**: A mean elevation of 173 metres is noted, ranging from 145 to 214 metres, leading to an elevation amplitude of 69 metres. This indicates some variation in terrain but is predominantly gentle.

Proxy Area 6

- **Slope**:This area has a higher proportion of steeper slopes (9%) compared to the other areas, with 91% being gentle slopes. This suggests a more varied topography.
- Elevation:** The area has a higher mean elevation at 237 metres, with a range from 164 to 300 metres, and an amplitude of 135 metres, indicating significant variation in terrain elevation.

From this analysis, it's clear that the topographical features of these proxy areas vary considerably. Areas like Proxy Area 2 and 3 are characterised by very flat terrains, while Proxy Area 6 shows more variation in both slope and elevation. These differences are crucial for considerations such as water management, soil erosion risk, agricultural potential, and biodiversity conservation in each area.

Analysing the above results it is possible to consider that the project area is suitable for conversion to pasture, since it presents vegetation classes, slope, altitude and soils similar to the proxy areas, just as the proxy areas are likely to be used to calculate the average deforestation rate for the project.

The deforestation rate for each proxy area was calculated from data obtained from PRODES (INPE, 2022). The PRODES data are official and accepted by official accrediting bodies for voluntary carbon markets. The annual deforestation rate was calculated using the equation described in VMD0006:

$$D\%_{planned,i,t} = \left(\sum_{pn=1}^{n*}\left(D\%_{pn} / Yrs_{pn}\right)\right) / n$$

where:

D%planned, i, t = Projected annual proportion of land that will be deforested in stratum i during year t. If the actual annual proportion is known and documented (e.g. 25% per year for 4 years), defined as proportion; % D%pn Percentage of deforestation in pn land parcel of a proxy area as a result of planned deforestation as defined in this module; %. Yrspn Number of years when deforestation occurred on the land parcel pn in the proxy area; years N Total number of land parcels examined Pn 1, 2, 3, ...n* plots examined in the proxy area i 1, 2, 3, ... M strata

The individual annual deforestation rates as well as the proportions of deforested areas and years of deforestation activities are presented in Table 24. The average of the annual deforestation rates for the proxy areas was calculated to be 6.29%. The map in Figure 26 presents the geographic location of the project area and the 8 selected proxy areas.

Table 32. Selected proxy areas and deforestation rate.

Year	Proxy Area						
	P1	P2	P3	P4	P5	P6	P7
1	1,96% 62,73Ha	0	1,59% 11,89ha	0	2,56% 14,89Ha	0,09% 33,71Ha	0%
10	6,79% 217,6ha	12,73% 317,28ha	18,56% 139,19ha	14,04% 18,25ha	20,06% 116,86	2,99% 1111,29ha	15,90% 242,19ha
Total 1-10 years	4,83%	12,73%	16,97%	14,04%	17,50%	2,90%	15,90%
Deforestation rate per year on total area	0,483%	1,273%	1,697%	1,404%	1,750%	0,290%	1,590%

Medium deforestation rate per year on total area	*1,21%*
Medium deforestation rate per year on useful area	*6,27%*

Deforestation Probability

The deforestation probability (L-Di) is set to 100% according to VMD0006 criteria, section 1.4.

Risk of Abandonment

The risk of abandonment is considered based on proxy areas that have the same class of deforestation agents over a 10-year interval. Properties near the project area were analysed based on the same deforestation classes and agents, climate, soil, and topography. Proxy areas are areas with similar spatial characteristics to the project area, as well as similarities in terms of activities and land use conditions. These areas were selected according to VMD0006 criteria based on geographic data analysis and the project proponent's knowledge of existing properties in the vicinity of the project area. Thus, with the land use conversion history analysis, if any of the representative areas have been abandoned for forest regeneration, then the planned deforestation activities are not eligible, and this module should not be used.

3.1.5. Additionality

According to the procedure defined in methodology VM0007, the most recent version of the tool referenced in the T-ADD was used to identify credible alternative land use scenarios and evaluate the proposed project alternatives and scenarios, and to demonstrate project additionality: "Combined tool to identify baseline scenario and demonstrate additionality in F/R CDM project activities (T-ADD) (v.01)" [61]. The additionality analysis, applying the T-ADD tool (v.1) is presented below for the APD activity.

Step 1. Identification of Alternative Land Use Scenarios for the Proposed AFOLU Project Activity

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

[61] Combined tool to identify the baseline scenario and demonstrate additionality in the CDM A/R project. Available at: <https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-02-v1.pdf>. Accessed on: 13/03/2023.

All realistic and credible land use scenarios were identified considering relevant national and/or sectoral policies and circumstances, such as historical land use practices and economic trends. The list of credible alternative land use scenarios that would have occurred on the land within the project boundary of the VCS AFOLU project is described below:

I. Continuation of the pre-project land use (business as usual)

This scenario involves the landowner´s planned deforestation to explore the commercial uses of timber products and other non-forest economic activities. The planned deforestation is, according to the national forest code, allowed to occur in 20% of the area located in the Amazon rainforest. For deforestation to occur it is necessary to submit a request for the suppression of vegetation to the competent environmental department, together with the plan for the suppression of vegetation, and with subsequent authorization from the environmental department, represented by the Single Environmental License (LAU).

The main activities that cause deforestation in the Legal Amazon region are livestock and logging when carried out intensively, and without proper management practices (Ferreira et al., 2015; Morales et al., 2021). In these deforestation processes, the first step is normally clear-cutting and logging. It is estimated that only 35% (yield) of this timber is converted into long-term wood products (IBAMA, 2016), and the non-merchantable timber that stays in the field is usually accumulated and burnt before the installation of pasture or agricultural activities. Most carbon emissions from baseline activities occur during this operation.

According to IPAAM, since 2018 there were already 645 LAUs emitted in order to approve the request for the suppression of vegetation in the Amazonas State, in which, in 2021, the largest approved area for deforestation was identified, equivalent to 36,052 ha. As the main project activity involves avoiding the planned deforestation, all project activity instances have presented their protocol for deforestation and are in the process of waiting to receive the LAU, which authorises legal deforestation on land, which demonstrates the credibility of the presented scenario.

Also, according to Freitas Junior and Barros (2021), the regions in the Legal Amazon presented higher livestock growth rates (from 1990 until 2015) than other regions in Brazil, a fact that evidence the process of expansion of bovine production in the region. Several elements contribute to this growth, which the author mentions with emphasis on the opening of roads, the establishment of tax incentives, and subsidised rural credit. As well as adequate weather conditions, with more uniform temperatures and less severe periods of drought than the other country's regions. Cattle ranching has grown in the region also

because it tends to be more profitable than other regions due to low land prices and higher pasture productivity (IMAZON, 2015).

II. Project activity on the land within the project boundary performed without being registered as the VCS AFOLU project

This scenario involves the maintenance of the preserved forest area by the landowners, with sustainable activities occurring in the project area, without any source of supplementary income. Monitoring and surveillance measures, taken by the landowners, will be made to privilege primarily their legal reserve (80% of the property), then to avoid any eventual external agent´s land invasion. Such measures were presented in Section 1.11. Description of the Project Activity of this PD, which involve:

- Patrolling and surveillance activities are taken by employees with this specific task. Monitoring bases and the necessary equipment (food, water, motorcycles, mobile phones) will be provided to support the task.
- Satellite monitoring will be done to identify fire alarms disclosed by the MapBiomas Alert data. Geospatial analysis can help to anticipate fires by tracking their advances. A deforestation pattern or regions with higher risk near the properties can be identified and provide information to create a mitigation plan.
- Leakage control is done by the project proponent together with the landowner to prevent potential carbon loss in the leakage area, which will be based on a cooperative effort with local stakeholders to promote a new approach to forest use and land use in the region.

Although being an interesting scenario, it also has the important characteristic of being completely financed by the landowners, which would not receive any kind of additional revenue executing those actions.

III. Logging being conducted through Sustainable Forest management

Logging in the State of Amazonas is a practice that occurs both legally and illegally. This is because the related environmental legislation is systematically not enforced, and for that logging would take place through or not the approval of the sustainable forest management plan. In a study conducted by Sistema de Monitoramento da Exploração de Madeira - Simex (IMAZON, 2022), it was detected in the State of Amazonas the timber farm for an area of 14,976 ha in the period (Aug/2020 Jul/2021), being 14% of the total area legally exploited. Of the unauthorised activity, most of it was identified within registered rural properties (40,9% of total illegal logging) (IMAZON, 2022).

The landowners of the properties in the Tapera project will already explore their legal reserve, conducting logging activities through their timber companies. According to the legislation on the subject, there is the possibility to execute forest management activities in the forest areas from a Legal Reserve

(80% of the property) and the other 20% (equivalent to the project area). In this scenario, the landowner would have to develop and approve a sustainable forest management plan under the competent environmental agency to explore the area.

Executing forest management to benefit from timber resources is an expensive activity but that would generate some revenue for the landowners and increase their land value. Those resources could be used to maintain the integrity of the rest of the forest area once it would start to have economic value. Although this is not the most viable economic scenario for the project area, it would still be a plausible scenario, given the possibility and the infrastructure for the treatment and sale of timber products in the region, combined with a growing demand for sustainable products.

According to the legislation on the subject, there is the possibility to execute forest management activities in the forest areas from a Legal Reserve (LR) inside an APA. In this scenario, the landowner would have to develop and approve a sustainable forest management plan under the competent environmental agency to explore his legal reserve area. Executing forest management to benefit from timber resources is an expensive activity but that would generate some revenue for the landowners. Those resources could be used to maintain the integrity of the forest area once it would start to have economic value. Actions to prevent illegal deforestation would be easier to take than such as patrolling and satellite monitoring, maybe not as strong and effective as in scenario (2), but much better than doing nothing as in scenario (1).

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

Considering the three credible alternative land use scenarios from **sub-step 1a**, a demonstration of compliance with all mandatory applicable legal and regulatory requirements was made in the next paragraphs.

I. Continuation of the pre-project land use (Business as Usual Scenario)

Maintaining the planned activities for the project area before the Tapera project, the landowners would continue to be in accordance with the pertinent legislation, already detailed in Section 2.1. All landowners have the rights to explore 20% of their lands in the most appropriate way they decide to, according to the Brazilian Forest Code, that is the plan to do and would continue to execute in this scenario. The planned activities for the project area involves the suppression of the vegetation followed by non-forest economic uses (e.g., cattle ranching and soybeans production).

II. Project activity on the land within project boundary performed without being registered as the VCS AFOLU project.

In terms of compliance, in the same way as scenario (I) both landowners from the Tapera project comply with the legality already described in Section 2.1. Besides the economic activities done in 80% of their lands, the additional activities executed to avoid invaders do not imply compliance with any legislation that has not already been complied with.

III. Logging being conducted through Sustainable Forest management

The Brazilian Forest Code (Law Nº 12,651, 2012, Brasil (2012b)) allows forest management practices inside the LR area of rural property, and there is no legal boundary to implement sustainable forest management practices in 20% of the property, after a Sustainable Forest Management Plan has been approved, meaning that additional revenues could be generated by the landowner. Some important articles state that:

> **Art. 17.** The Legal Reserve must be conserved with native vegetation cover by the rural property owner, owner or occupant in any capacity, individual or legal entity, public or private law.
>
> § 1 The economic exploitation of the Legal Reserve is admitted through management sustainability, previously approved by the competent body of SISNAMA, in accordance with the modalities provided for in art. 20.
>
> **Art. 20.** In the sustainable management of the forest vegetation of the Legal Reserve, practices of selective exploitation adopted in the modalities of sustainable management without purpose commercial for consumption on the property and sustainable management for forest exploitation with commercial purpose.
>
> **Art. 22.** Sustainable forest management of the Legal Reserve vegetation with purpose commercial activity depends on authorization from the competent body and must comply with the following guidelines:
> I - do not de-characterize the vegetation cover and do not harm the conservation of the native vegetation of the area;
> II - ensure the maintenance of species diversity;
> III - conduct the management of exotic species with the adoption of measures that favour the regeneration of native species.

Sub-step 1c. Selection of baseline scenario

Based on the baseline scenario described in Section 3.1.4 and all the common practices and the BAU scenario, the most credible scenario for Tapera to happen without the revenue of the carbon credits would be scenario (I) the continuation of the pre-project land use scenario.

Scenario (II) is easily rejected considering that it would add only costs to the landowners, and no additional revenue to them.

Scenario (III) was discarded mainly because scenario (I) presents more possibilities of non-forest economic uses for land, with higher potential for economic gains in the short, medium, and long term.

Step 2. Investment analysis

The proposed project activity, without the revenue from the sales of VCUs, is financially less attractive than Scenario I (defined as the BAU scenario), to demonstrate that, according to VT0001 (VERRA, 2012b), an investment analysis will be performed.

Sub-step 2a. Determine appropriate analysis method

According to VT0001 (VERRA, 2012b), to determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis, it's required to identify if the VCS AFOLU project generates no financial or economic benefits other than VCS related income. As the VCS AFOLU project generates financial or economic benefits other than VCS related income, the simple cost analysis (Option I).

Sub-step 2b. Option I. Apply simple cost analysis

The costs to implement REDD+ activities involve community engagement, monitoring and surveillance of the properties´ areas against illegal squatters, a decent infrastructure for the local workers etc. All the most relevant costs for implementing structured monitoring, surveillance, and fire protection systems were identified in partnership with the landowners and are described in Table 3.5 and Table 3.6 below.

Table 33 General CAPEX for infrastructure and equipment.

CAPEX	Unit costs [R$]	Units required	Total cost [R$]
Vehicles	300,000.00	1	300,000.00
Main building surveillance	40,000.00	4	160,000.00
Energy generator	5,000	4	20,000.00
Motorcycle	25,000.00	2	50,000.00
Triciclo	20,000,00	1	20,000,00
Signalling plate	300.00	20	6,000.00
Fire brigade equipment kit	3,000.00	12	36,000.00

Table 34 General OPEX for maintaining the surveillance and monitoring system.

OPEX	Annual cost/unit [R$]	Units required	Total annual cost [R$]
Field team	25,000.00	10	250,000.00
Motorcycle fuel	2,000.00	2	4,000.00
Generator fuel	20,000.00	2	40,000.00
Vehicles fuel	10,000.00	1	10,000.00
Surveillance	25,000.00	2	50,000.00
Courses and training	20,000.00	10	200,000.00
Remote monitoring (satellite	70,000.00	1	70,000.00
Social survey and community engagement	50,000.00	1	50,000.00

Considering that the AFOLU Project activity does not generate any financial or economic benefits other than VCS related income, without the revenues of carbon credits, a systematic conservation activity for the areas would not be possible to occur.

Step 3. Barrier Analysis

The VT0001 (VERRA, 2012b) requires investment analysis (Step 2) or Barrier Analysis (Step 3). The list below shows the most relevant barriers that would prevent the implementation of the type of project activity proposed without the revenue from the sale of VCUs:

- Investment barriers: financial flows to private area conservation are insignificant in Brazil;
- Institutional barriers: lack of enforcement of forest or land use related legislation is typical in the Tapera project area;
- Barriers related to local tradition: local customs and market conditions favour livestock as a means of livelihood for local communities;
- Barriers due to social conditions and land use practices: widespread illegal practices are well known in the Tapera project area.

The barriers identified do not impede the implementation of "Scenario III". On the contrary, the lack of financial resources for conservation, effective public policies to reduce deforestation and promote sustainable socioeconomic development, associated with the inherent difficulty of public power to curb illegal activities drives illegal deforestation in Brazil (Result of VT0001 v3.0 sub-phase 3b).

Step 4. Common practices analysis

In Brazil, there are few legal, regulated and operational mechanisms or policies capable of effectively avoiding legal deforestation on private properties. We consider for this analysis the mechanism called Environmental Reserve Quota (CRA)[62].

Although created in the 2012 Brazilian Forest Code, the mechanism of CRAs was only regulated in December 2018. Environmental Reserve Quotas are titles that represent an area covered by native vegetation on a property with an "excess of Legal Reserve" that can be acquired by owners with a "deficit of Legal Reserve" in the same biome, to regularise the rural property. One title represents 1 hectare with preserved forest cover. As these titles can be traded, the mechanism can be indicated as a similar initiative to a REDD+ APD project, but essential differences between them can be observed. As CRAs can only be traded within the same biome and to specific stakeholders, the regulatory framework is different from the one relevant for carbon projects. In addition, since forest cover in the Amazon biome exceeds 80%, the demand for bonds becomes very low, implying a low supply. This effect can be evidenced by the amount of bonds available in the market. In a search carried out in the main CRA[63] transaction platform, only 55 CRAs titles were offered for the entire State of Amazonas, and 110 for the entire Amazon biome, offering their remaining native vegetation surplus for "Legal Reserve compensation" in other properties.

However, the fact that they are offered in the market does not mean that a transaction (or payment for forest surplus) has taken place. As a result, it can be argued that the impacts of this mechanism are limited in the Amazon biome. In addition, the CRA mechanism does not consider forest carbon stocks, but only forest cover, thus not serving the purpose of offsetting GHG emissions. Thus, it is concluded that, although similar, the CRA mechanism presents essential distinctions in relation to carbon projects.

Conserving private forest areas in the state of Amazonas as a whole is an extremely rare practice. Conservation activities in larger areas are usually carried out in public areas, such as Conservation Units, federal and state conservation units. Although most of Brazil's agricultural production is deforestation free, it is observed that a fraction of the properties in the Amazon and Cerrado account for 62% of all potentially illegal deforestation and that about 20% of soybean exports and at least 17% of beef exports from both biomes to the EU may be contaminated with illegal deforestation [64].

In addition, the practice of implementing a structured monitoring system by private landowners in the Amazon without the benefit of carbon credits is a rare practice, being commonly observed on public lands, by measures adopted by the State Governments for biodiversity conservation.

---

[62] Environmental Reserve Quotas (CRAs) are securities representing vegetation cover that can be used to compensate for the lack of Legal Reserve on other properties. Available at: <https://www.bvrio.org/pt-br/mercado-de-cotas-de-reserva-ambiental/>. Accessed on 13/03/2023.

[63] CRA transaction platform. Available at: https://past.bvrio.org/florestal/cra/plataforma/prepara.do. Accessed on:31/03/2023.

[64] Questions and Answers about RPPN. Available at: https://www.gov.br/icmbio/pt-br/servicos/servicos-do-icmbio-no-gov.br/criesua-rppn/perguntas-e-respostas-sobre-rppn. Accessed on 14/03/2023.

The SNUC law allows the creation of conservative units in private lands (e.g. Private Reserve of Natural Heritage - Reserva Particular do Patrimônio Natural - RPPN), other mechanisms such as environmental servitude (Law Nº 6,938, 1981 (Brasil, 1981b)) and payment for environmental services (Law Nº 14,119, 2021 (Brasil, 2021)) can be seen as mechanisms for preserving and encouraging owners to take similar measures, however less effectively compared to a REDD+ project.

In the case of Environmental servitude, there are some possible benefits limited to the 20% of the land that the landowner has the right to explore, if implemented the conversion of the area to conservation matters, as an extension of its legal reserve. However, the financial and legal benefits do not exceed the opportunity cost of the local market (e.g., timber, livestock, and agriculture). Therefore, there are severe differences between the conservation mechanisms presented by the environmental servitude versus the proposed VCS AFOLU Project.

The implementation of payment for environmental services in the region is not yet effective to implement the proposed VCS AFOLU project activities, as the financial barrier exists while this is a recent mechanism in the Amazonas State.

According to the Brazilian government, the RPPN are important because contribute to the expansion of protected areas in the country; have highly positive indices for conservation, especially if considered the cost and benefit ratio; are easily created in relation to the other categories of UC; enable the participation of private initiative in the national conservation effort; contribute to the protection of the biodiversity of Brazilian biomes. The general benefits of adhering to the program are preserved property rights; exemption from the ITR related to the area created as RPPN; priority in the analysis of projects by the National Environment Fund (FNMA); preference in the analysis of agricultural credit applications, with official credit institutions, for projects to be implemented in properties that contain RPPN in its perimeter; possibilities of cooperation with private and public entities in the protection, and management of the Unit (ICMBio, 2020). Despite being apparently beneficial to landowners, the creation of an RPPN on the property is ineffective to stop local deforestation, considering both the high cost of opportunity in the face of cattle ranching, as well as the dismantling of environmental agencies seen in recent years in Brazil. It is also a mechanism that presents essential distinctions between the proposed AFOLU project activity, as the resources from the RPPN are insignificant given the REDD+ project costs, and there is no MRV-A system that would give the landowner any capability in implementing a structured monitoring and surveillance system around the properties.

The main alternative mechanism for carbon credit in the Amazon comes from 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 (FundoAmazonia, 2022). However, there are some fundamental differences between the accounting and financing mechanism of projects available in Amazon Fund versus the VCS REDD+ projects. In the first

one, the project would only be possible if it was provided within the available budget of the fund, furthermore, the mechanism of accounting for the GHG emissions reductions adopts different MRV-A mechanisms, besides that the program has had no more projects approval since 2019 (CNN, 2022).

As it is possible to observe there are some forest conservation mechanisms available in the market with a limited applicability range, and with essential distinctions between the proposed VCS AFOLU project activity and with low effectiveness in avoiding the planned deforestation for the 20% of the property in the Amazon biome, the proposed VCS AFOLU project activity is not the baseline scenario and, hence, the Tapera REDD+ Grouped Project is additional.

3.1.6. Methodology Deviations

The Tapera project has no methodology deviations.

3.2. Quantification of GHG Emission Reductions and Removals

3.2.1. Baseline Emissions from Planned Deforestation - APD

Baseline emissions are estimated according to VM0007 v1.7 - REDD+ Methodology Framework (REDD+ MF) and VMD0006 v1.3 - Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL-PL). This module allows estimating GHG emissions related to planned deforestation on forest lands that are legally authorized and documented to be converted to non-forest land. As presented in Section 2.2, these areas would be deforested in the absence of the REDD project activity and converted to pasture for cattle rising, as presented in Table 35.

Table 35. Stratum of the Tapera project.

Stratum I	Area (ha)
Lowland Dense Ombrophylous Forest	55,192.77
Total	55,192.77

Net carbon stock changes and GHG emissions from the project were calculated using two modules of the VM0007 methodology. To estimate baseline emissions related to APD areas, module VMD0006 "Estimating baseline changes in carbon stock and GHG emissions from planned forest clearing/degradation and planned wetland degradation (BL-PL)" was used. APD areas comprise forest

land on which proponents can apply for permission to clear forest areas (20% of the property according to the legal limit prescribed in the Brazilian Forest Code).

The annual area of baseline planned deforestation (AAplanned,i,t) is calculated according to VMD0006 BL- PL v1.3 (Equation 1):

$$AAplanned,i,t = (Aplanned,i * D\%planned,i,t) * L - Di \quad \text{Equation 1}$$

Where:

AAplanned,i,t	Annual area of baseline planned deforestation for stratum *i* at time t; ha.
Aplanned,i	Projected annual proportion of land that will be deforested in stratum *i* during year *t*; ha
D%planned,i,t	Total area of planned deforestation over the baseline period for stratum *i*; ha.
L − Di	Likelihood of deforestation for stratum *i*; %.

The total area of planned deforestation over the baseline period (Aplanned) is determined according to what is recognized as an immediate site-specific threat of deforestation, which, in its turn, is a function of the legal permissibility for deforestation. In our recent study involving the analysis of various proxies, we calculated a deforestation rate of 6.29%. However, for the purposes of our draft suppression plan, we have decided to apply a more conservative rate of 5% per year. This rate is consistent with the findings from the study of proxies, allowing for a balanced approach between environmental conservation and legal feasibility. For a complete discussion of the □□□□□□□□ determination, see Section 3.1.4. The Aplanned,I was considered to be 55,192.77 ha. The projected annual proportion of land that will be deforested in stratum i during year t (D%planned,,t) is determined according to vegetation suppression authorizations issued by the competent environmental agencies in each state. These authorizations should be viewed as verified plans with known and recorded actual annual deforestation proportions. According to the specifications of VMD0006 v1.3, L − Di is set to 100% because only private areas are included by the project (Table 36).

Table 36.. Total and annual area of planned deforestation over the baseline scenario.

L – Di	5%
Year	**$AA_{planned,i,t}$**
2021	2759.64
2022	2759.64

L – Di	5%
Year	**$AA_{planned,i,t}$**
2023	2759.64
2024	2759.64
2025	2759.64
2026	2759.64
2027	2759.64
2028	2759.64
2029	2759.64
2030	2759.64
2031	2759.64
2032	2759.64
2033	2759.64
2034	2759.64
2035	2759.64
2036	2759.64
2037	2759.64
2038	2759.64
2039	2759.64
2040	2759.64

L – Di	5%
Year	**$AA_{planned,i,t}$**
Total (Aplanned,i)	55,192.77

The total area of planned deforestation over the baseline period (Aplanned,i,t) in the project area (Table 36) is determined according to what is recognized as a site-specific immediate deforestation threat, which in turn is a function of the legal permissibility for deforestation, the suitability of the project area for conversion to alternative non-forest land use, government approval for deforestation and a management plan for the deforestation of the project area. For details on the determination $A_{planned,i,t,}$ see section **3.1.4.**

Change in Carbon Stock in the Baseline Scenario

This section presents a reservoir's expected changes in carbon stocks in the baseline scenario. Initial stocks and stocks in post-deforestation are obtained by peer-reviewed literature. This parameter will be updated when the Tapera project biomass inventory is made in the project area.

The project is located in the Amazon Biome, Amazonas, Brazil. Based on the correlation between geospatial data (BDiA, 2022c) and biomass data from the Amazon biome published in the literature (Nogueira et al., 2015), biomass was estimated in the project region. In the project area, only one stratum was identified, namely the Dense Lowland Ombryphilous forest (Db). According to Nogueira et al. (2015), the average biomass values of this stratum of the Amazon Forest are shown in Table 4.2. As already seen, after deforestation, the area would possibly become pasture, so post-deforestation values were considered pasture biomass according to Silva Neto et al. (2012) also present in Table 4.2.

Table 37. The total value of biomass, carbon, and carbon dioxide equivalent for dense lowland Ombriphylous forest (Db) and Pastures of Brachiaria brizantha cv. Marandu (Br)

Forest class	Nº of plots (n)	Above ground biomass			Aboveground carbon		Aboveground CO2-eq		Belowground biomass		Belowground carbon		Belowground CO2-eq		Total biomass		Total Carbon		Total Carbon CO2-eq	
		Mean	SD	$\sigma_{\bar{x}}^{c65}$	Mean	$\sigma_{\bar{x}}^{c}$	Mean	$\sigma_{\bar{x}}^{c}$	Mean	$\sigma_{\bar{x}}^{c}$	Mean	$\sigma_{\bar{x}}^{c}$	Mean	$\sigma_{\bar{x}}^{c}$	Mean	$\sigma_{\bar{x}}^{c}$	Mean	$\sigma_{\bar{x}}^{c}$	Mean	$\sigma_{\bar{x}}^{c}$
		Mg ha^{-1}			tC ha^{-1}		$tCO_{2\text{-}e}$ ha^{-1}		Mg ha^{-1}		tC ha^{-1}		$tCO_{2\text{-}e}$ ha^{-1}		Mg ha^{-1}		tC ha^{-1}		$tCO_{2\text{-}e}$ ha^{-1}	
Dense Lowland Ombryphilous forest (Db)[66]	533	**272,98**	76.72	6.51	**128.3**	7.09	**470,43**	25.99	**84.68**	11.59	**39.8**	**5.63**	**145.93**	20.64	**357.66**	13.30	**168.10**	9.05	**616.36**	33.19

[65] Considering the conversion factor for a 95% confidence interval of 1.96. Note: SD – standard deviation; $\sigma_{\bar{x}}$ – standard error
[66] Nogueira et al. (2015)

Pastures of Brachiaria brizantha cv. Marandu (Br)[67]	**36**	**7.87**	3.48	1.14	**3.70**	0.56	**13.56**	2.04	**1.74**	0.38	**0.82**	**0.18**	**3.00**	0.66	**9.61**	1.20	**4.52**	0.59	**16.56**	2.15

[67] Silva Neto et al. (2012)

Aboveground Tree Biomass

The baseline carbon stock change in aboveground tree biomass (ΔCABtree,i) is calculated according to the difference between the forest carbon stock in aboveground tree biomass (CABtree ,i) and the post-deforestation carbon stock in aboveground tree biomass (CABtreepost,i), according to VMD0006 v1.3 (Equation 2) (Table 4.3):

$$\Delta CABtree,I = CABtree\ bsl\ ,I - CABtreepost,i \qquad \text{Equation 2}$$

Where:

ΔCABtree,i	Baseline carbon stock change in aboveground tree biomass in stratum *i*; t CO_{2-e} ha^{-1}
CABtreebsl,i	Forest carbon stock in aboveground tree biomass in stratum *i*; t CO_{2-e} ha^{-1}
CABtreepost,i	Post-deforestation carbon stock in aboveground tree biomass in stratum *i*; t CO2- e ha-1
i	1, 2, 3, … M strata

Forest carbon stock in aboveground tree biomass (CABtree,bsl) was estimated based on peer-reviewed literature (Nogueira et al., 2015). The carbon component of dry matter of 0.47 t C t $d.m^{-1}$ is used when converting biomass measured in Mg ha^{-1} to t C ha^{-1} (IPCC, 2006b). The value of t CO_{2-e} ha^{-1} was obtained considering the molar weight of CO_2 (44 g mol^{-1}) divided by C (12 g mol^{-1}) Equation 3.

$$C_{AB_{tree\ bsl,i}} = ab * CF * \frac{44}{12} \qquad \text{Equation 3}$$

Where:

$C_{AB\_tree,bsl,i}$	Forest carbon stock in aboveground tree biomass in stratum *i*; t CO2-e ha-1

ab	Average biomass stock per hectare in the aboveground biomass pool of initial forest class *i*; Mg ha-1
CF	Default value of carbon fraction in biomass CF = 0.47 t C d.m^{-1} (IPCC, 2006b)
44/12	Ratio converting C to $CO_{2\text{-}e}$

Post-deforestation carbon stock in aboveground tree biomass (CABtreepost,) is taken from peer reviewed literature (Silva Neto et al., 2012) considering an average degradation and the total dry mass. The total values for the carbon stock in the belowground biomass are indicated in the Table 4.3

Table 38. Baseline carbon stock change in aboveground tree biomass (t $CO_{2\text{-}e}$ ha^{-1}).

Stratum (i)	CABtree bsl,i	CABtreepost,i	ΔCABtree,i
	t $CO_{2\text{-}e}$ ha^{-1}		
Dense Lowland Ombryphilous forest (Db)	470.43	13.56	456.87

Belowground Tree Biomass

Quantifying belowground tree biomass is also recommended, as it generally represents between 15% and 30% of aboveground biomass. The baseline carbon stock change in belowground tree biomass (ΔCBB_tree,i) is calculated according to the difference between the forest carbon stock in the belowground tree (CBBtreebsl,i) and the post-deforestation carbon stock in belowground tree biomass (CBBtree post,i), according to VMD0006 v1.3, Equation 4:

$$\Delta C_{BB\_tree,i} = C_{BB_{tree_{bsl}}{}^{i}} - C_{BB_{tree_{post}}{}^{i}}$$

Equation 4

Where:

$\Delta CBB\_tree,i$	Baseline carbon stock change in belowground tree biomass in stratum *i*; t CO_{2-e} ha^{-1}
CBBtreebsl,i	Forest carbon stock in belowground tree biomass in stratum *i*; t CO_{2-e} ha^{-1}
CBBtreepost,i	Post-deforestation carbon stock in belowground tree biomass in stratum *i*; t CO_{2-e} ha^{-1}
i	1, 2, 3, … M strata

The aboveground is converted into belowground biomass through a root-shoot ratio. The value used for the ratio of belowground biomass to aboveground biomass was 0.221 for the tropical forest of natural origin, according to the updated IPCC report (IPCC, 2019). The average carbon stock per hectare in belowground tree biomass in stratum *i* is determined by Equation 5.

$$C_{BB\_tree,bsl,i} = bb * CF * \frac{44}{12}$$

Equation 5

Where:

$CBB\_{tree,bsl},i$	Forest carbon stock in belowground tree biomass in stratum i; t CO_{2-e} ha^{-1}
Bb	Average biomass stock per hectare in the belowground biomass pool of initial forest class *i*; Mg ha^{-1}
CF	Default value of carbon fraction in biomass CF = 0.47 t C $d.m^{-1}$ (IPCC, 2006b)
44/12	Ratio converting C to CO_{2-e}

Post-deforestation carbon stock in belowground tree biomass ($CBB_{tree,post}$) is taken from peer-reviewed literature (Silva Neto et al., 2012). The total values for the carbon stock in the belowground biomass are indicated in Table 4.4.

Table 39. Baseline carbon stock change in belowground tree biomass (t CO2-e ha-1).

Stratum (i)	*CBBtree bsl,i*	*CBBtreepost,i*	*ΔCBBtree,i*
	t $CO_{2\text{-}e}$ ha^{-1}		
Dense Lowland Ombryphilous forest (Db)	145.93	3.00	142.93

Wood Products

The harvested trees would have been made into sawnwood, typical for the tropical hardwood species in Amazonas State. Baseline carbon stock change in wood products (□□□, Equation 6) is calculated through commercial inventory estimation, according to VMD0005 v1.1.

$$C_{WP,i} = \sum_{ty=s,w,oir,p,o} C_{XB,ty,i} * (1 - WW_{ty})$$

Equation 6

Where:

CWP,i	Carbon stock entering the wood products pool from stratum *i*; t $CO_{2\text{-}e}$ ha^{-1}
CXB,ty,i	Mean stock of extracted biomass carbon by class of wood product ty from stratum *i*; t $CO_{2\text{-}e}$ ha^{-1}
WWty	Wood waste. The fraction immediately emitted through mill inefficiency by class of wood product *ty*; dimensionless *WWty* = 0.24 (Pearson et al. (2012), page 8)
ty	Wood product class – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)
i	1, 2, 3, … M strata

The wood waste (*WWty*) is taken from peer-reviewed literature (Pearson et al., 2012). The mean stock of extracted biomass carbon by class of wood product (*CXB,y,i,* Equation 7) is calculated according to VMD0005 v1.1:

$$C_{XB,i,ty,i} = \frac{1}{A_i} * \sum_{j=1}^{S} (V_{ex,ty,j,i} * D_j * CF_j * \frac{44}{12})$$

Equation 7

Where:

CXB,i,ty,i	Mean stock of extracted biomass carbon by class of wood product *ty* from stratum *i*; t $CO_{2\text{-}e}$ ha^{-1}
Ai	Total area of stratum i; ha
Vex,ty,j,i	Volume of timber extracted from within stratum *i* (does not include slash left onsite) by species j and wood product class *ty*; m^3 Vex,ty,j,i =38.3 m^3 ha^{-1} ((da SILVA et al., 2001; Veríssimo et al., 1992), Table 1)
Dj	Mean wood density of species *j*; t d.m.m^{-3}
CFj	Carbon fraction of biomass for tree species *j*; t C t^{-1} d.m.
j	1, 2, 3, … S tree species
ty	Wood product class – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)
44/12	Ratio of molecular weight of CO_2 to carbon; t $CO_{2\text{-}e}$ t C^{-1}

The carbon entering the wood products pool at the time of deforestation that is expected to be emitted over 100 years (*CWP100,,* Equation 8) is calculated according to VMD0005 v1.1. The fraction of wood products that will be emitted into the atmosphere within 5 years (*SLFty*) and between 5 and 100 years (*Ofty*) of timber harvest is taken from peer-reviewed literature (Pearson et al., 2012; Winjum et al., 1998).

$$C_{WP100,i} = C_{WP,i} - C_{WP,i} * (1 - SLF_p) * (1 - Of_p)$$

Equation 8

Where:

CWP100,i	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100 years from stratum *i*; t $CO_{2\text{-}e}$ ha^{-1}
CWP,i	Carbon stock entering wood products pool at time of deforestation from stratum *i*; t $CO_{2\text{-}e}$ ha^{-1}
SLFty	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product *ty*; dimensionless *SLFty* = 0.2 (page 276, Winjum et al. (1998) and Pearson et al. (2012))
Ofty	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product *ty*; dimensionless OFty= 0.8 (page 276, Winjum et al. (1998) and Pearson et al. (2012))
ty	Wood product class – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)
i	1, 2, 3, … M strata

The Table 4.5 shows the results found for the mean stock of extracted biomass carbon by class of wood product ty from stratum Ds, the carbon stock entering the wood products pool from stratum Ds and the carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100 years from stratum Ds.

Table 40. Summary of calculations of wood products carbon pool in the baseline scenario (t CO2-e ha-1).

Stratum (i)	*CXB,i*	*CWP,i*	*CWP100,i*
	t $CO_{2\text{-}e}$ ha^{-1}		
Dense Lowland Ombryphilous forest (Db)	36.27	27.56	23.15

Carbon Stock Change in All Pools in the Baseline Scenario

The net carbon stock changes in all pools in the baseline ($\Delta C_{BSL,,t}$) is calculated according to the following Equation 9 from VMD0006 v1.3. Conservatively, the parameters $\Delta CABnon-tree,,$ $\Delta C_{LI,i}$, $\Delta CBBnon-tree,i,\Delta CDW,,\ \Delta CSOC,i$ have been left out of calculations as they are not included in the project boundary.

$$\Delta C_{BSL,i,t} = AA_{planned,i,t} * (\Delta C_{ABtree,i} - \Delta C_{WP,i} + \Delta C_{ABnon-tree,i} + \Delta C_{LI,i}) + (\sum_{t-10}^{t} AA_{planned,i,t}) * (\Delta C_{BBtree,i} + \Delta C_{BBnon-tree,i} + \Delta C_{DW,i}) * (\frac{1}{10}) + (\sum_{t-20}^{t} AA_{planned,i,t}) * (C_{WP100,i} + \Delta C_{SOC,i}) * (\frac{1}{20})$$

Equation 9

Where:

$\Delta CBSL,i,t$	Sum of the baseline carbon stock change in all terrestrial pools in stratum *i* in year *t*, t $CO_{2\text{-}e}$
$AAplanned,i,$	Annual area of baseline planned deforestation for stratum *i* in year *t*; ha
$CWP100,i$	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100 years from stratum *i*; t $CO_{2\text{-}e}$ ha^{-1}
$\Delta CABtree,i$	Baseline carbon stock change in aboveground tree biomass in stratum *i*; t $CO_{2\text{-}e}$ ha^{-1}
$\Delta CBBtree,i$	Baseline carbon stock change in belowground tree biomass in stratum *i*; t $CO_{2\text{-}e}$ ha^{-1}

$\Delta CABnon-tree,i$	Baseline carbon stock change in aboveground non-tree biomass in stratum *i*; t CO_{2-e} ha^{-1}
$\Delta CBBnon-tree,i$	Baseline carbon stock change in belowground non-tree biomass in stratum *i*; t CO_{2-e} ha^{-1}
$\Delta CWP,i$	Baseline carbon stock change in wood products in stratum *i*; t CO_{2-e} ha^{-1}
$\Delta CDW,i$	Baseline carbon stock change in dead wood in stratum *i*; t CO_{2-e} ha^{-1}
$\Delta CLI,i$	Baseline carbon stock change in litter in stratum *i*; t CO_{2-e} ha^{-1}
$\Delta CSOC,i$	Baseline carbon stock change in soil organic carbon in stratum *i*; t CO_{2-e} ha^{-1}
i	1, 2, 3, … M strata
t	1, 2, 3, … t* years elapsed since the projected start of the project activity

Stock changes in aboveground biomass and litter are emitted at the time of deforestation. Following deforestation, emissions from belowground biomass, dead wood, soil and wood products take place gradually over time. Stock changes in belowground biomass and dead wood are emitted at an annual rate of 1/10 of the stock change for 10 years, and at an annual rate of 1/20 of the stock change for 20 years for soil organic carbon (for non-wetland soils). Carbon stocks entering the wood products pool at the time of deforestation and that are expected to be emitted over 100-years are emitted at an annual rate of 1/20 of the stock for 20 years. Thus, for a given year t, emissions are summed across areas deforested from time t-10 up to time t (for belowground biomass and dead wood) and from time t-20 up to time t (for soil organic carbon and wood products), in the Equation 9.

Therefore, Table 41 and Table 42 show the net emissions for belowground biomass distributed over 10 years and the wood products pool that are expected to be emitted over 100-years distributed over 20 years, respectively. The Table 43 summarises all the values needed to calculate the Equation 9, as well as the final results for $\Delta CBSL,,t.$

Table 41.1 Stock changes in belowground biomass gradually over 10 years (t CO_{2-e}).

Year*	ΔCBBtree,i ∗ AAplanned,i,t	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}
2021 - 2022	394,435.35	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.53
2022 - 2023	394,435.35	-	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.53
2023 - 2024	394,435.35	-	-	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.53
2024 - 2025	394,435.35	-	-	-	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.53
2025 - 2026	394,435.35	-	-	-	-	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.53
2026 - 2027	394,435.35	-	-	-	-	-	39,443.5	39,443.5	39,443.5	39,443.5	39,443.53
2027 - 2028	394,435.35	-	-	-	-	-	-	39,443.5	39,443.5	39,443.5	39,443.53
2028 - 2029	394,435.35	-	-	-	-	-	-	-	39,443.5	39,443.5	39,443.53
2029 - 2030	394,435.35	-	-	-	-	-	-	-	-	39,443.5	39,443.53
2030 - 2031	394,435.35	-	-	-	-	-	-	-	-	-	39,443.53

Year*	ΔCBBtree,i ∗ AAplanned,i,t	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}
2031 - 2032	394,435.35	-	-	-	-	-	-	-	-	-	-
2032 - 2033	394,435.35	-	-	-	-	-	-	-	-	-	-
2033 - 2034	394,435.35	-	-	-	-	-	-	-	-	-	-
2034 - 2035	394,435.35	-	-	-	-	-	-	-	-	-	-
2035 - 2036	394,435.35	-	-	-	-	-	-	-	-	-	-
2036 - 2037	394,435.35	-	-	-	-	-	-	-	-	-	-
2037 - 2038	394,435.35	-	-	-	-	-	-	-	-	-	-
2038 - 2039	394,435.35	-	-	-	-	-	-	-	-	-	-
2039 - 2040	394,435.35	-	-	-	-	-	-	-	-	-	-
2040 - 2041	394,435.35	-	-	-	-	-	-	-	-	-	-
Total	7.888.706,90	39.443,53	78.887,07	118.330,60	157.774,14	197.217,67	236.661,21	276.104,74	315.548,28	354.991,81	394.435,35

*Years not shown in the table are values in 0.

Table 41.2 Stock changes in belowground biomass gradually over 10 years (t CO2-e)

Year*	ΔC BB tree * AA planned	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}
2021 - 2022	394,435.35	-	-	-	-	-	-	-	-	-	-
2022 - 2023	394,435.35	39,443.5	-	-	-	-	-	-	-	-	-
2023 - 2024	394,435.35	39,443.5	39,443.5	-	-	-	-	-	-	-	-
2024 - 2025	394,435.35	39,443.5	39,443.5	39,443.5	-	-	-	-	-	-	-
2025 - 2026	394,435.35	39,443.5	39,443.5	39,443.5	39,443.5	-	-	-	-	-	-
2026 - 2027	394,435.35	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	-	-	-	-	-
2027 - 2028	394,435.35	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	-	-	-	-
2028 - 2029	394,435.35	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	-	-	-
2029 - 2030	394,435.35	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	-	-
2030 - 2031	394,435.35	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	-
2031 - 2032	394,435.35	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39443,5	39,443.5	39,443.5	39,443.5	39,443.5

Year*	ΔC BB tree * AA planned	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}
2032 - 2033	394,435.35	-	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5
2033 - 2034	394,435.35	-	-	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5
2034 - 2035	394,435.35	-	-	-	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5
2035 - 2036	394,435.35	-	-	-	-	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5
2036 - 2037	394,435.35	-	-	-	-	-	39,443.5	39,443.5	39,443.5	39,443.5	39,443.5
2037 - 2038	394,435.35	-	-	-	-	-	-	39443,53	39443,53	39443,53	39443,53
2038 - 2039	394,435.35	-	-	-	-	-	-	-	39443,53	39443,53	39443,53
2039 - 2040	394,435.35	-	-	-	-	-	-	-	-	39443,53	39443,53
2040 - 2041	394,435.35	-	-	-	-	-	-	-	-	-	39443,53
Total	7,888,706.90	394,435.3	394,435.3	394,435.3	394,435.3	394,435.3	394,435.3	394,435.3	394,435.3	394,435.3	394,435.3

Table 41.3 Stock changes in belowground biomass gradually over 10 years (t CO2-e)

Year*	ΔC BB tree * AA planned	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}
2021 - 2022	394,435.35	-	-	-	-	-	-	-	-	-	-
2022 - 2023	394,435.35	-	-	-	-	-	-	-	-	-	-
2023 - 2024	394,435.35	-	-	-	-	-	-	-	-	-	-
2024 - 2025	394,435.35	-	-	-	-	-	-	-	-	-	-
2025 - 2026	394,435.35	-	-	-	-	-	-	-	-	-	-
2026 - 2027	394,435.35	-	-	-	-	-	-	-	-	-	-
2027 - 2028	394,435.35	-	-	-	-	-	-	-	-	-	-
2028 - 2029	394,435.35	-	-	-	-	-	-	-	-	-	-
2029 - 2030	394,435.35	-	-	-	-	-	-	-	-	-	-
2030 - 2031	394,435.35	-	-	-	-	-	-	-	-	-	-
2031 - 2032	394,435.35	-	-	-	-	-	-	-	-	-	-
2032 - 2033	394,435.35	39.443,5	-	-	-	-	-	-	-	-	-
2033 - 2034	394,435.35	39.443,5	39.443,5	-	-	-	-	-	-	-	-
2034 - 2035	394,435.35	39.443,5	39.443,5	39.443,5	-	-	-	-	-	-	-
2035 - 2036	394,435.35	39.443,5	39.443,5	39.443,5	39.443,5	-	-	-	-	-	-

Year*	ΔC BB tree * AA planned	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}
2036 - 2037	394,435.35	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	-	-	-	-	-
2037 - 2038	394,435.35	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	-	-	-	-
2038 - 2039	394,435.35	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	-	-	-
2039 - 2040	394,435.35	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	-	-
2040 - 2041	394,435.35	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	39.443,5	-
Total	7.888.706,9	354.991,8	315.548,3	276.104,7	236.661,2	197.217,7	157.774,1	118.330,6	78.887,1	39.443,5	-

Table 42.1 Stock changes in CWP100,i gradually over 20 years (t CO_{2-e}).

Year*	CWP100,i * AAplanned,i,t	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO2-e
2021 - 2022	63.898,8	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9

Year*	CWP100,i * AAplanned,i,t	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO2-e
2022 - 2023	63.898,8	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9
2023 - 2024	63.898,8	-	-	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9
2024 - 2025	63.898,8	-	-	-	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9
2025 - 2026	63.898,8	-	-	-	-	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9
2026 - 2027	63.898,8	-	-	-	-	-	3.194,9	3.194,9	3.194,9	3.194,9	3.194,9
2027 - 2028	63.898,8	-	-	-	-	-	-	3.194,9	3.194,9	3.194,9	3.194,9
2028 - 2029	63.898,8	-	-	-	-	-	-	-	3.194,9	3.194,9	3.194,9
2029 - 2030	63.898,8	-	-	-	-	-	-	-		3.194,9	3.194,9
2030 - 2031	63.898,8	-	-	-	-	-	-	-	-	-	3.194,9

Year*	CWP100,i * AAplanned,i,t	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO2-e
2031 - 2032	63.898,8	-	-	-	-	-	-	-	-	-	-
2032 - 2033	63.898,8	-	-	-	-	-	-	-	-	-	-
2033 - 2034	63.898,8	-	-	-	-	-	-	-	-	-	-
2034 - 2035	63.898,8	-	-	-	-	-	-	-	-	-	-
2035 - 2036	63.898,8	-	-	-	-	-	-	-	-	-	-
2036 - 2037	63.898,8	-	-	-	-	-	-	-	-	-	-
2037 - 2038	63.898,8	-	-	-	-	-	-	-	-	-	-
2038 - 2039	63.898,8	-	-	-	-	-	-	-	-	-	-
2039 - 2040	63.898,8	-	-	-	-	-	-	-	-	-	-

Year*	CWP100,i * AAplanned,i,t	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO2-e
2040 - 2041	63.898,8	-	-	-	-	-	-	-	-	-	-
Total	1.277.976,5	3.194,9	6.389,9	9.584,8	12.779,8	15.974,7	19.169,6	22.364,6	25.559,5	28.754,5	31.949,4

Table 42.2 Stock changes in CWP100,i gradually over 20 years (t CO2-e)

Year*	*CWP100,i * AAplanned,i,t*	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO2-e
2021 - 2022	63,898.82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2022 - 2023	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2023 - 2024	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2024 - 2025	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2025 - 2026	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2026 - 2027	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2027 - 2028	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2028 - 2029	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2029 - 2030	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94

Year*	*CWP100,i * AAplanned,i,t*	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO2-e
2030 - 2031	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2031 - 2032	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2032 - 2033	63898,82	-	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3,194.94	3194,94	3194,94
2033 - 2034	63898,82	-	-	3194,94	3194,94	3194,94	3194,94	3194,94	3,194.94	3194,94	3,194.94
2034 - 2035	63898,82	-	-	-	3194,94	3194,94	3194,94	3194,94	3,194.94	3,194.94	3,194.94
2035 - 2036	63898,82	-	-	-	-	3194,94	3194,94	3194,94	3194,94	3194,94	3,194.94
2036 - 2037	63898,82	-	-	-	-	-	3194,94	3194,94	3194,94	3194,94	3,194.94
2037 - 2038	63898,82	-	-	-	-	-	-	3194,94	3194,94	3194,94	3,194.94
2038 -2039	63,898.82	-	-	-	-	-	-	-	3,194.94	3,194.94	3,194.94

Year*	*CWP100,i * AAplanned,i,t*	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO2-e
2039 - 2040	63,898.82	-	-	-	-	-	-	-	-	3,194.94	3,194.94
2040 - 2041	63898,82	-	-	-	-	-	-	-	-	-	3194,94
Total	1,277,976.48	35,144.35	38,339.29	41,534.24	44,729.18	47,924.12	51,119.06	54,314.00	57,508.94	60,703.88	63,898.82

Table 42.3 Stock changes in CWP100,i gradually over 20 years (t CO2-e)

Year*	*CWP100,i * AAplanned,i,t*	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO2-e
2021 - 2022	63.898,8	-	-	-	-	-	-	-	-	-	-
2022 - 2023	63898,82	3194,94	-	-	-	-	-	-	-	-	-
2023 - 2024	63898,82	3194,94	3194,94	-	-	-	-	-	-	-	-
2024 - 2025	63898,82	3194,94	3194,94	3194,94	-	-	-	-	-	-	-
2025 - 2026	63898,82	3194,94	3194,94	3194,94	3194,94	-	-	-	-	-	-
2026 - 2027	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	-	-	-	-	-
2027 - 2028	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	-	-	-	-
2028 - 2029	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	-	-	-
2029 - 2030	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	-	-

Year*	*CWP100,i * AAplanned,i,t*	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO2-e
2030 - 2031	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	-
2031 - 2032	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2032 - 2033	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2033 - 2034	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2034 - 2035	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2035 - 2036	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2036 - 2037	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2037 - 2038	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2038 -2039	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94

Year*	*CWP100,i * AAplanned,i,t*	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO2-e
2039 - 2040	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
2040 - 2041	63898,82	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94	3194,94
Total	**1.277976,48**	**60703,88**	**57508,94**	**54314,00**	**51119,06**	**47924,12**	**44729,18**	**41534,24**	**38339,29**	**35144,35**	**31949,41**

Table 43. Calculation of the sum of baseline carbon stocks changes in all pools (t CO2-e).

Year	***Aplanned,i * D%planned,i,t***	***AAplanned,i ,t***	***AAplanned,i,t * ΔCABtree,i***	***AAplanned,i,t* ΔCWP,i***	***AAplanned,i,t * ΔCBBtree,i***	***AAplanned,i,t* CWP100,i***	***ΔCBSL,i,t***	***ΔCBSL,i,t Accumulated***
	ha	ha	**tCO_{2-e}**	**tCO_{2-e}**	**tCO_{2-e}**	**tCO_{2-e}**	**tCO_{2-e}**	**tCO_{2-e}**
2021-2022	2.759,6	2.759,6	1.260.796,7	76.070,0	39.443,5	3.194,9	1.227.365,2	1.227.365,2
2022-2023	2.759,6	2.759,6	1.260.796,7	76.070,0	78.887,1	6.389,9	1.270.003,6	2.497.368,8
2023-2024	2.759,6	2.759,6	1.260.796,7	76.070,0	118.330,6	9.584,8	1.312.642,1	3.810.010,9
2024-2025	2.759,6	2.759,6	1.260.796,7	76.070,0	157.774,1	12.779,8	1.355.280,6	5.165.291,6
2025-2026	2.759,6	2.759,6	1.260.796,7	76.070,0	197.217,7	15.974,7	1.397.919,1	6.563.210,6
2026-2027	2.759,6	2.759,6	1.260.796,7	76.070,0	236.661,2	19.169,6	1.440.557,6	8.003.768,2
2027-2028	2.759,6	2.759,6	1.260.796,7	76.070,0	276.104,7	22.364,6	1.483.196,0	9.486.964,2
2028-2029	2.759,6	2.759,6	1.260.796,7	76.070,0	315.548,3	25.559,5	1.525.834,5	11.012.798,7

Year	***Aplanned,i * D%planned,i,t***	***AAplanned,i ,t***	***AAplanned,i,t * ΔCABtree,i***	***AAplanned,i,t* ΔCWP,i***	***AAplanned,i,t * ΔCBBtree,i***	***AAplanned,i,t* CWP100,i***	***ΔCBSL,i,t***	***ΔCBSL,i,t Accumulated***
	ha	ha	**tCO_{2-e}**	**tCO_{2-e}**	**tCO_{2-e}**	**tCO_{2-e}**	**tCO_{2-e}**	**tCO_{2-e}**
2029-2030	2.759,6	2.759,6	1.260.796,7	76.070,0	354.991,8	28.754,5	1.568.473,0	12.581.271,7
2030-2031	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	31.949,4	1.611.111,5	14.192.383,1
2031-2032	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	35.144,4	1.614.306,4	15.806.689,5
2032-2033	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	38.339,3	1.617.501,3	17.424.190,9
2033-2034	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	41.534,2	1.620.696,3	19.044.887,2
2034-2035	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	44.729,2	1.623.891,2	20.668.778,4
2035-2036	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	47.924,1	1.627.086,2	22.295.864,5
2036-2037	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	51.119,1	1.630.281,1	23.926.145,6

Year	*Aplanned,i * D%planned,i,t*	*AAplanned,i ,t*	*AAplanned,i,t * ΔCABtree,i*	*AAplanned,i,t* ΔCWP,i*	*AAplanned,i,t * ΔCBBtree,i*	*AAplanned,i,t* CWP100,i*	*ΔCBSL,i,t*	*ΔCBSL,i,t Accumulated*
	ha	ha	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}
2037-2038	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	54.314,0	1.633.476,0	25.559.621,7
2038-2039	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	57.508,9	1.636.671,0	27.196.292,7
2039-2040	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	60.703,9	1.639.865,9	28.836.158,6
2040-2041	2.759,6	2.759,6	1.260.796,7	76.070,0	394.435,3	63.898,8	1.643.060,9	30.479.219,5
2041-2042	-	-	-	-	354.991,8	60.703,9	415.695,7	30.894.915,2
2042-2043	-	-	-	-	315.548,3	57.508,9	373.057,2	31.267.972,4
2043-2044	-	-	-	-	276.104,7	54.314,0	330.418,7	31.598.391,1
2044-2045	-	-	-	-	236.661,2	1.119,1 5	287.780,3	31.886.171,4

Year	*Aplanned,i * D%planned,i,t*	*AAplanned,i ,t*	*AAplanned,i,t * ΔCABtree,i*	*AAplanned,i,t* ΔCWP,i*	*AAplanned,i,t * ΔCBBtree,i*	*AAplanned,i,t* CWP100,i*	*ΔCBSL,i,t*	*ΔCBSL,i,t Accumulated*
	ha	ha	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}
2045-2046	-	-	-	-	197.217,7	7.924,1 [4]	245.141,8	32.131.313,2
2046-2047	-	-	-	-	157.774,1	44.729,2	202.503,3	32.333.816,5
2047-2048	-	-	-	-	118.330,6	41.534,2	159.864,8	32.493.681,3
2048-2049	-	-	-	-	78.887,1	38.339,3	117.226,4	32.610.907,7
2049-2050	-	-	-	-	39.443,5	35.144,4	74.587,9	32.685.495,6
2050-2051	-	-	-	-	-	31.949,4	31.949,4	32.717.445,0
TOTAL	**55192,8**						**32.717.445**	

Non-CO2 Emissions in the Baseline Scenario

Greenhouse gas emissions in the baseline resulting from deforestation activities within the project area (□□□□□□,,□) are calculated using Equation 10, according to VMD0006 v1.3.

Greenhouse gas emissions in the baseline resulting from deforestation activities within the project area ($GHG_{BSL,i,t}$) are calculated using Equation 10, according to VMD0006 v1.3.

$$GHG_{BSL,i,t} = E_{FC,i,t} + E_{BiomassaBurn,i,t} + N_2O_{direct-N,i,t} \quad \text{Equation 10}$$

Where:

$GHG_{BSL,i,t}$	Greenhouse gas emissions as a result deforestation activities within the project boundary in the stratum *i* in year *t*; t CO_{2-e}
$E_{FC,i,t}$	Net CO_{2-e} emission from fossil fuel combustion in stratum *i* in year *t*; t CO_{2-e}
$E_{BiomassaBurn,i,t}$	Non-CO_2 emissions due to biomass burning in stratum *i* in year *t*; t CO_{2-e}
$N_2O_{direct-N,i,t}$	Direct N_2O emission as a result of nitrogen application on the alternative land use within the project boundary in stratum *i* in year *t*; t CO_{2-e}
i	1, 2, 3, … M strata
t	1, 2, 3, …t* years elapsed since the start of the REDD VCS project activity

The baseline scenario conservatively excludes nitrogen application ($N_2O_{direct-N,i,t}$) and net CO_{2-e} emissions from burning fossil fuels ($E_{FC,i,t}$) (see Section 3.3). Hence, non-CO_2 emissions due to biomass burning ($E_{BiomassaBurn,i,t}$) are calculated according to VMD0013 v1.2 (Equation 11). For that, The area burnt ($A_{burn,i,t}$) equal to annual area of baseline planned deforestation in the baseline case ($AA_{planned,i,t}$). Combustion and emission factors and global warming potential are default values adopted and taken from IPCC reports (IPCC, 2006a, 2014).

$$E_{biomassbur\ n,i,t} = \sum_{g=1}^{G} \left(\left(A_{burn,i,t} * B_{i,t} * COMF_i * G_{g,i} \right) * 10^{-3} \right) * GWP_g \qquad \text{Equation 11}$$

Where:

$E_{biomassbur\ n,i,t}$	Greenhouse gas emissions due to biomass burning in stratum *i* in year *t* of each GHG (CO_2, CH_4, N_2O); t CO_{2-e}
$A_{burn,i,t}$	Area burnt for stratum *i* in year *t*; ha
$B_{i,t}$	Average aboveground biomass stock before burning stratum *I* in year *t*; t d.m. ha^{-1}
$COMF_i$	Combustion factor for stratum *i*; unitless $COMF_i$ = 0.59 (Table 2.6, page 2.55, IPCC (2006a))
$G_{g,i}$	Emission factor for stratum *i* for gas *g*; kg t^{-1} d.m. burnt G_{g,CH_4} = 6.8 kg t^{-1}, G_{g,NO_2} = 0.2 kg t^{-1} (Table 2.5, page 2.54, IPCC (2006a))

GWP_g	Global warming potential for gas g; t CO_2/t gas g GWP_{CH_4} = 28 t CO_2 t_{gas}^{-1}, GWP_{NO_2} = 265 t CO_2 t_{gas}^{-1} (Box 3.2, Table 1, page 87, IPCC (2014) and Grennhouse (2014))
g	1, 2, 3 ... g greenhouse gases including carbon dioxide, methane and nitrous oxide; unitless
i	1, 2, 3, ... M strata
t	1, 2, 3, ... t* time elapsed since the start of the project activity; years

The average aboveground biomass stock before burning ($B_{i,t}$) is calculated according to VMD0013 v1.2 adjusted to reflect methodological deviation (Equation 12).

$$B_{i,t} = \left(C_{AB_{tree},i,t} + C_{DWi,t} + C_{LI,i,t}\right) * \frac{12}{44} * \frac{1}{CF} \qquad \text{Equation 12}$$

Where:

$B_{i,t}$	Average aboveground biomass stock before burning for stratum *i*, year *t*; tonnes d.m. ha^{-1}
$C_{AB_{tree},i,t}$	Carbon stock in aboveground biomass in trees in stratum *i* in year *t*; t CO_{2-e} ha^{-1})
$C_{DWi,t}$	Carbon stock in dead wood for stratum *i* in year *t*; t CO_{2-e} ha^{-1}
$C_{LI,i,t}$	Carbon stock in litter for stratum *i* in year *t*; t CO_{2-e} ha^{-1}
$\frac{12}{44}$	Inverse ratio of molecular weight of CO_2 to carbon; t CO_{2-e} t C^{-1}
$\frac{1}{CF}$	Carbon fraction of biomass; t C t^{-1} d.m. CF = 0.47 t C t^{-1} d.m. (pg. 4.48, Table 4.3, IPCC (2006b))
i	1, 2, 3, ... M strata
t	1, 2, 3, ... t* time elapsed since the start of the project activity; years

Table 44 shows the parameters used in calculating biomass burning for the baseline scenario, as well as results accounted for CH_4 and N_2O emissions generated and the average aboveground biomass stock before burning for stratum Ds.

Table 44. Non-CO_2 emissions in the baseline case (t CO_{2-e}).

	Bi,t			
Year	***AAplanned,i,t = Aburn,i,t***	***Ebiomassbur,CH4,i,t***	***Ebiomassbur,N2O,i,t***	***GHGBSL,i,t***
	ha	**tCO_{2-e}**	**tCO_{2-e}**	**tCO_{2-e}**
2021-2022	2.759,6	84.625,7	23.556,5	108.182,2
2022-2023	2.759,6	84.625,7	23.556,5	108.182,2
2023-2024	2.759,6	84.625,7	23.556,5	108.182,2
2024-2025	2.759,6	84.625,7	23.556,5	108.182,2
2025-2026	2.759,6	84.625,7	23.556,5	108.182,2
2026-2027	2.759,6	84.625,7	23.556,5	108.182,2
2027-2028	2.759,6	84.625,7	23.556,5	108.182,2
2028-2029	2.759,6	84.625,7	23.556,5	108.182,2
2029-2030	2.759,6	84.625,7	23.556,5	108.182,2
2030-2031	2.759,6	84.625,7	23.556,5	108.182,2
2031-2032	2.759,6	84.625,7	23.556,5	108.182,2
2032-2033	2.759,6	84.625,7	23.556,5	108.182,2
2033-2034	2.759,6	84.625,7	23.556,5	108.182,2
2034-2035	2.759,6	84.625,7	23.556,5	108.182,2
2035-2036	2.759,6	84.625,7	23.556,5	108.182,2
2036-2037	2.759,6	84.625,7	23.556,5	108.182,2
2037-2038	2.759,6	84.625,7	23.556,5	108.182,2
2038-2039	2.759,6	84.625,7	23.556,5	108.182,2
2039-2040	2.759,6	84.625,7	23.556,5	108.182,2
2040-2041	2.759,6	84.625,7	23.556,5	108.182,2
2041-2042	-	-	-	-
2042-2043	-	-	-	-
2043-2044	-	-	-	-
2044-2045	-	-	-	-
2045-2046	-	-	-	-

2046-2047	-	-	-	-
2047-2048	-	-	-	-
2048-2049	-	-	-	-
2049-2050	-	-	-	-
2050-2051	-	-	-	-
TOTAL	**55.192,8**	**1.692.513,8**	**471.130,4**	**2.163.644,2**

Net GHG emissions in the Baseline Scenario

The baseline net GHG emissions for planned deforestation (Equation 13) is determined according to VMD0006 BL-PL v1.3.

$$\Delta C_{BSL,planned} = \sum_{t=1}^{t^*} \sum_{i=1}^{M} \left(\Delta C_{BSL,i,t} + GHG_{BSL-E,i,t} \right) \qquad \text{Equation 13}$$

Where:

$\Delta C_{BSL,planned}$	Net greenhouse gas emissions in the baseline from planned deforestation up to year t^*; t CO_{2-e}
$\Delta C_{BSL,i,t}$	Net carbon stock changes in all pools in the baseline stratum i in year t; t CO_{2-e}
$GHG_{BSL-E,i,t}$	Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum i in year t; t CO_{2-e} yr^{-1}.
i	1, 2, 3, ... M strata
t	1, 2, 3, ... t* time elapsed since the start of the project activity; years

Table 45) presents all values for net carbon stock changes in all pools in the baseline stratum Ds in year t, greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum Ds in year t and, finally, the net greenhouse gas emissions in the baseline from planned deforestation up to year t.

Table 45. Net GHG emissions in the baseline from planned deforestation in the baseline period (t CO2-e).

Year	$\Delta C_{BSL,i,t}$	$GHG_{BSL-E,i,t}$	$\Delta C_{BSL,planned}$	$\Delta C_{BSL,planned,accumulated}$
	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}
2021-2022	1.227.365	108.182	1.335.547	1.335.547
2022-2023	1.270.004	108.182	1.378.186	2.713.733
2023-2024	1.312.642	108.182	1.420.824	4.134.558
2024-2025	1.355.281	108.182	1.463.463	5.598.020
2025-2026	1.397.919	108.182	1.506.101	7.104.122
2026-2027	1.440.558	108.182	1.548.740	8.652.861
2027-2028	1.483.196	108.182	1.591.378	10.244.240
2028-2029	1.525.835	108.182	1.634.017	11.878.256
2029-2030	1.568.473	108.182	1.676.655	13.554.912
2030-2031	1.611.111	108.182	1.719.294	15.274.205
2031-2032	1.614.306	108.182	1.722.489	16.996.694
2032-2033	1.617.501	108.182	1.725.684	18.722.377
2033-2034	1.620.696	108.182	1.728.878	20.451.256
2034-2035	1.623.891	108.182	1.732.073	22.183.329
2035-2036	1.627.086	108.182	1.735.268	23.918.598
2036-2037	1.630.281	108.182	1.738.463	25.657.061
2037-2038	1.633.476	108.182	1.741.658	27.398.719
2038-2039	1.636.671	108.182	1.744.853	29.143.572
2039-2040	1.639.866	108.182	1.748.048	30.891.621
2040-2041	1.643.061	108.182	1.751.243	32.642.864
2041-2042	415.696	-	415.696	33.058.559
2042-2043	373.057	-	373.057	33.431.617
2043-2044	330.419	-	330.419	33.762.035

2044-2045	287.780	-	287.780	34.049.816
2045-2046	245.142	-	245.142	34.294.957
2046-2047	202.503	-	202.503	34.497.461
2047-2048	159.865	-	159.865	34.657.326
2048-2049	117.226	-	117.226	34.774.552
2049-2050	74.588	-	74.588	34.849.140
2050-2051	31.949	-	31.949	34.881.089
TOTAL	**32.717.445**	**2.163.644**	**34.881.089**	

3.2.2.Project Emissions

Expected project emissions are estimated ex-ante and apply Equation 14 of module M-MON (VMD0015) of Methodology VM0007. Ex-ante projections of deforestation in the project case assume no deforestation have taken place as one of the project proponents is the baseline agent of deforestation and has committed to not undertake land clearing on the property.

$$\Delta C_{WPS-REDD} = \sum_{t=1}^{t*} \sum_{i=1}^{M} (\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,i,t} + \Delta C_{P,DistPA,i,t} + GHG_{P-E,i,t} - \Delta C_{P,Enh,i,t}) \quad \textbf{Equation 14}$$

Where:

$\Delta CWPS-REDD$	Net GHG emissions in the REDD project scenario up to year *t**; t CO_{2-e}
$\Delta CP,DefPA,i,t$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum *i* in year *t*; t CO_{2-e}
$\Delta CP,Deg,i,t$	Net carbon stock change as a result of degradation in the project area in the project case in stratum i in year t; t CO_{2-e}
$\Delta CP,DistPA,i,t$	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum *i* in year *t*; t CO_{2-e}
$GHGP-E,i,t$	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum *i* in year *t*; t CO_{2-e}
$\Delta CP,Enh,i,t$	Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline* in stratum *i* in year *t*; t CO_{2-e}

- For areas with a degradation baseline (i.e. using Module BL-DFW) this parameter shall be set to zero, for areas with baseline set by Module BL-UP and Module BL-PL this parameter may be conservatively set to zero.

i 1, 2, 3, … M strata

t 1, 2, 3, … t* years elapsed since the start of the project activity

In the case of an identified deforestation agent, the agent has committed not to deforest, collect firewood, or remove wood from the forests in the project area. Thus, these actions are expected to prevent degradation by illegal actors, and ex-ante degradation is estimated as zero (*ΔCP,eg,i,t = 0*).

Amazon forests have a low incidence of natural disturbance (Espírito-Santo et al., 2014), which does not generally result in tree death and C emissions (*ΔCP,istPA,i,t = 0*). Furthermore, according to module VMD00015 for areas with baseline set by Module BL-PL the $\Delta CP,Enh,i,t$ parameter may be conservatively set to zero (*ΔCP,Enh,i,t = 0*).. Therefore, Equation 14 can be rewritten as (Equation 15):

$$\Delta C_{WPS-REDD} = \sum_{t=1}^{t*} \sum_{i=1}^{M} (\Delta C_{P,DefPA,i,t} + GHG_{P-E,i,t}) \qquad \textbf{Equation 15}$$

Where:

$\Delta CWPS-REDD$	Net GHG emissions in the REDD project scenario up to year *t**; t CO_{2-e}
$\Delta CP,DefPA,i,t$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum *i* in year *t*; t CO_{2-e}
$GHGP-E,i,t$	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum *i* in year *t*; t CO_{2-e}
i	1, 2, 3, … M strata
t	1, 2, 3, … t* years elapsed since the start of the project activity

The net carbon stock change as a result of deforestation (*ΔCP,efPA,i,t*) is equal to the area deforested multiplied by the emission per unit area, according to VMD0015 v2.2 (Equation 16).

$$\Delta C_{P,DefPA,i,t} = \sum_{u=1}^{U} (A_{DefPA,u,i,t} * \Delta C_{pools,P,Def,u,i,t}) \qquad \textbf{Equation 16}$$

Where:

$\Delta CP,DefPA,i,t$	Net carbon stock change as a result of deforestation in the project case in the project area in stratum *i* at time *t*; t CO_{2-e}
$ADefPA,u,i,t$	Area of recorded deforestation in the project area stratum *i* converted to land use *u* at time *t*; ha
$\Delta Cpools,P,Def,u,i,t$	Net carbon stock changes in all pools in the project case in land use *u* in stratum *i* at time *t*; t CO_{2-e} ha^{-1}
u	1, 2, 3, … U post-deforestation land uses.
i	1, 2, 3, … M strata
t	1, 2, 3, … t* years elapsed since the start of the project activity

According to VMD0015 v2.2, an *ex-ante* estimate of deforestation in the project area must be made. As the deforestation agent has committed to providing infrastructure and policies to prevent deforestation, the $ADefPA,,i,t$ parameter can be set to zero. Hence, the project area currently does not carry out any activities, so there are no project emissions to report at the audit time.

3.2.3.Leakage

Leakage is the net change of anthropogenic GHG emissions that occurs outside the Project boundary and is attributable to Project activities. Leakage due to Project activities is expected to be very low. Small levels of leakage could occur as land-use changes (agricultural expansion, illegal timber harvesting etc.) in the Project surroundings outside of the Project Area. These land-uses are economically attractive owing to market pressures, global demand for timber products, increasing domestic demand for meat and soy products, population expansion in frontier deforestation areas.

The Project proponents will adopt proactive initiatives to fight these leakage sources, based on a cooperative effort with Agrofrut co-operative, its members, local stakeholders and landowners and in accordance with leakage management strategies outlined in VM0007.

Specifically, a key source of managing leakage will be for the Project to provide strong economic incentive for Agrofrut co-operative members to participate in Project activities (rather than continuing illegal timber harvesting outside the Project Area, for example). This will be done through the construction of an agricultural processing plant for the processing of fruits and oils (non-timber forest products) to provide alternative income from forest conversion (as per Section 2.1).

The estimates of GHG emissions due to leakage from market effects through reduced logging is equal to the sum of emissions from logging in the case of the potentially shifted baseline plus a leakage factor, as per the equation:

$$\Delta C_{LK-REED} = \Delta C_{LK-AS,planned} + \Delta C_{LK-ME} \qquad \textbf{Equation 17}$$

Where:

ΔCLK−REED	Net GHG emissions due to leakage from the REDD project activity up to year *t**; t CO_{2-e}
ΔCLK−AS,planned	Net GHG emissions due to activity shifting leakage for projects preventing planned deforestation up to year *t** – from Module LK-ASP; t CO_{2-e}
ΔCLK−ME	Net GHG emissions due to market-effects leakage up to year *t** – from Module LK-ME; t CO_{2-e}

Estimation of emissions from activity shifting

Activity shifting leakage due to displacement of planned deforestation was assessed using a series of equations outlined in VMD0009 LK-ASP. Thus, Equation 18 is used when the specific deforestation agent is identified as is the case of the Tapera project.

$$\Delta C_{LK-AS,planned} = \sum_{t=1}^{t*} \sum_{i=1}^{M} (LKA_{planned,i,t} * \Delta C_{BSL,i}) + GHG_{LK,E,i,t} \qquad \textbf{Equation 18}$$

Where:

$\Delta CLK-AS,planned$	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation up to year *t**; t CO_{2-e}
$LKAplanned,i,t$	The area of activity shifting leakage in stratum *i* in year *t*; ha
$\Delta CBSL,i$	Net carbon stock changes in all pre-deforestation pools in baseline stratum *i*; t CO_{2-e} ha^{-1}

$GHGLK,E,i,t$	Greenhouse gas emissions as a result of leakage of avoiding deforestation activities in stratum i in year t; t CO2-e
i	1, 2, 3, … M strata; unitless
t	1, 2, 3, … t* time elapsed since the start of the project activity; years

The procedure for calculating leakage when the deforestation agent is identified must follow three steps: (i) determination of the baseline rate of forest clearance by the deforestation agent; (ii) estimate new projection of forest clearance by the baseline agent of deforestation with project implementation if no leakage is occurring; and (iii) monitor all areas deforested by baseline agent of deforestation through the years in which planned deforestation was forecast to occur. In step (iii), all areas deforested by the baseline agent of deforestation must be monitored. Areas of deforestation may be anywhere in the host country. There is no requirement to track international leakage. For this, the following equation must be followed (Equation 19).

$$LKA_{planned,i,t} = A_{defLK,i,t} - NewR_{i,t}$$ **Equation 19**

Where:

$LKAplanned,i,t$	The area of activity shifting leakage in stratum *i* in year *t*; ha
$AdefLK,i,t$	The total area of monitored deforestation by the baseline agent of the planned deforestation in stratum *i* in year *t*; ha
$NewRi,t$	New calculated forest clearance by the baseline agent of the planned deforestation in stratum *i* in year *t* where no leakage is occurring; ha
i	1, 2, 3, … M strata; unitless
t	1, 2, 3, … t* time elapsed since the start of the project activity; years

Non-CO_2 emissions due to biomass burning in the area of activity shifting leakage is calculated according to the same procedures used to estimate baseline GHG emissions due to biomass burning. Non-CO_2 emissions due to nitrogen application are not part of the project scope.

According to VMD0009 LK-ASP v1.3, the parameter $AdefLK,,t$ is monitored. *Ex-ante*, it is assumed this value is zero and the deforestation agent is the same as the project proponent. Still according to the methodology, if $NewRi,$ exceeds $AdefLK,i,t$ then $LKAplanned,i,t$ must be set as zero as negative leakage is not considered under the VCS. Therefore, for the time being, in the Tapera project

the $\Delta CLK-AS,lanned$ will be assumed to be zero. In this sense, GHG emissions due to activity shifting for avoiding planned deforestation are set to zero in *ex-ante*.

Estimation of emissions from market-effects

According to VMD0011 LK-ME v1.1, the total leakage due to market effects is equal to the sum of market- effects leakage through decreased timber harvest and decreased harvest for fuelwood / charcoal production (Equation 20).

$$\Delta C_{LK-ME} = LK_{MarketEffects,timber} + LK_{MarketEffects,FW/C} + LK_{MarketEffects,peat} \quad \textbf{Equation 20}$$

Where:

$\Delta CLK-ME$	Net greenhouse gas emissions due to market-effects leakage; t CO_{2-e}
$LKMarketEffects,timber$	Total GHG emissions due to market-effects leakage through decreased timber harvest; t CO_{2-e}
$LKMarketEffects,FW/C$	Total GHG emissions due to market-effects leakage through decreased harvest of fuelwood and charcoal sold into regional and/or national markets; t CO_{2-e}
$LKMarketEffects,peat$	Total GHG emissions due to market-effects leakage through decreased timber, fuelwood and charcoal harvest resulting in increased peatland drainage; t CO_{2-e}

As there is no fuelwood or charcoal collection by the baseline agent of deforestation market leakage is limited to leakage through decreased timber harvest as calculated in Equation 21. Leakage due to market effects is equal to the baseline emissions from logging multiplied by a leakage factor and, where applicable, by a leakage management factor:

$$LK_{MarketEffects,timber} = \sum_{i=1}^{M}(LF_{ME} * LK_{MAF} * AL_{T,i}) \quad \textbf{Equation 21}$$

Where:

$LKMarketEffects,timber$	Total GHG emissions due to market-effects leakage through decreased timber harvest; t CO_{2-e}

LFME	Leakage factor for market-effects calculations; dimensionless
LKMAF	Leakage management adjustment factor; dimensionless
ALT,i	Summed emissions from timber harvest in stratum *i* in the baseline case potentially displaced through implementation of the project; t CO_{2-e}
i	1,2,3,…M strata; dimensionless

The deduction of the leakage factor for market-effects calculations (*LFME*) was adopted based on the relation between mean merchantable biomass as a proportion of total aboveground tree biomass for each forest type (*PMLFT*) and merchantable biomass as a proportion of total aboveground tree biomass for stratum i within the project boundary (*PMPi*). The *PMLFT* is estimated considering the literature data. According to Homma (2011), from 45 billion m3 of Amazon wood stocks, almost 14 billion m3 was marketable. Thus, the *PMLFT* adopted is 31% for legal Amazon. The *LFME* used for timber is 0.4, where mean merchantable biomass as a proportion of total aboveground tree biomass for each forest type is equal to merchantable biomass as a proportion of total aboveground tree biomass within the project boundary (*PMLFT = ±15% to PMPi*). The species that would be harvested in the project area is an Amazonian species and could only originate from other native forest sites in the Brazilian Amazon.

Additionally, they would need to come from woods that are in a state of relative maturity and where it is simple to locate trees of millable size (> 40 cm DBH). According to Higuchi et al. (1998), the proportion of stem (merchantable portion) biomass to total aboveground biomass is largely constant in mature Amazonian forests. It is also not anticipated to vary between the mature native forests in the project area and those in other regions of the Brazilian Amazon.

Deduction factors for *LFME*:

PMLFT = ±15% toPMPi	*LFME = 0.4*
PMLFT > 15% less than PMPi	*LFME = 0.7*
PMLFT > 15% greater than PMPi	*LFME = 0.2*

Where:

PMLFT	Mean merchantable biomass as a proportion of total aboveground tree biomass for each forest type (%)
PMPi	Merchantable biomass as a proportion of total aboveground tree biomass for stratum *i* within the project boundary (%)

LFME	Leakage factor for market-effects calculations; dimensionless

Moreover, if leakage management activities are established within areas under the control of the project proponent in order to minimise the displacement of land use activities to areas outside the project area by maintaining the production of total biomass in commercial species that is merchantable, a leakage management adjustment factor (□□□□□) may be applied (Equation 22). As leakage management activities have not been established within areas under the control of the proponent and according to Higuchi et al. (1998), that the proportion of stem biomass (marketable portion) to total aboveground biomass is constant in mature Amazonian forests, the □□□□□ was kept at 1.

$$LK_{MAF} = 1 - \left(\frac{PRODMB_{LMA,t}}{PRODMB_{BL,t}}\right) \qquad \textbf{Equation 22}$$

Where:

LKMAF	Leakage management adjustment factor; dimensionless
PRODMBLMA,t	Production biomass in commercial species that is merchantable in year *t* in leakage management areas; t per year
PRODMBBL,t	Production of biomass in commercial species that is merchantable in year *t* in the baseline case; t per year
t	1, 2, 3, … t* time elapsed since the projected start of the REDD project activity;years

The next step is to estimate the emissions associated with the displaced logging activity. This is based on the total volume that would have been logged in the baseline in the project area across strata and time periods (Equation 23):

$$AL_{T,i} = \sum_{t=1}^{t} (C_{BSL,XBT,i,t}) \qquad \textbf{Equation 23}$$

Where:

ALT,i	Summed emissions from timber harvest in stratum *i* in the baseline case laced through implementation of carbon project; t CO_{2-e}
$CBSL,XBT,i,t$	Carbon emission due to displaced timber harvests in the baseline scenario in stratum *i* in year *t*; t CO_{2-e}
i	1, 2, 3, …M strata
t	1, 2, 3, … t* time elapsed since the projected start of the REDD project activity; years

The carbon emission due to the displaced logging has two components: the biomass carbon of the extracted timber and the biomass carbon in the forest damaged in the process of timber extraction (Equation 24):

$$C_{BSL,XBT,i,t} = ((V_{BSL,EX,i,t} * D_{mn} * CF) + (V_{BSL,EX,i,t} * LDF) + (V_{BSL,EX,i,t} * LIF)) * \frac{44}{12}$$ **Equation 24**

Where:

$C_{BSL,XBT,i,t}$	Carbon emission due to timber harvests in the baseline scenario in stratum *i* in year *t*; t CO_{2-e}
$V_{BSL,EX,i,t}$	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum *i* in year *t*; m^3 $V_{BSL,EX,i,t}$ = 38.3 m^3 ha^{-1} (da SILVA et al., 2001; Veríssimo et al., 1992)
D_{mn}	Mean wood density of commercially harvested species; t d.m.m^{-3} D_{mn} = 0.60 t d.m. m^{-3} (VMD0011-LK-ME-v1.1).
CF	Carbon fraction of biomass for commercially harvested species *j*; t C t d.m.$^{-1}$ CF = 0.47 t C t d.m.$^{-1}$ ((IPCC, 2006b) page 4.48, Table 4.3).
LDF	Logging damage factor; t C m^{-3} LDF = 0.53 t C m^{-3} (VMD0011-LK-ME-v1.1).
LIF	Logging infrastructure factor; t C m^{-3} LIF = 0.29 t C m^{-3} (VMD0011-LK-ME-v1.1)
i	1, 2, 3, ... M strata
t	1, 2, 3, ... t* time elapsed since the projected start of the project activity; years

The logging damage factor (□□□) is a representation of the quantity of emissions that will ultimately arise per unit of extracted timber (m3). These emissions arise from the non-commercial portion of the felled tree (the branches and stump) and trees incidentally killed during tree felling. The default values given here come from the slope of the regression equation between carbon damage and volume extracted based on

774 logging gaps measured by Winrock International in Bolivia, Belize, the Republic of Congo, Brazil and Indonesia, and 134 logging gaps in Mexico.

The logging infrastructure factor (LDF) is a representation of the quantity of emissions that will ultimately arise per unit of timber (m3) from roads, skid trails and logging decks. The conservative default value is the upper confidence interval of the average emission from analyses conducted across 1 473 hectares in the Republic of Congo and 366 hectares in Brazil.

Therefore, the total values for calculating leakage due to market effect, as well as the results for *ΔCLK−ME* are shown in Table 46.

Table 46. Net greenhouse gas emissions due to market-effects leakage (t CO2-e).

Year	$A_{planned,i} * D\%_{planned,i,t}$	$CBSL_{,XBT,i,t}$	$AL_{T,i}$	$LKMarketEffects_{,timber}$	$\Delta CLK-ME$
	ha	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}	tCO_{2-e}
2021-2022	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2022-2023	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2023-2024	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2024-2025	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2025-2026	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2026-2027	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2027-2028	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2028-2029	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2029-2030	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2030-2031	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2031-2032	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2032-2033	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2033-2034	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2034-2035	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2035-2036	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2036-2037	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0

2037-2038	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2038-2039	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2039-2040	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2040-2041	2.759,6	427.075,1	427.075,1	170.830,0	170.830,0
2041-2042	-	-	-	-	-
2042-2043	-	-	-	-	-
2043-2044	-	-	-	-	-
2044-2045	-	-	-	-	-
2045-2046	-	-	-	-	-
2046-2047	-	-	-	-	-
2047-2048	-	-	-	-	-
2048-2049	-	-	-	-	-
2049-2050	-	-	-	-	-
2050-2051	-	-	-	-	-
TOTAL	**55.192,8**	**8.541.501,6**			**3.416.600,6**

Leakage Management Area Diagnosis

The leakage management area (LMA) comprises non-forest areas located outside the project boundary in which the project proponent intends to implement the activities which reduce the risk of leakage in the project scenario. These activities must include the agents of deforestation and involve seeking new sources of income which contribute to forest conservation. Leakage management could involve agriculture, agroforestry, reforestation, education, or other activities. To define the Leakage Management Area was defined in the nearest communities of the project area.

Leakage Management Plan

The main objective of the project is to avoid planned deforestation. This goal will be achieved through the expansion of monitoring of the area, along with the inclusion of the local community in the project activities, with environmental education and alternative sources of income to minimise risks of invasion and deforestation within the project area and the reference region.

As mentioned throughout this project description document, the Tapera Amazon REDD+ Project envisages the possibility of implementing a Non-Timber Forest Products (NTFP) extraction program to provide an alternative source of income for the local communities surrounding the project area.

The non-timber forest products of choice are: breu resin, tonka beans, jatoba fruits, copaiba oil, nuts, which will need to be further studied.

Brazilian legislation, such as Decree nº 6040, guarantees the right of traditional peoples and communities to achieve sustainable development, and through it, activities such as a collection of forest products are allowed if they do not cause damage to the area in question. As a result, the Project Proponents cannot (by law) or want to prohibit local communities from collecting NTFPs in the Project Area.

Moreover, the project activities will enable the creation of jobs to monitor the area, prioritising the hiring of residents for monitoring of the area, with professional training. Income from the sale of credits will make it possible to invest in the educational and professional training of children and adults in the community.

Beyond the project's ecological and carbon benefits, the implementation of REDD+ mechanisms promotes benefit sharing.

Commercially Sensitive Information

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

Further Information

No further information is applicable.

3.2.4.Net GHG Emission Reductions and Removals

Net GHG emission reduction estimates are based in VM0007 v1.7. The total net greenhouse gas emissions reductions of the REDD project activity are calculated as follows (Equation 25, Equation 26 and Equation 27):

$$NER_{REDD} = \Delta C_{BSL-REDD} - \Delta C_{WPS-REDD} - \Delta C_{LK-REDD}$$ **Equation 25**

Where:

NER_{REDD}	Total net GHG emission reductions of the REDD project activity up to year t^*; t CO_{2-e}
$\Delta C_{BSL-REDD}$	Net GHG emissions in the REDD baseline scenario up to year t^*; t CO_{2-e}
$\Delta C_{WPS-REDD}$	Net GHG emissions in the REDD project scenario up to year t^*– from Module MREDD; t CO_{2-e}
$\Delta C_{LK-REDD}$	Net GHG emissions due to leakage from the REDD project activity up to year t^*; t CO_{2-e}

$$\Delta C_{BSL-REDD} = \Delta C_{BSL,planned} + \Delta C_{BSL,unplanned} + \Delta C_{BSL,degrad-FW/C}$$ **Equation 26**

Where:

$\Delta C_{BSL-REDD}$	Net GHG emissions in the REDD baseline scenario up to year t^*; t CO_{2-e}
$\Delta C_{BSL,planned}$	Net GHG emissions in the baseline scenario from planned deforestation up to year t^*; t CO_{2-e}
$\Delta C_{BSL,unplanned}$	Net GHG emissions in the baseline scenario from unplanned deforestation up to year t^*; t CO_{2-e}
$\Delta C_{BSL,degrad-FW/C}$	Net GHG emissions in the baseline scenario from degradation caused by fuelwood collection and charcoal making up to year t^*; t CO_{2-e}

$$\Delta C_{LK-REDD} = \Delta C_{LK-AS,planned} + \Delta C_{LK-AS,unplanned} + \Delta C_{LK-AS,deg\,rad-FW/C} + \Delta C_{LK-ME} \quad \text{Equation 27}$$

Where:

$\Delta CLK-REDD$	Net GHG emissions due to leakage from the REDD project activity up to year t^*; t CO_{2-e}
$\Delta CLK-AS,planned$	Net GHG emissions due to activity shifting leakage for projects preventing planned deforestation up to year t^*; t CO_{2-e}
$\Delta CLK-AS,unplanned$	Net GHG emissions due to activity shifting leakage for projects preventing unplanned deforestation up to year t^*; t CO_{2-e}
$\Delta CLK-AS,deg\ rad-FW/C$	Net GHG emissions due to activity shifting leakage for degradation caused by extraction of wood for fuel up to year t^*; t CO_{2-e}
$\Delta CLK-ME$	Net GHG emissions due to market-effects leakage up to year t^*; t CO_{2-e}

Specific procedures for the quantification of the net GHG emissions in the REDD baseline scenario, the net GHG emissions in the REDD project scenario and GHG emissions due to leakage can be found in Sections 4.1, 4.2 and 4.3, respectively. Total net GHG emission reductions of the REDD project activity are reported in Table 47.

Table 47. Total net GHG emission reductions of the REDD project activity (t CO2-e) (ex-ante).

Year	Estimated baseline emissions or removals (tCO_{2-e})	Estimated project emissions or removals (tCO_{2-e})	Estimated leakage emissions (tCO_{2-e})	Estimated net GHG emission reductions or removals (tCO_{2-e})
2021-2022	1.335.547,4		170.830,0	1.164.717,4
2022-2023	1.378.185,9		170.830,0	1.207.355,8
2023-2024	1.420.824,3		170.830,0	1.249.994,3
2024-2025	1.463.462,8		170.830,0	1.292.632,8
2025-2026	1.506.101,3		170.830,0	1.335.271,3
2026-2027	1.548.739,8		170.830,0	1.377.909,7
2027-2028	1.591.378,2		170.830,0	1.420.548,2
2028-2029	1.634.016,7		170.830,0	1.463.186,7
2029-2030	1.676.655,2		170.830,0	1.505.825,2
2030-2031	1.719.293,7		170.830,0	1.548.463,6
2031-2032	1.722.488,6		170.830,0	1.551.658,6
2032-2033	1.725.683,5		170.830,0	1.554.853,5
2033-2034	1.728.878,5		170.830,0	1.558.048,5
2034-2035	1.732.073,4		170.830,0	1.561.243,4
2035-2036	1.735.268,4		170.830,0	1.564.438,3
2036-2037	1.738.463,3		170.830,0	1.567.633,3
2037-2038	1.741.658,3		170.830,0	1.570.828,2
2038-2039	1.744.853,2		170.830,0	1.574.023,2
2039-2040	1.748.048,1		170.830,0	1.577.218,1
2040-2041	1.751.243,1		170.830,0	1.580.413,0

2041-2042	415.695,7			415.695,7
2042-2043	373.057,2			373.057,2
2043-2044	330.418,7			330.418,7
2044-2045	287.780,3			287.780,3
2045-2046	245.141,8			245.141,8
2046-2047	202.503,3			202.503,3
2047-2048	159.864,8			159.864,8
2048-2049	117.226,4			117.226,4
2049-2050	74.587,9			74.587,9
2050-2051	31.949,4			31.949,4
TOTAL	**34.881.089,2**			**31.464.488,5**

Uncertainty Analysis

VMD0017 v2.2 is used to perform an uncertainty analysis under the Tapera project. In order to create an overall uncertainty estimate of the total net GHG emission reductions, this module combines uncertainty information with conservative estimations. Uncertainty in baseline estimations were estimated through an assessment of deforestation rates, stocks in carbon pools and carbon stock changes.

Guidance on uncertainty – a precision target of a 95% confidence interval half-width equal to or less than 15% of the recorded value must be targeted. This is especially important in terms of project planning for measurement of carbon stocks; sufficient measurement plots should be included to achieve this precision level across the measured stocks.

Assess Uncertainty in Projection of Baseline Rate of Deforestation or Degradation

Uncertainty in baseline rate of deforestation is set as zero (*UncertaintyBSL,ATE = 0*), as the deforestation rates are based on actual deforestation plans (BL-PL), following VMD0017 v2.2, Section 5.1.1 criteria.

Assess Uncertainty of Emissions and Removals in Project Area in Baseline Scenario

Uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD baseline scenario is estimated according to VMD0017 v2.2 (Equation 28):

$$Uncertainty_{REDD-BSL,SS} = \frac{\sqrt{\sum_{i=1}^{M}\left(U_{REDD-BSL,SS,i} * E_{REDD-BSL,SS,i}\right)^2}}{\sum_{i=1}^{M} E_{REDD-BSL,SS,i}} \qquad \text{Equation 28}$$

Where:

$Uncertainty_{REDD-BSL,SS}$	Total uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD baseline scenario; %
$U_{REDD-BSL,SS,i}$	Percentage uncertainty in the combined carbon stocks and greenhouse gas sources in stratum i in the REDD baseline scenario; %
$E_{REDD-BSL,SS,i}$	Sum of combined carbon stocks and GHG sources in the REDD baseline scenario; t CO_{2-e}
i	1, 2, 3 ...M strata; unitless

Uncertainty should be expressed as the 95% confidence interval half width as a percentage of the mean. Uncertainty is first propagated across pools within strata. The percentage uncertainty in the combined carbon stocks and greenhouse gas sources is calculated as follows (Equation 29):

$$U_{REDD-BSL,SS,i} = \frac{\sqrt{\sum_{1}^{n}\left(U_{REDD-BSL,SS,i,pool\#} * E_{REDD-BSL,SS,i,pool\#}\right)^2}}{\sum_{1}^{n} E_{REDD-BSL,SS,i,pool\#}} \qquad \textbf{Equation 29}$$

Where:

$U_{REDD-BSL,SS,i}$	**Percentage uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD baseline scenario in stratum *i*; %**
$U_{REDD-BSL,SS,i,pool\#}$	**Percentage uncertainty for carbon stocks and greenhouse gas sources in the REDD baseline scenario in stratum *i*; %**
$E_{REDD-BSL,SS,i,pool\#}$	**Carbon stock or GHG sources in the REDD baseline scenario; t CO_{2-e}**
i	**1, 2, 3 ...M strata; unitless**

Uncertainty in pools derived from field measurement with 95% confidence interval calculated as the standard error of the averaged plot measurements in each stratum multiplied by the *t value* for the 95% confidence level (1.96).

Estimate Total Uncertainty in REDD Baseline Scenario

Total Uncertainty in REDD baseline scenario is estimated according to VMD0017 v2.2 (Equation 30):

$$Uncertainty_{REDD-BSL,t*} = \sqrt{Uncertainty_{BSL,RATE,t*}^{2} + Uncertainty_{REDD-BSL,SS}^{2}} \quad \textbf{Equation 30}$$

Where:

$Uncertainty_{REDD-BSL,t*}$	**Cumulative uncertainty in REDD baseline scenario up to year *t**; %**
$Uncertainty_{BSL,RATE,t*}$	**Cumulative uncertainty in the baseline rate of deforestation up to year *t*; %**
$Uncertainty_{REDD-BSL,SS}$	**Total uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD baseline scenario; %**
t	**1, 2, 3, ...t* time elapsed since the start of the project activity; years**

$Uncertainty_{REDD-BSL,t*}$ is equal to $Uncertainty_{REDD-BSL,SS}$ since $Uncertainty_{BSL,RATE,t*}$ is set to zero.

In the Tapera project, as the biomass considered for now was from a bibliographic reference, the uncertainty values were obtained by the same reference (Nogueira et al., 2015). Therefore, the uncertainty of Table 4.2 was propagated (standard error−$\sigma\bar{x}$ propagation equations) to the final calculation of the baseline carbon stock and then the percentage uncertainty of the estimate was calculated (Equation 30).

Uncertainty Ex Post in the REDD Project Scenario

As no ex post (re)measurements of carbon pools or GHG sources were made, the uncertainty of these sources is already included in $UncertaintyREDD-BSL,*$ and $UncertaintyREDD-WPS$ is set to zero.

Total Error in the REDD+ Project Activity

Calculation of leakage is conservative in all instances and therefore uncertainty in leakage is not considered here. Total project uncertainty is therefore equal to the combined uncertainty in baseline and project estimates for the REDD activities (Equation 31). The total error in the REDD+ project activity is therefore calculated according to the scope of the project.

$$NER_{REDD+ERROR} = \sqrt{(Uncertainty_{REDD_{BSL},t*} * \Delta C_{BSL-REDD,t*})^2} * \left(\frac{1}{\Delta C_{BSL-REDD,t*}}\right)$$ **Equation 31**

Where:

$NER_{REDD+ERROR}$	**Cumulative uncertainty for the REDD+ (REDD and WRC) project activities up to year *t**; %**
$Uncertainty_{REDD_{BSL},t*}$	**Cumulative uncertainty in REDD baseline scenario up to year *t*; %**
$\Delta C_{BSL-REDD,t*}$	**Net GHG emissions in the REDD baseline scenario up to year t*; t CO_{2-e}**
t	**1, 2, 3, ...t* time elapsed since the project start; year**

Therefore, we can consider that the Equation 31 can be simplified to $NERREDD+ERROR = UncertaintyREDDBSL,t*$.

Implications for Project Accounting

The allowable uncertainty in this methodology REDD-MF is +/- 15% of NER_{REDD+} at the 95% confidence level. Where uncertainty exceeds 15% of NERREDD+ at the 95% confidence level then the deduction shall be equal to the amount that the uncertainty exceeds the allowable level. The adjusted value for $NERREDD$ to account for uncertainty shall be calculated as described in Equation 32.

$$Adjusted\_NER_{REDD+} = NER_{REDD} * (100\% - NER_{REDD+ERROR} + 15\%)$$ **Equation 32**

Where:

$Adjusted\_NER_{REDD+}$	**Total net GHG emission reductions of the REDD+ project activities up to year *t** adjusted to account for uncertainty; t CO_{2-e}**
$NER_{REDD+ERROR}$	**Cumulative uncertainty for the REDD+ (REDD and WRC) project activities up to year *t**; %**

Factors related to the activities of the ARR or WRC project were not accounted for because they were not included in the scope of this project. As the uncertainty level was set at +/- 15%, no deductions should result for the uncertainty (Table 48)

Table 48. Cumulative uncertainty for the REDD+ project activities and Total net GHG emission reductions of the REDD+ project activities up to year t* adjusted to account for uncertainty (t CO2-e) (ex-ante).

Year	NER_{REDD}	$NER_{REDD+ERROR}$	$Adjusted\_NER_{REDD+}$
	(tCO_{2-e})	%	(tCO_{2-e})
2021-2022	1.164.717,4	4,7%	1.164.717,4
2022-2023	1.207.355,8	4,7%	1.207.355,8
2023-2024	1.249.994,3	4,7%	1.249.994,3
2024-2025	1.292.632,8	4,7%	1.292.632,8
2025-2026	1.335.271,3	4,7%	1.335.271,3
2026-2027	1.377.909,7	4,7%	1.377.909,7
2027-2028	1.420.548,2	4,7%	1.420.548,2
2028-2029	1.463.186,7	4,7%	1.463.186,7
2029-2030	1.505.825,2	4,7%	1.505.825,2
2030-2031	1.548.463,6	4,7%	1.548.463,6
2031-2032	1.551.658,6	4,7%	1.551.658,6
2032-2033	1.554.853,5	4,7%	1.554.853,5
2033-2034	1.558.048,5	4,7%	1.558.048,5
2034-2035	1.561.243,4	4,7%	1.561.243,4
2035-2036	1.564.438,3	4,7%	1.564.438,3
2036-2037	1.567.633,3	4,7%	1.567.633,3
2037-2038	1.570.828,2	4,7%	1.570.828,2
2038-2039	1.574.023,2	4,7%	1.574.023,2
2039-2040	1.577.218,1	4,7%	1.577.218,1
2040-2041	1.580.413,0	4,7%	1.580.413,0
2041-2042	415.695,7	4,7%	415.695,7
2042-2043	373.057,2	4,7%	373.057,2
2043-2044	330.418,7	4,7%	330.418,7

2044-2045	287.780,3	4,7%	287.780,3
2045-2046	245.141,8	4,7%	245.141,8
2046-2047	202.503,3	4,7%	202.503,3
2047-2048	159.864,8	4,7%	159.864,8
2048-2049	117.226,4	4,7%	117.226,4
2049-2050	74.587,9	4,7%	74.587,9
2050-2051	31.949,4	4,7%	31.949,4
TOTAL	**31.464.488,5**		**31.464.488,5**

Calculation of AFOLU Pooled Buffer Account Contribution

The number of credits to be held in the AFOLU pooled buffer account is determined as a percentage of the total carbon stock benefits. For this project, this is equal to the net GHG emissions in the baseline minus the net emissions in the project case. Leakage emissions do not factor into the buffer calculations. Non_CO2 emissions from fossil fuels and fertiliser usage were conservatively excluded from the project scope. Buffer is calculated through VM0007 v1.7 (Equation 33).

Equation 33

$$Buffer_{planeed} = \left(\Delta C_{BSL,planeed} - \sum_{t=1}^{t*}{}_{BSL\ planned} \sum_{i=1}^{M} (E_{FC,i,t} + N_2O_{direct,i,t}) \right) - \left(\Delta C_{P,planned} - \sum_{t=1}^{t*}{}_{P\ planeed} \sum_{i=1}^{M} (E_{FC,i,t} + N_2O_{direct,i,t}) \right) * Buffer\%$$

Where:

$Buffer_{planeed}$	**Buffer withholding for avoiding planned deforestation project activities; t CO_{2-e}**
$\Delta C_{BSL,planeed}$	**Net greenhouse gas emissions in the baseline from planned deforestation up to year t*; t CO_{2-e}**
$E_{FC,i,t}$	**Net CO_{2-e} emission from fossil fuel combustion in stratum i in year t; t CO_{2-e}**
$N_2O_{direct,i,t}$	**Direct N2O emission as a result of nitrogen application on the alternative land use within the project boundary in stratum i in year t; t CO_{2-e}**
$\Delta C_{P,planned}$	**Net GHG emissions within the project area in the project scenario; t CO_{2-e}**
$Buffer\%$	**Buffer withholding percentage; %**

The buffer pool allocation was estimated using the AFOLU Non-Permanence Risk Tool v.4.0 and the resulting value for the second baseline period was 10%.

Calculation of Verified Carbon Units

Total number of Verified Carbon Units (VCUs) generated by the project activity implementation is estimated (ex-ante) according to VM0007 v1.7 (Equation 34). It is important to remember that only ex- ante estimates were considered.

$$VCU_t = Adjusted_{NER_{REDD+}} - Buffer_{Planned} \qquad \textbf{Equation 34}$$

Where:

VCUt	Number of Verified Carbon Units at year t = t2 - t1; VCU
AdjustedNERREDD+	Total net GHG emission reductions of the REDD+ project activity up adjusted to account for uncertainty; t CO_{2-e}
BufferPlanned	Total permanence risk buffer withholding; t CO_{2-e}

Hence, the estimated net GHG emission reductions or removals result from the difference between (i) the net GHG emission reductions or removals and (ii) buffer pool allocation (Table 49).

Table 49. Total net GHG emission reductions of the REDD project activity (t CO2-e) (ex-ante) and Buffer pool allocation (t CO2-e).

Year	Estimated net GHG emission reductions or removals or *Adjusted_NERREDD+* *(t CO_{2-e})*	Buffer pool allocation *(t CO_{2-e})*	*VCUt* (t CO_{2-e})
2021-2022	1.164.717,4	116.471,7	1.048.245,6
2022-2023	1.207.355,8	120.735,6	1.086.620,2
2023-2024	1.249.994,3	124.999,4	1.124.994,9
2024-2025	1.292.632,8	129.263,3	1.163.369,5
2025-2026	1.335.271,3	133.527,1	1.201.744,1
2026-2027	1.377.909,7	137.791,0	1.240.118,8
2027-2028	1.420.548,2	142.054,8	1.278.493,4
2028-2029	1.463.186,7	146.318,7	1.316.868,0
2029-2030	1.505.825,2	150.582,5	1.355.242,6
2030-2031	1.548.463,6	154.846,4	1.393.617,3
2031-2032	1.551.658,6	155.165,9	1.396.492,7
2032-2033	1.554.853,5	155.485,4	1.399.368,2
2033-2034	1.558.048,5	155.804,8	1.402.243,6
2034-2035	1.561.243,4	156.124,3	1.405.119,1
2035-2036	1.564.438,3	156.443,8	1.407.994,5

2036-2037	1.567.633,3	156.763,3	1.410.870,0
2037-2038	1.570.828,2	157.082,8	1.413.745,4
2038-2039	1.574.023,2	157.402,3	1.416.620,8
2039-2040	1.577.218,1	157.721,8	1.419.496,3
2040-2041	1.580.413,0	158.041,3	1.422.371,7
2041-2042	415.695,7	41.569,6	374.126,1
2042-2043	373.057,2	37.305,7	335.751,5
2043-2044	330.418,7	33.041,9	297.376,9
2044-2045	287.780,3	28.778,0	259.002,2
2045-2046	245.141,8	24.514,2	220.627,6
2046-2047	202.503,3	20.250,3	182.253,0
2047-2048	159.864,8	15.986,5	143.878,4
2048-2049	117.226,4	11.722,6	105.503,7
2049-2050	74.587,9	7.458,8	67.129,1
2050-2051	31.949,4	3.194,9	28.754,5
TOTAL	**31.464.488,5**	**3.146.448,9**	**28.318.039,7**

3.3. Monitoring

3.3.1. Data and Parameters Available at Validation

Table 50. Data and parameters that are determined or available at validation and remain fixed throughout the project crediting period at the Tapera Project.

Data / Parameter	AAplanned,i,t
Data unit	ha
Description	Annual area of baseline planned deforestation for stratum *i* at time *t*
Source of data	Calculated based on VMD0006 v1.3 equation 4
Value applied	See the values applied in the Table 4.1
Justification of choice of data or description of measurement methods and procedures applied	Estimated based on projected annual proportion of land that will be deforested in stratum i during year t, the total area of planned deforestation over the baseline period for stratum I and the likelihood of deforestation for stratum i according to VMD0006 v1.3.
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	Aplanned,i,t
Data unit	ha
Description	Projected annual proportion of land that will be deforested in stratum i during year t.
Source of data	Vegetation Management Plan
Value applied	55,192.77

Justification of choice of data or description of measurement methods and procedures applied	Determined according to what is recognized as an immediate site-specific threat of deforestation, which, in its turn, is a function of the legal permissibility for deforestation, the suitability of the project area for conversion to alternative non-forest land use, the government approval for deforestation and a management plan for deforesting the project area. See Section 3.1.4 for a complete description of measurement methods and procedures applied.
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	D%planned,i,t
Data unit	%
Description	Total area of planned deforestation over the baseline period for stratum i
Source of data	Vegetation Management Plan
Value applied	5%
Justification of choice of data or description of measurement methods and procedures applied	Where a valid verifiable plan exists for the rate at which deforestation is projected to occur, this rate must be used, according to VMD0006 v1.3, Section 1.3 criteria.
Purpose of Data	Determination of baseline scenario.
Comments	-

Data / Parameter	L − Di
Data unit	%
Description	Likelihood of deforestation for stratum i
Source of data	VMD0006 v1.3
Value applied	100
Justification of choice of data or description of measurement methods and procedures applied	For all areas not both under Government control and zoned for deforestation, L-Di must be equal to 1. Must be revisited at the time of baseline revision
Purpose of Data	Determination of baseline scenario
Comments	

Data / Parameter	CF
Data unit	t C t d.m^{-1}
Description	Default value of carbon fraction in biomass
Source of data	(IPCC, 2006b) page 4.48, Table 4.3
Value applied	0.47
Justification of choice of data or description of measurement methods and procedures applied	The default value was used to be more conservative
Purpose of Data	• Calculation of baseline emissions • Calculation of leakage
Comments	-

Data / Parameter	ab
Data unit	Mg ha^{-1}
Description	Average biomass stock per hectare in the aboveground biomass pool of initial forest class *i*
Source of data	Nogueira et al., 2015
Value applied	See the values applied in the Table 4.2
Justification of choice of data or description of measurement methods and procedures applied	Average biomass stock per hectare in the aboveground biomass pool was estimated based on peer-reviewed literature
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	CABtreebsl,i
Data unit	t $CO_{2\text{-}e}$ ha^{-1}
Description	Forest carbon stock in aboveground tree biomass in stratum *i*
Source of data	Estimated based on peer-reviewed literature (Nogueira et al., 2015).
Value applied	470.43
Justification of choice of data or description of measurement methods and procedures applied	Forest carbon stock in aboveground tree biomass was estimated based on peer-reviewed literature $CABtreebsl,i = ab * CF * \frac{44}{12}$
Purpose of data	Calculation of baseline emissions
Comments	

Data / Parameter	CABtreepost,i
Data unit	t $CO_{2\text{-}e}$ ha^{-1}
Description	Post-deforestation carbon stock in aboveground tree biomass in stratum *i*
Source of data	Secondary data from peer-reviewed literature (Silva Neto et al., 2012)
Value applied	13.56
Justification of choice of data or description of measurement methods and procedures applied	Post-deforestation carbon stock in aboveground tree biomass is taken from peer reviewed literature (Silva Neto et al., 2012) considering an average degradation and the total dry mass
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	ΔCABtree,i
Data unit	t $CO_{2\text{-}e}$ ha^{-1}
Description	Baseline carbon stock change in aboveground tree biomass in stratum *i*
Source of data	Calculated based on VMD0006 v1.3 Equation 6
Value applied	456.87
Justification of choice of data or description of measurement methods and procedures applied	Estimated based on the forest carbon stock in aboveground tree biomass in stratum *i* and the post-deforestation carbon stock in aboveground tree biomass in stratum *i* $\Delta C_{AB_{tree},i} = C_{AB_{tree}}{}_{bsl,i} - C_{AB_{tree}}{}_{post,i}$
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	44/12
Data unit	Dimensionless
Description	Ratio converting C to CO_{2-e}
Source of data	-
Value applied	44/12 = 3.67
Justification of choice of data or description of measurement methods and procedures applied	Conversion of carbon to carbon dioxide
Purpose of Data	• Calculation of baseline emissions • Calculation of leakage
Comments	-

Data / Parameter	bb
Data unit	Mg ha^{-1}
Description	Average biomass stock per hectare in the belowground biomass pool of initial forest class *i*
Source of data	The aboveground is converted into belowground biomass through a root-shoot ratio
Value applied	See the values applied in the Table 4.2
Justification of choice of data or description of measurement methods and procedures applied	Average biomass stock per hectare in the belowground biomass pool was estimated based on peer-reviewed literature and through a root-shoot ratio
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	Root-shoot ratio
Data unit	t root d.m.t^{-1} shoot d.m.
Description	Root to shoot ratio appropriate to species or forest type / biome; note that as defined here, root to shoot ratio is applied as belowground biomass per unit area: aboveground biomass per unit area (not on a per stem basis)
Source of data	IPCC, 2019 – Table 4.4
Value applied	0.221
Justification of choice of data or description of measurement methods and procedures applied	The ecological zone was selected as a Tropical Rain Forest on the South American continent
Purpose of Data	• Calculation of baseline emissions
Comments	-

Data / Parameter	$CBBtreebsl,i$
Data unit	t $CO_{2\text{-}e}$ ha^{-1}
Description	Forest carbon stock in belowground tree biomass in stratum *i*
Source of data	Estimated based on peer-reviewed literature (Silva Neto et al., 2012)
Value applied	145.93
Justification of choice of data or description of measurement methods and procedures applied	Calculated from carbon stock in aboveground biomass in trees in the baseline in stratum *i* and root to shoot ratios $C_{BB\_tree,bsl,i} = bb * CF * \frac{44}{12}$
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	CBBtreepost,i
Data unit	t $CO_{2\text{-}e}$ ha^{-1}
Description	Post-deforestation carbon stock in belowground tree biomass in stratum i
Source of data	Estimated based on peer-reviewed literature (Silva Neto et al., 2012)
Value applied	3.00
Justification of choice of data or description of measurement methods and procedures applied	Post-deforestation carbon stock in belowground tree is taken from peer reviewed literature (Silva Neto et al., 2012) considering an average degradation and the total dry mass
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	$\Delta CBB\_tree,i$
Data unit	t CO2-e ha-1
Description	Baseline carbon stock change in belowground tree biomass in stratum *i*
Source of data	Calculated based on VMD0006 v1.3 Equation 8
Value applied	142.93
Justification of choice of data or description of measurement methods and procedures applied	Estimated based on the forest carbon stock in aboveground tree biomass in stratum *i* and the post-deforestation carbon stock in aboveground tree biomass in stratum *i* $\Delta CBB\_tree,I = CBBtree_{bsl,i} - CBBtree_{post,i}$
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	CWP,i
Data unit	t CO_2-e ha^{-1}
Description	Carbon stock entering the wood products pool from stratum *i*
Source of data	Calculated based on VMD0005 v1.1 equation 2
Value applied	27.57
Justification of choice of data or description of measurement methods and procedures applied	Estimated based on mean stock of extracted biomass carbon by class of wood product ty from stratum *i* and the wood waste (the fraction immediately emitted through mill inefficiency by class of wood product)
Purpose of Data	Calculation of baseline emissions
Comments	

Data / Parameter	CXB,ty,i
Data unit	t $CO_{2\text{-}e}$ ha^{-1}
Description	Mean stock of extracted biomass carbon by class of wood product ty from stratum *i*
Source of data	Calculated based on VMD0005 v1.1 equation 1
Value applied	36.27
Justification of choice of data or description of measurement methods and procedures applied	Estimated based on volume of timber extracted from stratum *i* (does not include slash left onsite) by species *j* and wood product class *ty* measurement methods and procedures applied, mean wood density of species *j*, carbon fraction and the total area of stratum
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	WWty
Data unit	Dimensionless
Description	Wood waste. The fraction immediately emitted through mill inefficiency by class of wood product *ty*
Source of data	Pearson et al. (2012), page 8
Value applied	0.24
Justification of choice of data or description of measurement methods and procedures applied	Waste wood gives the proportion emitted immediately due to factory inefficiency which is 0.19 in developed countries, 0.24 in developing countries.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	Vex,ty,j,i
Data unit	$m^3 ha^{-1}$
Description	Volume of timber extracted from within stratum *i* (does not include slash left onsite) by species *j* and wood product class *ty*
Source of data	da SILVA et al., 2001; Veríssimo et al., 1992, Table 1
Value applied	38.3
Justification of choice of data or description of measurement methods and procedures applied	Estimated value based on the average of the values presented in Table 1 by Veríssimo et al., 1992 for a forest stratum similar to the Tapera project
Purpose of Data	• Calculation of baseline emissions • Calculation of leakage
Comments	-

Data / Parameter	D_i
Data unit	t d.m.m^{-3}
Description	Mean wood density of species j
Source of data	Default value of VMD0011 LK-ME v1.1
Value applied	0.60
Justification of choice of data or description of measurement methods and procedures applied	Regional average (0.58 t d.m.m-3 - tropical Africa; 0.60 t d.m.m-3 - tropical America; 0.57 t d.m.m-3 - tropical Asia) from Brown, S. 1997. Estimating Biomass and Biomass Change of Tropical Forests: a Primer. For the Food and Agriculture Organization of the United Nations. Rome, 1997. FAO Forestry Paper - 134. ISBN 92- 5-103955-0.
Purpose of Data	• Calculation of baseline emissions • Calculation of leakage
Comments	-

Data / Parameter	CWP100,i
Data unit	t $CO_{2\text{-}e}$ ha^{-1}
Description	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100 years from stratum *i*
Source of data	Calculated based on VMD0005 v1.1 equation 3
Value applied	23.15
Justification of choice of data or description of measurement methods and procedures applied	Estimated base on carbon stock entering wood products pool at time of deforestation from stratum *i*, fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product *ty*, and Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product *ty*
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	SLFty
Data unit	Dimensionless
Description	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product *ty*
Source of data	page 276, (Winjum et al., 1998) and page 8, (Pearson et al., 2012)
Value applied	0.2
Justification of choice of data or description of measurement methods and procedures applied	Winjum et al. 1998 give the following proportions for wood products with short-term (<5 yr) uses after which they are retired and oxidized (applicable internationally): Sawnwood: 0.2 The methodology makes the assumption that all other classes of wood products, and where wood product class ty is unknown, are 100% oxidized within 5 years
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	Ofty
Data unit	Dimensionless
Description	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product *ty*
Source of data	page 276, (Winjum et al., 1998) and page 8, (Pearson et al., 2012)
Value applied	0.8
Justification of choice of data or description of measurement methods and procedures applied	Default value suggested by Winjun et al., 1998
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$GHG_{BSL,i,t}$
Data unit	t CO_{2-e}
Description	Greenhouse gas emissions as a result deforestation activities within the project boundary in the stratum *i* in year *t*
Source of data	Calculated based on VMD0006 v1.3 equation 15
Value applied	See the values applied in the Table 4.10
Justification of choice of data or description of measurement methods and procedures applied	Calculated based on the non-CO2 emissions due to biomass burning in stratum *i* in year *t*
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$E_{BiomassaBurn,i,t}$
Data unit	t CO_{2-e}
Description	Non-CO_2 emissions due to biomass burning in stratum *i* in year *t*
Source of data	Calculated based on VMD0013 v1.2 equation 1
Value applied	See the values applied in the Table 4.9
Justification of choice of data or description of measurement methods and procedures applied	Calculated based on area burnt for stratum *i* in year *t*, average aboveground biomass stock before burning stratum *i*, in year *t*, combustion factor for stratum *i*, emission factor for stratum *i* for gas *g* and the Global warming potential for gas *g*
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	Aburn,i,t
Data unit	ha
Description	Area burnt for stratum *i* in year *t*
Source of data	Equal to AAplanned,i,t in the baseline case
Value applied	See the values applied in the Table 4.9
Justification of choice of data or description of measurement methods and procedures applied	For the calculation of baseline emissions, the burned area is considered equivalent to the annual deforested area, assuming that all deforestation is preceded by a fire to clear the land in the baseline case
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	Bi,t
Data unit	t d.m. ha-1
Description	Average aboveground biomass stock before burning stratum *i* in year *t*
Source of data	Calculated based on VMD0013 v1.3 Equation 2
Value applied	272.98
Justification of choice of data or description of measurement methods and procedures applied	Calculated based on carbon stock in aboveground biomass in trees in stratum *i* in year *t*, Carbon stock in dead wood for stratum *i* in year *t*, Carbon stock in litter for stratum *i* in year *t* and Carbon fraction of biomass
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$COMF_i$
Data unit	Dimensionless
Description	Combustion factor for stratum *i*
Source of data	Table 2.6, page 2.55, IPCC (2006a)
Value applied	0.59
Justification of choice of data or description of measurement methods and procedures applied	Default values in Table 2.6 of IPCC, 2006a
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$G_{g,i}$
Data unit	kg t-1 d.m. burnt
Description	Emission factor for stratum *i* for gas *g*
Source of data	Table 2.5, page 2.54, IPCC (2006a)
Value applied	G_{g,CH_4} = 6.8 kg t-1, G_{g,NO_2} = 0.2 kg t-1
Justification of choice of data or description of measurement methods and procedures applied	Default values in Table 2.6 of IPCC, 2006a
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	GWPg
Data unit	t CO_2/t gas g
Description	Global warming potential for gas *g*
Source of data	Box 3.2, Table 1, page 87, IPCC (2014)
Value applied	$GWP_{CH_4} = 28$ t CO_2 t_{gas}^{-1}, $GWP_{NO_2} = 265$ t CO_2 t_{gas}^{-1}
Justification of choice of data or description of measurement methods and procedures applied	Default factor from the latest IPCC Assessment Report
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	CABtree,i,t
Data unit	t $CO_{2\text{-}e}$ ha^{-1}
Description	Carbon stock in aboveground biomass in trees in stratum *i* in year *t*
Source of data	Estimated based on peer-reviewed literature (Nogueira et al., 2015)
Value applied	470.43
Justification of choice of data or description of measurement methods and procedures applied	Forest carbon stock in aboveground tree biomass was estimated based on peer-reviewed literature $CABtreebls,i = ab * CF * \frac{44}{12}$
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	12/44
Data unit	Dimensionless
Description	Ratio converting CO2-e to C
Source of data	-
Value applied	12/44 = 0.27
Justification of choice of data or description of measurement methods and procedures applied	Conversion of carbon dioxide to carbon
Purpose of data	Calculation of baseline emissions
Comments	-

Data / Parameter	ΔCBSL,i,t
Data unit	t $CO_{2\text{-}e}$
Description	Net carbon stock changes in all pools in the baseline stratum *i* in year *t*
Source of data	Calculated based on VMD0006 v1.3 Equation 13
Value applied	See the values applied in the Table 4.10
Justification of choice of data or description of measurement methods and procedures applied	Estimated based on the annual area of baseline planned deforestation for stratum *i* in year *t*, the baseline carbon stock change in aboveground tree biomass in stratum *i*, the baseline carbon stock change in belowground tree biomass in stratum *i*, the baseline carbon stock change in wood products in stratum *i*, and the carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum *i*.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	ΔCBSL,planned
Data unit	t CO_{2-e}
Description	Net greenhouse gas emissions in the baseline from planned deforestation up to year *t**
Source of data	Calculated based on VMD0006 v1.3 Equation 1
Value applied	See the values applied in the Table 4.10
Justification of choice of data or description of measurement methods and procedures applied	Estimated based on the net carbon stock changes in all pools in the baseline and GHG emissions as a result of deforestation activities within the project boundary in the baseline stratum *i* in year *t*
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	ΔCLK−ME
Data unit	t CO_{2-e}
Description	Net greenhouse gas emissions due to market-effects leakage
Source of data	Calculated based on VMD0011 v1.1 Equation 1
Value applied	See the values applied in the Table 4.11
Justification of choice of data or description of measurement methods and procedures applied	Total leakage due to market effects is equal to the sum of market- effects leakage through decreased timber harvest and decreased harvest for fuelwood / charcoal production
Purpose of Data	Calculation of leakage
Comments	-

Data / Parameter	LKMarketEffects,timber
Data unit	t CO_{2-e}
Description	Total GHG emissions due to market-effects leakage through decreased timber harvest
Source of data	Calculated based on VMD0011 v1.1 Equation 2
Value applied	See the values applied in the Table 4.11
Justification of choice of data or description of measurement methods and procedures applied	Leakage due to market effects is equal to the baseline emissions from logging multiplied by a leakage factor and, where applicable, by a leakage management factor
Purpose of Data	Calculation of leakage
Comments	-

Data / Parameter	LFme
Data unit	Dimensionless
Description	Leakage factor for market-effects calculations
Source of data	VMD0011 LK-ME v1.1
Value applied	0.4
Justification of choice of data or description of measurement methods and procedures applied	When the mean biomass is equal 15% to the biomass within the project boundaries, the □□□□ shall be considered 0.4. In the Tapera project, the biomass of the total trees aboveground is considered equal in the Amazon Biome and in the Project Area
Purpose of Data	Calculation of leakage
Comments	-

Data / Parameter	LKmaf
Data unit	Dimensionless
Description	Leakage management adjustment factor
Source of data	Calculated based on VMD0011 v1.1 Equation 3
Value applied	1
Justification of choice of data or description of measurement methods and procedures applied	As leakage management activities have not been established within areas under the control of the proponent and according to Higuchi et al. (1998), that the proportion of stem biomass (marketable portion) to total aboveground biomass is constant in mature Amazonian forests, the LKMAF was kept at 1.
Purpose of Data	Calculation of leakage
Comments	-

Data / Parameter	$CBSL,XBT,i,t$
Data unit	t CO_{2-e}
Description	Carbon emission due to displaced timber harvests in the baseline scenario in stratum *i* in year *t*
Source of data	Calculated based on VMD0011 v1.1 Equation 5
Value applied	See the values applied in the Table 4.11
Justification of choice of data or description of measurement methods and procedures applied	The carbon emission due to the displaced logging has two components: the biomass carbon of the extracted timber and the biomass carbon in the forest damaged in the process of timber extraction
Purpose of Data	Calculation of leakage
Comments	-

Data / Parameter	LDF
Data unit	t C m^{-3}
Description	Logging damage factor
Source of data	VMD0011 LK-ME v1.1
Value applied	0.53
Justification of choice of data or description of measurement methods and procedures applied	Default value for broadleaf and mixed forests of 0.53 t C m-3. Default value for broadleaf and mixed forests of 0.53 t C m-3 from 774 logging gaps measured by Winrock International in Bolivia, Belize, the Republic of Congo, Brazil and Indonesia may be used for tropical broadleaf forests
Purpose of Data	Calculation of leakage
Comments	-

Data / Parameter	LIF
Data unit	t C m^{-3}
Description	Logging infrastructure factor
Source of data	VMD0011 LK-ME v1.1
Value applied	0.29
Justification of choice of data or description of measurement methods and procedures applied	Conservative default value of 0.29 t C m-3 calculated from 1,839 hectares of logging concessions analysed by Winrock International in the Republic of Congo and Brazil, may be used for tropical broadleaf forests
Purpose of Data	Calculation of leakage
Comments	-

3.3.2.Data and Parameters Monitored

Table 51. Data and parameters to be monitored during the crediting period of the Tapera project.

Data / Parameter	Project Forest Cover Monitoring Map
Data unit	N/A
Description	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event.
Source of data	Remote sensing in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied	The measurement methods and procedures applied are described in Approved VCS Module VMD0015-M-REDD-v2.2 - methods for monitoring of GHG emissions and removals in REDD and CIW projects.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	Remote sensing and GPS.
QA/QC procedures to be applied	The minimum map accuracy must be 90% for the classification of forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$A_{burn,i,t}$

Data unit	ha
Description	Burned area in stratum *i* at time *t*
Source of data	Remote sensing data
Description of measurement methods and procedures to be applied	It is considered that burning is a common practice in the region, and that all deforested area undergoes burning in a given moment
Frequency of monitoring/recording	Areas burnt will be monitored every 5 years or if verification occurs on a frequency of less than every 5 years, examination will occur prior to any verification event
Value applied	This value varies annually, depending on the area deforested.
Monitoring equipment	Remote sensing and GPS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using Landsat satellites images with resolution 30 meters (MapBiomas, 2022a) validating through a pixel-by-pixel based machine learning algorithms classification using Google Earth Engine. 2) The Mapbiomas methodology uses an image with minimal cloud cover product of Landsat scenes mosaicked from various months of the year (MapBiomas, 2022a). 3) An independent verifiable accuracy assessment was performed using high-resolution images with 5 m resolution from Planet Image to confirm the minimum map accuracy of 90% for each land use class used. 4) Conservatively the secondary forest is eliminated from the forest class according to Silva Junior et al. (2020). Also, with the objective of reducing the classification error between forest cover maps, a PRODES hydrography mask was downloaded by TerraBrasilis plataform is added in each forest cover maps map, in this way, this land use class remained unchanged in all years (Assis et al., 2019)
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions
Calculation method	N/A

Comments	As burning of biomass is common practice in the region, it was considered that all the deforested areas were burnt – deforestation cycle includes burning

Data / Parameter	AAplanned,i,t
Data unit	ha
Description	Annual area of baseline planned deforestation for stratum i at time t
Source of data	Calculated according to VMD0006 v1.3, Equation 5
Description of measurement methods and procedures to be applied	Calculated based on the Projected annual proportion of land that will be deforested in stratum i during year t, Total area of planned deforestation over the baseline period for stratum i and Likelihood of deforestation for stratum i
Frequency of monitoring/recording	Must be monitored every 5 years or if verification occurs on a frequency of less than every 5 years, examination will occur prior to any verification event
Value applied	See the values applied in the Table 4.1
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of baseline emissions
Calculation method	VMD0006 v1.3, Equation 5
Comments	-

Data / Parameter	$A_{planned,i}$
Data unit	hectare
Description	Projected annual proportion of land that will be deforested in stratum *i* during year *t*
Source of data	Forest suppression plan
Description of measurement methods and procedures to be applied	According to the Forest Suppression Plan
Frequency of monitoring/recording	Must be examined at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	See the values applied in the Table 4.1
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of baseline emissions
Calculation method	N/A
Comments	-

Data / Parameter	ADefPA,u,i,t
Data unit	ha
Description	Area of recorded deforestation in the project area stratum *i* converted to land use *u* in year *t*
Source of data	Remote sensing data
Description of measurement methods and procedures to be applied	Remote sensing tools
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	Remote sensing and GPS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using Landsat satellites images with resolution 30 metres (MapBiomas, 2022a) validating through a pixel-by-pixel based machine learning algorithms classification using Google Earth Engine. 2) The Mapbiomas methodology uses images with minimal cloud cover product of Landsat scenes mosaicked from various months of the year (MapBiomas, 2022a). 3) An independent verifiable accuracy assessment was performed using high-resolution images with 5 m resolution from Planet Image to confirm the minimum map accuracy of 90% for each land use class used. 4) Conservatively the secondary forest is eliminated from the forest class according to Silva Junior et al. (2020). Also, with the objective of reducing the classification error between forest cover maps, a PRODES hydrography mask was downloaded by TerraBrasilis platform is added in each forest cover maps map, in this way, this land use class remained unchanged in all years (Assis et al., 2019)
Purpose of data	Calculation of project emissions
Calculation method	N/A

Comments	-

Data / Parameter	ΔCP,DefPA,i,t
Data unit	t CO_{2-e}
Description	Net carbon stock change as a result of deforestation in the project area in the project case in stratum *i* in year *t*
Source of data	Calculated according to VMD0015 v2.2, Equation 3
Description of measurement methods and procedures to be applied	Calculated based on the area of recorded deforestation in the project area stratum *i* converted to land use *u* at time *t* and the net carbon stock changes in all pools in the project case in land use *u* in stratum *i* at time *t*
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	VMD0015 v2.2, Equation 3
Comments	-

Data / Parameter	ΔCpools,Def,u,i,t
Data unit	t $CO_{2\text{-}e}$ ha^{-1}
Description	Net carbon stock changes in all pools as a result of deforestation in the project case in land use u in stratum i in year t
Source of data	Calculated according to VMD0015 v2.2, Equation 5
Description of measurement methods and procedures to be applied	Calculated based on carbon stock in all pools in the baseline case in stratum i, carbon stock in all pools in post-deforestation land use u in stratum i and carbon stock sequestered in wood products from harvests in stratum i
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	VMD0015 v2.2, Equation 5
Comments	-

Data / Parameter	GHGP,E,i,t
Data unit	t CO^{2-e}
Description	Greenhouse gas emissions as a result of deforestation activities within the project area in the project case in stratum i in year t
Source of data	Calculated based on VMD0015 v2.2 Equation 30
Description of measurement methods and procedures to be applied	Calculated based on the non-CO^2 emissions due to biomass burning in stratum i in year t
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	VMD0015 v2.2 Equation 30
Comments	-

Data / Parameter	EBiomassBurn,i,t
Data unit	t $CO_{2\text{-}e}$
Description	Greenhouse gas emissions due to biomass burning in stratum i in year t of each GHG (CO_2, CH_4, N_2O)
Source of data	Calculated based on VMD0013 v1.2 Equation 1
Description of measurement methods and procedures to be applied	Calculated based on area burnt for stratum *i* in year *t*, average aboveground biomass stock before burning stratum *i*, in year *t* combustion factor for stratum *i*, emission factor for stratum *i* for gas *g* and the Global warming potential for gas *g*
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	See the values applied in the Table 4.9
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	VMD0013 v1.2 Equation 1
Comments	-

Data / Parameter	Asp
Data unit	ha
Description	Area of sample plots in biomass inventory
Source of data	Recording and archiving of number and size of sample plots
Description of measurement methods and procedures to be applied	Cluster plot in Maltese cross setup with four rectangular sub-plots with 0.1 ha (10 m x 100 m) each
Frequency of monitoring/recording	Must be re-evaluated whenever the baseline is revised
Value applied	N/A
Monitoring equipment	GPS and measuring tape
QA/QC procedures to be applied	GPS coordinates are double checked in the field
Purpose of data	Calculation of baseline emissions
Calculation method	N/A
Comments	The biomass inventory will be estimated according to the Standard Operating Procedure (SOP)34

Data / Parameter	n
Data unit	Dimensionless
Description	Number of sample plots
Source of data	Recording and archiving of number of sample points
Description of measurement methods and procedures to be applied	Calculated with statistic equation
Frequency of monitoring/recording	Must be re-evaluated whenever the baseline is revised
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	
Purpose of data	Calculation of baseline emissions
Calculation method	Calculated using the following formula: $$n = \frac{(t^2 \times CV^2)}{(E\%^2 + (\frac{t^2 \times CV^2}{N}))}$$ Where: n Number of parcels sampled in each stratum (variable for each stratum) t Student t value at 90% of confidence level for (n-1) degree of freedom. CV Coefficient of variation (%) (variable for each stratum) E% Permissible sampling error (10%) N Number of parcels in total stratum area (variable for each stratum)
Comments	The biomass inventory will be estimated according to the Standard Operating Procedure (SOP)

Data / Parameter	DBH
Data unit	cm
Description	Diameter at breast height of a tree in cm
Source of data	Field measurements in sample plots
Description of measurement methods and procedures to be applied	Measured 1.3m above ground. Measure all trees above some minimum DBH (≥ 10 cm) in the sample plots
Frequency of monitoring/recording	Must be re-evaluated whenever the baseline is revised. Where carbon stock enhancement is included, monitoring shall occur at least every five years
Value applied	N/A
Monitoring equipment	Measuring tape
QA/QC procedures to be applied	Standard quality control procedures for forest inventory including field data collection and data management were applied. The procedure of DBH measurement is already applied in national forest monitoring and is available from published handbooks, and from Penman et al. (2003) (an example of a handbook is MacDicken (1997)).
Purpose of data	Calculation of baseline emissions
Calculation method	Diameter (DBH) is calculated based on circumference at breast height (CBH) measurement, by means of the basic perimeter equation: $DBH = \frac{CBH}{\pi}$
Comments	The biomass inventory will be estimated according to the Standard Operating Procedure (SOP)

Data / Parameter	$B_{i,t}$
Data unit	t d.m. ha^{-1}
Description	Average aboveground biomass stock before burning stratum *i* in year *t*
Source of data	Calculated based on VMD0013 v1.2 Equation 2
Description of measurement methods and procedures to be applied	Calculated based on the Carbon stock in aboveground biomass in trees in stratum *i* in year *t* and Carbon fraction of biomass
Frequency of monitoring / recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied	See the valued applied in Table 4.9
Monitoring equipment	N/A
QA / QC procedures to be applied	N/A
Purpose of data	• Calculation of baseline emissions • Calculation of leakage
Calculation method	VMD0013 v1.2 Equation 2
Comments	-

Data / Parameter	$\Delta CWPS-REDD$
Data unit	t CO_{2-e}
Description	Net GHG emissions in the REDD project scenario up to year *t**
Source of data	Calculated according to VMD0015 v2.2, Equation 1
Description of measurement methods and procedures to be applied	Calculated based on net carbon stock change as a result of deforestation in the project area in the project case in stratum *i* in year *t*, Net carbon stock change as a result of degradation in the project area in the project case in stratum *i* in year *t*, Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum *i* in year *t* and Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum *i* in year *t*
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	VMD0015 v2.2, Equation 1
Comments	-

Data / Parameter	$\Delta CLK-REDD$
Data unit	t CO_{2-e}
Description	Net GHG emissions due to leakage from the REDD project activity up to year *t**
Source of data	Calculated according to VM0007 v1.7 Equation 4
Description of measurement methods and procedures to be applied	Calculated based on net GHG emissions due to activity shifting leakage for projects preventing planned deforestation up to year *t**, and the Net GHG emissions due to market-effects leakage up to year *t**
Frequency of monitoring / recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	See the values applied in the Table 4.11
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of data	Calculation of leakage
Calculation method	VM0007 v1.7 Equation 4
Comments	-

Data / Parameter	$\Delta CLK-AS,planned$
Data unit	t CO2-e
Description	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation up to year *t**
Source of data	Calculated according to VMD0009 v1.3, Equation 1
Description of measurement methods and procedures to be applied	Calculated based on the area of activity shifting leakage in stratum *i* in year *t*, the net carbon stock changes in all pre-deforestation pools in baseline stratum *i*, and the Greenhouse gas emissions as a result of leakage of avoiding deforestation activities in stratum *i* in year *t*
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	VMD0009 v1.3, Equation 1
Comments	-

Data / Parameter	$LKAplanned,i,t$
Data unit	Ha
Description	The area of activity shifting leakage in stratum *i* in year *t*
Source of data	Calculated according to VMD0009 v1.3, Equation 6
Description of measurement methods and procedures to be applied	Calculated according to the total area of monitored deforestation by the baseline agent of the planned deforestation in stratum *i* in year *t*, and the New calculated forest clearance by the baseline agent of the planned deforestation in stratum *i* in year *t* where no leakage is occurring
Frequency of monitoring / recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	VMD0009 v1.3, Equation 6
Comments	-

Data / Parameter	ADefLK,i,t
Data unit	ha
Description	The total area of monitored deforestation by the baseline agent of the planned deforestation in stratum *i* in year *t*
Source of data	Remote sensing data
Description of measurement methods and procedures to be applied	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation. Legal records will include government permits to deforest including concession licenses. Ex ante, project proponents must determine and justify the likelihood of leakage based on characteristics of the baseline agent or class of agent.
Frequency of monitoring/ recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	Remote sensing and GIS tools
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1. Land use and land cover mapping is assessed using Landsat satellites images with resolution 30 meters (MapBiomas, 2022a) validating through a pixel-by-pixel based machine learning algorithms classification using Google Earth Engine. 2. The Mapbiomas methodology uses image with minimal cloud cover product of Landsat scenes mosaicked from various months of the year (MapBiomas, 2022a). 3. An independent verifiable accuracy assessment was performed using high-resolution image with 5 m resolution from Planet Image to confirm the minimum map accuracy of 90% for each land use class used. 4. Conservatively the secondary forest is eliminated of the forest class according to Silva Junior et al. (2020). Also, with the objective of reducing the classification error between forest cover maps, a PRODES hydrography mask was downloaded by TerraBrasilis plataform is added in each forest cover maps map, in this way, this land use class remained unchanged in all years (Assis et al., 2019)

Purpose of data	Calculation of leakage emissions
Calculation method	N/A
Comments	-

Data / Parameter	$NewRi,t$
Data unit	ha
Description	New calculated forest clearance in stratum *i* in year *t* by the baseline agent of the planned deforestation where no leakage is occurring
Source of data	Calculated according to VMD0009 v1.3, Equation 4 or 5
Description of measurement methods and procedures to be applied	Calculated based on projected annual proportion of land that will be deforested outside the project boundary in stratum *i* in year *t*, and Total area of planned deforestation outside the project boundary over the baseline period for stratum *i*, according to equation 04 or based on Deforestation by the baseline agent of the planned deforestation in stratum *i* in year *t* in the absence of the project, projected annual proportion of land that will be deforested in project stratum *i* in year *t*, and Total area of planned deforestation over the baseline period for project stratum *i*
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	VMD0009 v1.3, Equation 4 or 5
Comments	Equation 4 is used when the identified deforestation agent has made public a business plan or similar documentation containing data suited for estimating a conversion rate over the baseline period. Equation 5 is used when the conversion rate must be estimated. In this case, the projected annual proportion of land that will be deforested is the same used to set the baseline, while the deforestation provoked by the identified deforestation agent is calculated by VMD0009 v1.3, Equation 1 or 2
Monitoring equipment	N/A

Data / Parameter	D%planned,i,t
Data unit	%
Description	Projected annual proportion of land that will be deforested in project stratum *i* in year *t*
Source of data	Deforestation permits for areas outside the project boundary
Description of measurement methods and procedures to be applied	Defined in deforestation permits. Use a verifiable plan or proxy areas
Frequency of monitoring/ recording	Must be revisited at the time of baseline revision
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	-

Data / Parameter	$A_{planned,i,OP}$
Data unit	ha
Description	Total area of planned deforestation outside the project boundaries over the entire project lifetime for stratum *i*
Source of data	Deforestation permits for areas outside the project boundary
Description of measurement methods and procedures to be applied	Defined in deforestation permits
Frequency of monitoring/recording	Must be re-evaluated whenever the baseline is revised
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	This parameter is used when an identified deforestation agent has made public a business plan or similar documentation containing data suited for estimating a conversion rate over the baseline period in areas outside the project boundary

Data / Parameter	$WoPR_{i,t}$
Data unit	ha
Description	Deforestation by the baseline agent of the planned deforestation in stratum *i* in year *t* in the absence of the project
Source of data	Calculated according to VMD0009 v1.3, equation 2 or 3
Description of measurement methods and procedures to be applied	Projected based on linear regression according to VMD0009 v1.3 Equation 2 or based on the average number of hectares of forest cleared by the baseline agent of the planned deforestation in the five years prior to project implementation in stratum *i* by agent *ag* within the country (VMD0009 v1.3 Equation 3)
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	VMD0009 v1.3 Equation 2 is used when the results of the analysis must produce a statistically significant regression with a $p \leq 0.05$ and an adjusted $r2$ of ≥ 0.75. The regression is calculated based on the deforested by the deforestation agent each year over the previous five years within the country. Where no statistically significant regression can be found, VMD0009 v1.3 Equation 3 is used
Comments	-

Data / Parameter	HistHai,ag
Data unit	Ha
Description	Number of hectares of forest cleared by the baseline agent of the planned deforestation in the five years prior to project implementation in stratum *i* by agent *ag* within the country
Source of data	Remote sensing data
Description of measurement methods and procedures to be applied	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Frequency of monitoring / recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	Remote sensing tools
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using Landsat satellites images with resolution 30 meters (MapBiomas, 2022a) validating through a pixel-by-pixel based machine learning algorithms classification using Google Earth Engine. 2) The Mapbiomas methodology uses image with minimal cloud cover product of Landsat scenes mosaicked from various months of the year (MapBiomas, 2022a). 3) An independent verifiable accuracy assessment was performed using high-resolution image with 5 m resolution from Planet Image to confirm the minimum map accuracy of 90% for each land use class used. 4) Conservatively the secondary forest is eliminated of the forest class according to Silva Junior et al. (2020). Also, with the objective of reducing the classification error between forest cover maps, a PRODES hydrography mask was downloaded by TerraBrasilis platform is added in each forest cover maps map, in this way, this land use class remained unchanged in all years (Assis et al., 2019)
Purpose of data	Calculation of leakage

Calculation method	N/A
Comments	-

Data / Parameter	$GHG_{LK,E,i,t}$
Data unit	t CO2-e
Description	Greenhouse gas emissions as a result of leakage of avoiding deforestation activities in stratum *i* in year *t*
Source of data	Calculated according to VMD0009 v1.3, Equation 7
Description of measurement methods and procedures to be applied	Calculated based on Non-CO2 emissions due to biomass burning in stratum *i* in year *t*
Frequency of monitoring / recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	VMD0009 v1.3, Equation 7
Comments	

Data / Parameter	$\Delta CLK-ME$
Data unit	t CO2-e
Description	Net greenhouse gas emissions due to market-effects leakage
Source of data	Calculated according to VMD0011 v1.1 Equation 1
Description of measurement methods and procedures to be applied	Calculated based on total GHG emissions due to market- effects leakage through decreased timber harvest
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	See the values applied in the Table 4.11
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	VMD0011 v1.1 Equation 1
Comments	-

Data / Parameter	LKMarketEffects,timber
Data unit	t CO2-e
Description	Total GHG emissions due to market-effects leakage through decreased timber harvest
Source of data	Calculated according to VMD0011 v1.1, Equation 2
Description of measurement methods and procedures to be applied	Calculated according to leakage factor for market-effects calculations, summed emissions from timber harvest in stratum *i* in the baseline case potentially displaced through implementation of carbon project and leakage management adjustment factor
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	See the values applied in the Table 4.11
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	VMD0011 v1.1, Equation 2
Comments	-

Data / Parameter	LFME
Data unit	Dimensionless
Description	Leakage factor for market-effects calculations
Source of data	Default data from VMD0011 v1.1
Description of measurement methods and procedures to be applied	Each project thus must calculate within each stratum the proportion of total biomass in commercial species that is merchantable (PMPi). This must then be compared to the mean proportion of total biomass that is merchantable for each forest type (PMLFT).
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	0.4
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	-

Data / Parameter	ALT,i
Data unit	t CO2-e
Description	Summed emissions from timber harvest in stratum *i* in the baseline case laced through implementation of carbon project
Source of data	Calculated based on VMD0011 v1.1, Equation 4
Description of measurement methods and procedures to be applied	Calculated based on Carbon emission due to displaced timber harvests in the baseline scenario in stratum *i* in time *t*
Frequency of monitoring/ recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	See the values applied in the Table 4.11
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	VMD0011 v1.1, Equation 4
Comments	-

Data / Parameter	$CBSL_{,XBT,i,t}$
Data unit	t CO2-e
Description	Carbon emission due to timber harvests in the baseline scenario in stratum *i* in year *t*
Source of data	Calculated according to VMD0011 v1.1, Equation 5
Description of measurement methods and procedures to be applied	Calculated based on the volume of timber projected to be extracted from within the project boundary during the baseline in stratum *i* at time *t*, the mean wood density of commercially harvested species, the carbon fraction of biomass for commercially harvested species *j*, the logging damage factor (LDF), and the logging infrastructure factor (LIF)
Frequency of monitoring/ recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	See the values applied in the Table 4.11
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	VMD0011 v1.1, Equation 5
Comments	-

Data / Parameter	VBSL,EX,i,t
Data unit	m3
Description	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum *i* in year *t*
Source of data	da SILVA et al., 2001; Veríssimo et al., 1992
Description of measurement methods and procedures to be applied	The volume of commercial wood found in previous inventories carried out to request the deforestation of the project area and the deforestation in the baseline scenario are considered to estimate market leakage effects.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	38.3 m3 ha-1
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage emissions
Calculation method	N/A
Comments	-

Data / Parameter	LDF
Data unit	t C m-3
Description	Logging damage factor
Source of data	Default value provided by VMD0011 v1.1
Description of measurement methods and procedures to be applied	Default value for broadleaf and mixed forests of 0.53 t C m-3 from 774 logging gaps measured by Winrock International in Bolivia, Belize, the Republic of Congo, Brazil and Indonesia may be used for tropical broadleaf forests
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	Default value for broadleaf and mixed forests of 0.53 t C m-3
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage emissions
Calculation method	N/A
Comments	-

Data / Parameter	LIF
Data unit	t C m-3
Description	Logging infrastructure factor
Source of data	Default value provided by VMD0011 v1.1
Description of measurement methods and procedures to be applied	Factor for calculating the emissions arising from the creation of logging infrastructure (roads, skid trails and decks) during logging operations per cubic meter extracted
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	Conservative default value of 0.29 t C m-3
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	-

3.3.3.Monitoring Plan

The Monitoring Plan was developed based on the guidelines of the "VM0007 REDD+ Methodology Framework (REDD+ MF), v1.6". According to the methodology, the Monitoring Plan demands the inclusion of the following tasks:

- Monitoring of project implementation;
- Monitoring the change in the current carbon stock and greenhouse gas emissions;
- Monitoring leakage in the carbon stock change and greenhouse gas emission;
- Estimation of net ex-post carbon stock change and greenhouse gas emission.

Monitoring Project Implementation

The project implementation will be monitored considering the project activity defined earlier. Table 44 presents information relevant to this task, following the criteria in section 9.3.1 of VM0007. Orgânica Consultoria will be responsible for the implementation of the project activity and its monitoring. The implementation of specific project activities can be performed by external consultants operating under the supervision of Organica Consultoria. Digital files will be stored in the Organica Consultoria database and hard copies will be archived at their headquarters.

Table 52. Standardised Benefit Category, Project Activities, and Technical Description of the Monitoring Task.

Standardised Benefit Category	Project Activities	Technical Description of the Monitoring Task
Forest cover / GHG emissions reduction	Improving asset surveillance	Deforestation, forest degradation and fire scars will be monitored annually by means of satellite images and field verifications. Land use change maps will be collected from PRODES and DETER/INPE[68], MapBiomas[69] and orbital images from the European Space Agency[70].

[68] Available at: http://terrabrasilis.dpi.inpe.br/ . Accessed on: 12/12/2022.

[69] Available at: https://mapbiomas.org/ . Accessed on: 12/12/2022.

[70] Available at: <https://sentinels.copernicus.eu/web/sentinel/home>. Accessed on: 12/12/2022.

Standardised Benefit Category	Project Activities	Technical Description of the Monitoring Task
Reduction of GHG emissions	Remote Biomass Monitoring	Land use change maps from scientifically recognized data sources such as MapBiomas will be used. There will also be annual remote monitoring of the area through satellite imagery and drone and radar overflights in order to assess the conservation status of the area and project zone, more specifically, to assess whether there have been changes in forest cover during the monitoring period.
Reduction of GHG emissions	Prevention and Fighting of Forest Fires	Training on good management and firefighting practices will be offered to the communities living in the project area to prevent the spread of forest fires. The training in good management practices will focus on risk control and mitigation measures. There will be firefighting training for the formation of volunteer brigades. The execution of the training will be registered through activity reports. The number of training sessions will be reported in each monitoring report. Forest fires should also be prevented by establishing firebreaks. The number and extension of the firebreaks will be monitored and reported in each monitoring report.

Project implementation will be monitored through schedules, activity reports, meeting minutes, attendance lists, financial statements, forest cover maps. From the monitoring of the implementation of the Tapera project, it is possible to monitor the processes, enabling learning and continuous improvements, guaranteeing the quality and efficiency of the project.

Organica Consultoria has digital data storage on the Google Drive[71] platform, which will be managed throughout the duration of the project (30 years). All required documents will be made available to Validation and Verification Teams (VVBs) in each verification process.

[71] Available at: https://www.google.com/intl/pt-BR/drive/ . Accessed on:1/12/2022

Monitoring of changes in current carbon stock, GHG emissions and leakage

This monitoring task will follow the criteria established in module VMD00015 v2, which provides methods to monitor *ex- post* GHG emissions and removals due to deforestation, forest degradation, natural disturbances and carbon stock enhancement in the project area and leakage belt. The monitoring of changes in current carbon stock and GHG emissions is carried out in three steps, presented in the next sections.

Selection and analysis of land use and land cover change data sources

This project uses different data sources to monitor land use and land cover change in the project area and the Leakage Belt. Classified orbital images from the PRODES project of the National Institute for Space Research (INPE) are used to assess deforestation. The PRODES project uses images compatible with those generated by the Landsat series satellites, termed "Landsat-class". These images are characterised by their spatial resolution of 30 metres and at least 3 spectral bands. Currently, images from the Landsat-8, SENTINEL-2 (European Union) or CBERS-4 INPE/CRESDA (Brazil/China) satellites are also used. Precision evaluations are done with the European Space Agency (ESA) SENTINEL satellite series, with 10x10m spatial resolution. Classified orbital images from INPE's DETER service are used to assess deforestation and forest degradation alerts. The DETER service uses WFI sensor images from the Sino-Brazilian Earth Resources Satellite (CBERS-4) and AWiFS images from the Indian Remote Sensing Satellite (IRS), with 64 and 56 metres spatial resolution, respectively.

Land use and land cover change data processing

Landsat-8, SENTINEL-2 and CBERS-4 images are provided by their suppliers already orthorectified, with a refined system of geometric correction through control points and digital terrain elevation models. This corresponds to the highest level of geometric correction and means that the images are ready to be used in conjunction with existing maps and field measurements without the need for further processing, in accordance with the cartographic standards in force. The PRODES project performs image compositing for multiple satellites (and dates) to reduce cloud cover in a scene and assess the increase in deforested area. The DETER system has high temporal resolution. Visual analysis of each scene is performed by INPE technicians to evaluate image quality, selecting images that are not excessively contaminated with clouds.

Post-processing and accuracy evaluation

Data from the PRODES´[72] Project will be used annually to monitor land use change on all lands managed by the identified deforestation agent (including the project area and lands outside the project

[72] Available at: http://www.dpi.inpe.br/prodesdigital/dadosn/. Accessed on: 12/12/2022.

boundaries). Reference maps of forest cover will be generated and updated as soon as the data are released by INPE.

Data from DETER services will be used monthly to assess deforestation and forest degradation alerts (ADegW,I , ADistPA,i,t , Aburn,i,t). Deforestation and forest degradation alerts will be verified in the field by direct observation every four months. If deforestation is confirmed by PRODES data, it will be used to estimate GHG emissions due to deforestation of the project area (ADefPA,i,u,t) or leakage by displacement of activity (ADefLK,i,u,t) in the project scenario. If the DETER data are not confirmed by PRODES but are verified in the field through direct observation, they will be used to update the forest cover reference maps and will therefore also be counted as deforestation of the project area or leakage. DETER data have higher temporal resolution and lower spatial resolution than PRODES data, which makes them suitable for generating deforestation alerts that can be used to guide rapid responses by project proponents. **Interpretation and Analysis** Data from the PRODES project will be used to monitor deforestation in the project area (ADefPA,i,u,t) and leakage from displacement activity (ADefLK,i,u,t) under the project scenario. The net change in carbon stock as a result of deforestation in the project area and leakage belt will be calculated taking into account net changes in the carbon stock in all reservoirs in the design scenario (ΔCpools,Def,u,i,t). Calculations will be done according to equations 03 to 06 in module VMD0015 v2.2 and equations 01 to 07 in module VMD0009 v1.3.

An initial participatory rural appraisal of the communities in and around the project area was conducted to determine if there was potential for illegal logging to occur. Given the initial scope of the project, it was characterised that all families living within the project area exploit the forest for timber and fuel, which should be considered a low-impact subsistence activity. No logging or fuelwood economic activity was perceived by the proponents. In this sense, the proponents assumed that the extraction of trees for timber or firewood is a constant on the property where the community presence is perceived. Participatory rural appraisal will be carried out every two years, as established in the methodology.

In accordance with common practice in the Amazon, it is assumed that fire is used for land clearing after deforestation in the project area in the baseline and project scenarios. Non-CO_2 emissions due to biomass burning are considered according to equation 30 of module VMD00015 v2.2 and equations 01 and 02 of module VMD0013 v1.2.

Documentation

The monitoring report will bring relevant information about the time series of land use change and GHG emissions data, considering data sources and protocols for processing, data classification and accuracy assessment, following the module VMD0015 v2.2.

The digital files will be stored in the proponents' database. Organica Consultoria has accounts for storing digital data on the Google Drive platform, which will be managed throughout the duration of the project (30 years).

Printed copies of all documents will be filed at the headquarters of Organica Consultoria., being made available to the validation and verification body (VVBs) at each verification process.

Estimation of *ex- post* changes in net carbon stock and GHG emissions

The *ex- post* estimates are performed according to the methodological procedures described in section **3.2.** A technical description of the monitoring task and an overview of the data collection procedures are described in section **3.3.3**.

Table 53. Data and parameters to be monitored during the Tapera project crediting period.

Data / Parameter	Aburn,i,t
Data unit	hectare
Description	Burned area in stratum *i* at time *t*
Source of data	Remote sensing data
Description of measurement methods and procedures to be applied	Burning is considered a common practice in the region, and that every deforested area suffers burning at some point.
Frequency of monitoring/recording	Burned areas will be monitored annually, the examination will take place before any verification event.
Value applied	This value varies annually, depending on the area deforested.
Monitoring equipment	Remote sensing
QA/QC procedures to be applied	Good practices in remote sensing; Land use change map for the monitoring period; Land use change map superimposed with location data from fire alerts from INPE-BDQUEIMADAS (http://www.inpe.br/queimadas/abasFogo.php) in the period; Quantify pixels of deforested areas on fire alerts. Monitor areas of burned forest
Purpose of data	N/A
Calculation method	As burning biomass is a common practice in the region, it was considered that all deforested areas were burned – the deforestation cycle includes burning.

Comments	Remote sensing

Data / Parameter	External Leakage
Data unit	tCO_2/year
Description	Net CO_2 emissions due to unplanned deforestation moved outside the leakage belt by year *t**
Source of data	Remote sensing and GIS data. Secondary data.
Description of measurement methods and procedures to be applied	Leakage management areas that result in a decrease in the carbon stock will be subject to monitoring.
Frequency of monitoring/recording	Annually
Value applied	Values are described in Table 55.
Monitoring equipment	Remote sensing and GIS. Secondary data.
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of leakage
Calculation method	As per LK-ASU, Step 4.
Comments	N/A

Data / Parameter	MANFOR
Data unit	Ex-ante it can be assumed that MANFOR should remain constant.
Description	Total area of forests under active management (nationally)
Source of data	Official country-specific data from IBAMA.
Description of measurement methods and procedures to be applied	According to the LK-ASU, it is necessary to demonstrate that the areas will be protected against deforestation. Such demonstrations must include sufficient numbers of rangers to prevent illegal colonization and an active management plan detailing harvest plans and return intervals and/or evidence that the concession owner has already expelled illegal settlers/invaders from forest areas.
Frequency of monitoring/recording	Annually
Value applied	396,495,172
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	PROTFOR
Data unit	hectare
Description	Total area of nationally fully protected forests
Source of data	Official ISA country-specific data.
Description of measurement methods and procedures to be applied	According to the LK-ASU, it is necessary to demonstrate that the areas will be protected against deforestation. Such demonstrations are made by governmental mechanisms and national policies. Ex-ante it can be assumed that PROTFOR must remain constant.
Frequency of monitoring/recording	Annually
Value applied	88,566,400
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology using this module.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	TOTFOR
Data unit	hectare
Description	Total available national forest area
Source of data	Official country-specific data. As the country has a wide variety of forest biomes throughout its extension, TOTFOR considered only the Amazon Forest biome. This is a conservative approach. Thus, as a representation of the total area of the Amazon Forest in Brazilian territory, TOTFOR consisted of multiplying the size of the Brazilian Amazon by 97%, which represents its preserved area, according to SEMA.
Description of measurement methods and procedures to be applied	According to LK-ASU, forest areas suitable for conversion to livestock, it can be conservatively assumed that TOTFOR should remain constant for the baseline period.
Frequency of monitoring/recording	Annually
Value applied	486,461,572
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	ΔCP, LB
Data unit	tCO_2e
Description	Liquid greenhouse gas emissions within the leakage belt in the case of the project
Source of data	According to the M-REDD Module.
Description of measurement methods and procedures to be applied	According to the M-REDD Module.
Frequency of monitoring/recording	Annually
Value applied	Ex post
Mmonitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology using this module.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	PROPIMM
Data unit	Proportion
Description	Estimated proportion of baseline deforestation caused by immigrant population
Source of data	Official country-specific data (government). The proportion of baseline deforestation caused by the immigrant population (PROPIMM) was estimated for a period from 2012 to 2020. For the calculation of PROPIMM, local data for births, deaths and population were used. It is then assumed that the total annual population growth of a given municipality is attributed to: i) births and ii) immigration. Thus, by subtracting the number of annual births from the total annual population growth, it is possible to infer the number of immigrants.
Description of measurement methods and procedures to be applied	Estimated as a proportion of the area deforested in the last 5 years by the population that migrated to the leakage belt and project area in the last 5 years (all areas within 2 km of the project area boundaries design and leakage belt should be considered here).
Frequency of monitoring/recording	Annually
Value applied	1.33
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology using this module.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	UMADefLB,i,t
Data unit	hectare
Description	Area of deforestation recorded in the leakage belt in the case of the project in stratum *i* in the year *t*
Source of data	As per the M-REDD Module. Satellite image.
Description of measurement methods and procedures to be applied	According to the M-REDD Module. Analysis of satellite images.
Frequency of monitoring/recording	Annually
Value applied	Ex post
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology using this module.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	UMADefPA,I,u,t
Data unit	hectare
Description	Area of deforestation recorded in the project area in case of project in stratum *i* converted to land use *u* in year *t*
Source of data	As per M-REDD Module. Satellite image.
Description of measurement methods and procedures to be applied	According to the M-REDD Module. Analysis of satellite images.
Frequency of monitoring/ recording	Annually
Value applied	To measure ex-post.
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology that uses this module.
Purpose of data	Calculation of leakage
Calculation method	N/A
Comments	N/A

Data / Parameter	RFt
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	Non-Permanence Risk Report (v3.1), Remote sensing and GIS data, Literature data
Description of measurement methods and procedures to be applied	All VCS Non-Permanence Risk Report data sources will be used to measure the various risk factors.
Frequency of Monitoring/ recording	Annually
Value applied	10
Monitoring equipment	VCS Approved AFOLU Non-Permanence Risk Tool
QA/QC procedures to be applied	Literature data from renowned sources will be used and critically checked. When possible, the average of two or more sources will be used.
Purpose of data	Calculation of project emissions
Calculation method	All risk factors described in the VCS Risk Report have been assessed.
Comments	N/A

Data / Parameter	ADefLB,eu,u,t
Data unit	hectare
Description	Deforested area recorded in the leakage belt in stratum *i* converted to land use *i* in year *t*
Source of data	According to Module M-REDD v2 .two. Remote sensing images.
Description of measurement methods and procedures to be applied	According to the M-REDD Module. Analysis of satellite images.
Frequency of monitoring/recording	Annually
Value applied	Ex-post
Monitoring equipment	N/A
QA/QC procedures to be applied	As per REDD+ MoF section 9.3 or other VCS methodology using this module.
Purpose of data	Calculation of leakage
Comments	N/A

Data / Parameter	Leakage Belt Forest Cover Monitoring Map
Data unit	hectare
Description	Map showing the location of the forest area within the leakage belt area at the beginning of each monitoring period. Applicable only when leakage must be monitored on a leakage belt.
Source of data	Remote sensing in combination with GPS data collected during soil verification
Description of measurement methods and procedures to be applied	Minimum map accuracy should be 90% for forest/non-forest classification on remote sensing images. If classification accuracy is less than 90%, the map is not acceptable for further analysis. More remote sensing data and ground verification data will be needed to produce a product that achieves the minimum 90% mapping accuracy.
Frequency of monitoring/ recording	Must be monitored at least every 5 years or if verification occurs at a frequency less than every 5 years, examination must occur prior to any verification event.
Value applied	Ex-post
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Mapbiomas data are applicable for use in this project, according to the criteria listed below (Methodology VM0007): i) Mapbiomas data cover the entire project area, leakage belt and reference region. ii) Mapbiomas data cover the entire reference period (beginning, middle and end) of the fixed baseline period. iii) Mapbiomas monitors the conversion of forest areas into non-forest areas. iv) Monitoring took place throughout the fixed baseline period. In case of unavailability of Mapbiomas data for the monitoring period, other sources will be consulted such as PRODES or an image classification (Landsat 8) will be carried out to measure the deforested area. Land use and land cover mapping is evaluated using images with a spatial resolution greater than 30 meters. The assessment of the classification accuracy is performed by analysing the overall accuracy and the kappa index

	obtained from a confusion matrix. The minimum classification mapping accuracy should be greater than 90%, which is considered very good.
Purpose of data	Calculation of leakage
Calculation method	Remote sensing and GIS
Comments	N/A

Data / Parameter	Forest Coverage Monitoring Map
Data unit	hectare
Description	Map showing the location of the forest area within the leakage belt area at the beginning of each monitoring period. Applicable only when leakage must be monitored on a leakage belt.
Source of data	Remote sensing in combination with GPS data collected during the soil verification
Description of measurement methods and procedures to be applied	Minimum map accuracy should be 90% for forest/non-forest classification on remote sensing images. If classification accuracy is less than 90%, the map is not acceptable for further analysis. More remote sensing data and ground verification data will be needed to produce a product that achieves the minimum 90% mapping accuracy.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs at a frequency less than every 5 years, examination must occur prior to any verification event.
Value applied	Ex-post
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Mapbiomas data are applicable for use in this project, according to the criteria listed below (Methodology VM0007): i) Mapbiomas data covers the entire project area, leakage belt and reference region. ii) Mapbiomas data cover the entire reference period (beginning, middle and end) of the fixed baseline period. iii) Mapbiomas monitors the conversion of forest areas into non-forest areas. iv) Monitoring took place throughout the fixed baseline period. In case of unavailability of Mapbiomas data for the monitoring period, other sources will be consulted such as PRODES or an image classification (Landsat 8) will be carried out to measure the deforested area. Land use and land cover mapping is evaluated using images with a spatial resolution greater than 30 meters. The assessment of the classification accuracy is performed by analyzing the overall accuracy

	and the kappa index obtained from a confusion matrix. The minimum classification mapping accuracy should be greater than 90%, which is considered very good.
Purpose of data	Calculation of project emissions
Calculation method	Remote sensing and GIS
Comments	N/A

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

The results of climate monitoring will be made available on the project website and will also be publicly available on Verra's website. The results will be presented to local communities through communication campaigns, and scientific articles will be published in technical journals.

3.4. Optional Criterion: Climate Change Adaptation Benefits

The Tapera project generates climate change adaptation benefits.

3.4.1. Regional Climate Change Scenarios (GL1.1)

Ongoing climate changes pose a significant threat to the Amazon Rainforest, with projections indicating an escalating trend towards heightened temperatures and aridity in the region. Global climate simulations, particularly those linking surface water temperature peaks in the Pacific Ocean with the El Niño phenomenon, illustrate more pronounced impacts. Historical events affirm the legitimacy of the correlation between Pacific Ocean surface temperature and El Niño. Models incorporating biospheric feedback effects depict even graver consequences for the Amazon, foreseeing the disappearance of forested areas and subsequent soil heating, leading to increased carbon emissions, exacerbating climate effects, and causing further deforestation.

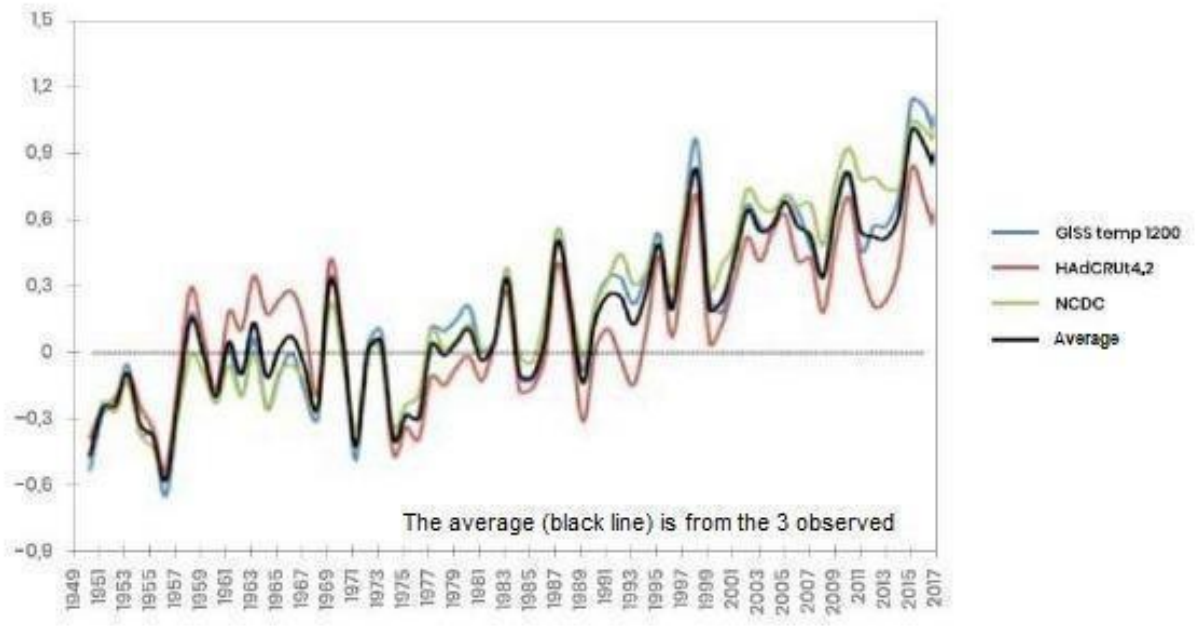
An unforeseen climate peril emerged in 2005 when a devastating drought struck the Amazon, linked to a water temperature gradient from the North Atlantic to the South. This forms part of an intensifying oscillation, exacerbated by the worsening hot water patch in the tropical North Atlantic due to reduced aerosol loads—an issue expected to escalate due to ongoing global warming. The realisation of such a scenario hinges on our efforts to curtail greenhouse gas emissions resulting from fossil fuel combustion and deforestation. Brazil stands at significant risk of losing the Amazon rainforest, making it one of the countries most vulnerable to global warming.

Various climate models yield divergent outcomes for the Amazon's future climate. Notably, the UK Meteorological Center's Hadley Center model suggests a catastrophic scenario. While an error in the GFDL model's indication of increased rainfall has been corrected, results across models remain varied. It is crucial to evaluate these models for specific purposes related to representing the Amazon's future climate and interpret remaining uncertainties for policymaking. Despite concerns raised by the Hadley Center's results in 2000, subsequent research has not identified a specific error, yet the model's simulated future climate appears to exaggerate numerical values for temperature and drought. The projected climate surpasses the tolerance limits of Amazon rainforest trees, leading to potentially high mortality.

Climate change is underway, with escalating impacts and risks tied to the extent of warming, potentially causing irreversible damage to ecosystems, biodiversity, agriculture, and the overall economy

and society. Integrating effective climate change adaptation measures can foster a more resilient society in the medium term. In the Amazon, observed warming from 1949 to 2017 ranges from 0.6 to 0.7°C according to various temperature data sources, all pointing to increased warming in recent decades, with 2017 standing out as the warmest year since the mid-20th century. Figure 27 illustrates the observed temperature anomaly over 1961-1990 from three data sources that analyse the Amazon Forest.

Figure 60. Observed temperature anomaly for 1961-1990 obtained from three data sources for Amazonia. Sources: GISS-NASA Goddard Institute for Space Studies, USA, NCDC-National Climatic Data Center, USA, HAdCRU-Hadley Centre-Climate Research United, United Kingdom.



Climate change scenarios for the Amazon, as projected by sophisticated climate models endorsed by the IPCC, foretell a notable escalation in the average air temperature surpassing 4ºC by the conclusion of the 21st century. Simultaneously, there is a projected reduction in Amazonian rainfall of up to 40%, as illustrated in Figure 60. This change in air temperature has the potential to generate major imbalances in vital ecosystems for the survival of humanity. According to the National Plan for Adaptation to Climate Change, South America emerges as the continent facing the highest risk of species extinction, estimated at 23%. The analysis attributing causes leans towards human influence carrying greater significance compared to natural factors, aligning with findings from earlier IPCC reports and the recent summary on global warming surpassing 1.5°C, depicted in Figure 29.

Figure 61. Projections of temperature and precipitation changes in the tropical region of South America produced by the IPCC AR5 model defined for 2046-2065 and 2081-2100 with low emission (RCP2.6) and high emission (RCP8.5) scenarios, for the period from 1981 -2010 [73].

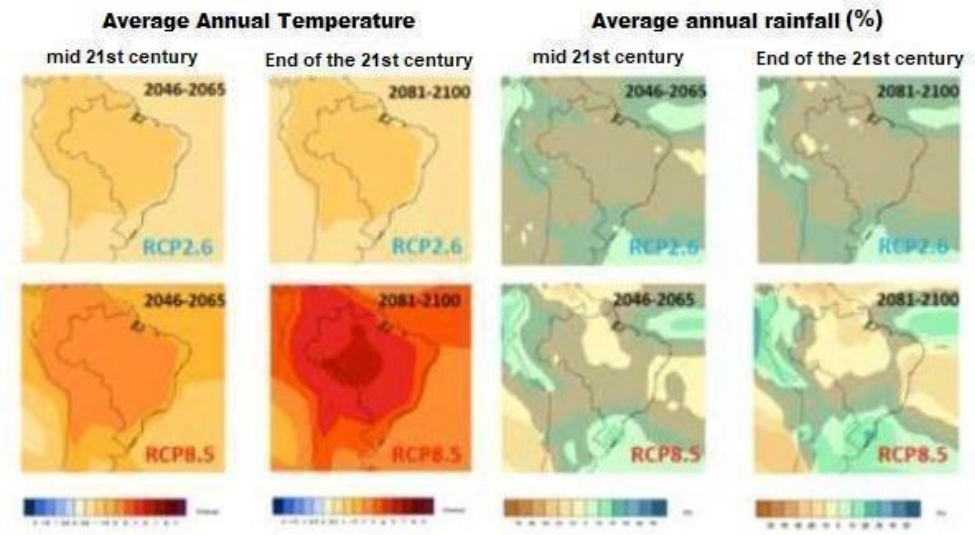
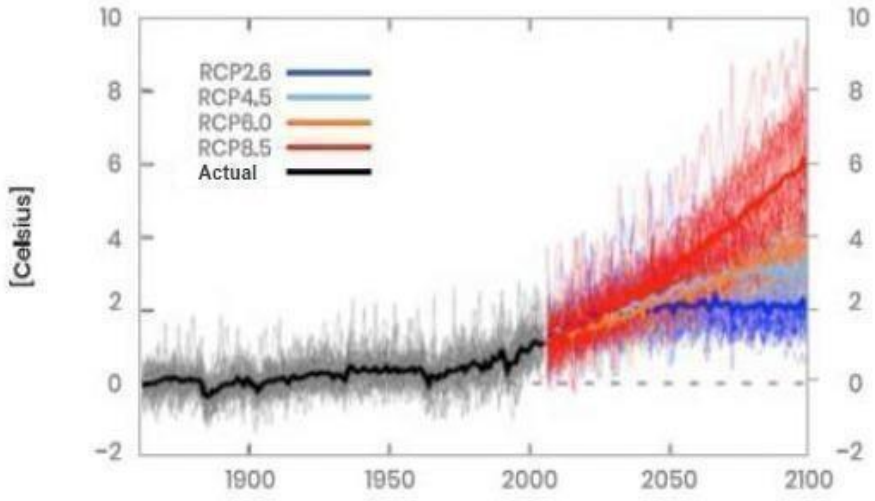


Figure 62. Projections of temperature changes up to 2100 for the various IPCC A5 emission scenarios for the Amazon[74].



[73] Marengo, J.A., Souza Jr, C. 2018. Climate Change: Impacts and Scenarios for the Amazon. São Paulo. 2018. Available at: https://www.oamanhaehoje.com.br/assets/pdf/Report_Climate_Change_impacts_and_scenarios_for_the_Amazon.pdf . Accessed on 14/12/2022.

[74] Marengo, J.A., Souza Jr, C. 2018. Climate Change: Impacts and Scenarios for the Amazon. São Paulo. 2018. Available at: https://www.oamanhaehoje.com.br/assets/pdf/Report_Climate_Change_impacts_and_scenarios_for_the_Amazon.pdf . Accessed on 14/12/2022.

3.4.2.Climate Change Impacts (GL1.2)

Global warming has far-reaching consequences, prompting shifts in geographic distribution, seasonal activities, migration patterns, abundance, and intraspecific interactions of various terrestrial, aquatic, and marine species in response to ongoing climate change. The IPCC AR6 highlights the vulnerability of ecosystems, including the Amazon, to extreme weather events such as droughts and fires, showcasing the current exposure of many human and natural systems to climate variability.

Recognized as a primary threat to biodiversity in the 21st century, human-induced climate change affects species and populations disparately. To effectively guide conservation efforts, it is crucial to identify where and which species are most susceptible to climate change. Ribeiro et al. (2016) conducted an assessment of mammalian exposure to climate change in the Brazilian Amazon, evaluating the efficacy of the Protected Areas (PAs) network in mitigating impacts on "critically exposed" species. Their findings suggest that mammals face substantial exposure to climate change, and the existing Protected Areas may not be sufficient to prevent impacts on these vulnerable species.

Climate change's profound effects on biodiversity and carbon storage capacity in the Amazon, a critical region for global climate regulation, are undeniable. While each scientific expedition uncovers new species, uncertainties persist regarding their biology and adaptability to environmental changes. The impacts of climate change vary depending on species biology, adaptive capacity, and distribution across ecosystems. Species with restricted habits and small populations are more vulnerable, while those with greater adaptive plasticity and wider distribution may fare better. Fragmentation of ecosystems in the Amazon amplifies the potential effects of climate change, particularly for populations facing inbreeding and loss of genetic variability, impacting adaptive capacity and reproductive capability. Molecular studies using microsatellite loci contribute to understanding genetic diversity, supporting management plans for species under environmental pressure.

The Tapera project region will experience adverse effects on the well-being of communities and biodiversity due to climate change. Weather events heighten the vulnerability of both human and natural systems. While global environmental and climate changes have been escalating in recent decades, media coverage has only brought widespread attention to these issues in recent years. This delay in public awareness presents a societal and governmental challenge in understanding the causes and role of environmental changes in health conditions.

Climate change has varied impacts on human health, both direct and indirect. Direct impacts include occurrences such as heat waves or deaths from extreme events like hurricanes and floods. Indirectly, climate change influences health through environmental changes, altering ecosystems and biogeochemical cycles. This can elevate the incidence of infectious diseases and non-communicable

diseases, including malnutrition and mental illness. It is essential to note that not all health impacts are negative; for instance, higher temperatures may reduce winter mortality. Nevertheless, the consensus is that negative impacts will outweigh the positive ones.

Seasonal climate fluctuations affect vector-borne diseases, such as increased dengue fever in summer and malaria in the Amazon during the dry season. Extreme events introduce fluctuations that can impact waterborne diseases, like leptospirosis, hepatitis, and diarrheal diseases. Respiratory diseases are influenced by fires and thermal inversions that concentrate pollution, notably in urban areas. Malnutrition can result from agricultural losses due to droughts and floods, affecting food security.

Anticipated impacts in the project area and its surroundings include the gradual savannization of the Amazon, especially in the southern portion, leading to changes in ecosystems and natural occurrence patterns of species. Loss of endemic plant and animal populations, forest fragmentation, and habitat loss are expected. Extreme weather events, increased temperatures, and intensified droughts and fires will impact agriculture, food security, and may force migration from communities. Effects on ichthyofauna and artisanal fishing, heightened incidence of tropical diseases, epidemics, stress, and increased diseases in animals raised for protein production are also foreseen. Additionally, impacts on nutrient cycling and soil biota may reduce productivity in cultivated areas and the forest itself.

3.4.3.Measures Needed and Designed for Adaptation (GL1.3)

Based on the causal model described, the measures initially proposed to help communities and biodiversity adapt to the likely impacts of climate change are described in Table 54.

Table 54. Measures to assist communities and biodiversity adapt to the likely impacts of climate change.

Item	Adaptation Measure	Directed to		Outputs	Results	Impacts
		Community	Biodiversity			
1	Permanent maintenance of contact with institutions that issue climate alerts for the region to issue climate alerts for the region	X	X	Weather alerts communicated to local population	The local population is warned about extreme weather events and risks of storms, fires, etc.	Less climate risk for the local population
2	Ongoing training on topics related to climate change, vulnerabilities, mitigation and adaptation measures	X	X	Training courses for extractive communities	Local population well-informed and motivated to adopt mitigation and adaptation measures to combat climate change	Less climate risk for the local population
3	Acquisition and donation of river emergency transport for health care and emergencies	X		River ambulance and better assisted population	Ease of emergency transport	Increased quality of life and improved health of the local population
4	River transport measures to adapt the local population to the effects of extreme weather events	X		Improved moorings along river banks	Ease of transport for the local population	Better infrastructure for the local population
5	River transport measures to adapt the local population to the effects of extreme weather events	X		Training courses for extractive communities	Use of a wider range of plants for food production by local people	Food, energy and water security for the local population

Item	Adaptation Measure	Directed to		Outputs	Results	Impacts
		Community	Biodiversity			
6	Training in practices of broader use of local biodiversity and adaptation of forest plants in crops	X	X	Training courses for extractive communities	Use of a wider range of plants for food production by local people	Food security for the local population
7	Monitor rates of deforestation and forest degradation in the region to analyse the effects of climate change on biodiversity		X	Biweekly analysis maps of forest cover in the project area	Improved knowledge about forest (and biodiversity) response to climate change	Biodiversity benefited
8	Continuous forest inventory to analyse the effects of climate change on the adaptation of species to the environment throughout their lives		X	Annual carbon reports executed	Improved knowledge about forest (and biodiversity) response to climate change	Biodiversity benefited

4. COMMUNITY

4.1. Without-Project Community Scenario

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

Up until the late 19th century, the Uatumã River basin remained largely unexplored within the province of Amazonas. Despite numerous scientific expeditions from Europe in the 18th and 19th centuries, the basin remained untouched, resulting in scarce historical documentation on its occupation. The gaps in knowledge extend further, encompassing indigenous peoples' history, social interactions with the incoming white settlers, the roles of religious orders, and the existing trade networks.

The earliest human settlements in the Uatumã and Jatapu river basin predate the arrival of white settlers in the 17th century. Over 3,000 years ago, hunter-gatherer societies, notably the Arawak linguistic group, displayed a remarkable level of complexity in their communities (URBAN, 1992). Arawak migration to the Negro, Urubu, and Uatumã river basins unfolded across different periods, representing one of the oldest dispersals in the Amazon basin (PORRO, 1995). Motivated by inter-tribal conflicts and the relentless pursuit of slaves by rescue troops along the Negro and Urubu rivers, the Arawaks inevitably encountered colonizers, initially with the Spanish and later with the Portuguese. Despite their expertise in agriculture, collection, and fishing, the Arawaks faced enslavement, diseases, tribal conflicts, extermination by white settlers, and invasions, leading to the eventual disappearance of their populations from the current territories encompassing the municipalities of Urucará (AM), São Sebastião (AM), Itapiranga (AM), and Silves (AM).

As was the case across the entire Amazon basin, the colonisation process witnessed resistance and fierce struggles from the indigenous people. The Arawaks, despite limited historical, anthropological, and archaeological evidence, did not submit peacefully to the construction and maintenance of missions. Instances such as the destruction of the Jatapu mission were met with immediate and cruel responses from the Grão-Pará government, highlighting the pervasive violence that marked the indigenous resistance during the colonization era.

The settlements that gave rise to the cities of Urucará, São Sebastiao do Uatumã and Distrito de Santana, both belonging to the municipality of Silves until 1887, were made up of settlers and peasants, and would only emerge over the course of the 19th century. According to the commission in charge of collecting statistical data from the province in 1839, the population residing in the missions and villages that made up the Jatapu (485 inhabitants) and Uatumã (332

inhabitants) rivers totaled 817 inhabitants (BAENA, 2004). However, the indigenous populations residing in the most distant *cabeiras* were not included in this statistic.

The beginning of the settlement of the town that is now Urucará occurred with the arrival of Crispim Lobo de Macedo, a merchant who left Cametá, in Pará, and travelled to the most distant corners of Paraná from Urucará and the river Uatumã in the first decades of the 19th century, settling in this territory with his family, slaves and household (TENÓRIO, 2016).

Crispim Lobo de Macedo developed agriculture in the area to strategically protect the Portuguese Crown's domains on the Uatumã and Jatapu rivers and enable the exploitation of "*drogas do sertão*"[75] and later latex, products valued in Europe. The indigenous people who were not part of this exploitation system migrated to the upper reaches of the rivers, heading north, beyond the borders with the Guianas.

Occupying these lands through settlers and mestizos, and establishing an agricultural and economic base there, was of fundamental importance to guarantee the domain of the territory at times of dispute between the Portuguese and the Spanish. This tiny village made it possible to possess the territory through symbolic power. Crispim Lobo de Macedo did not have military power for this purpose, his presence and the interests he represented symbolised Portuguese power. In addition to settlement, other economic interests were behind this incursion, such as the extraction of chestnuts, hunting and catechization.

The native indigenous peoples, controlled by the few settlers, were fundamental to the economic and territorial success in the early days of the founding of Urucará. Although historical evidence is rare, the natives, knowledgeable about rich agriculture, vast knowledge of the region's rivers and forest products of high economic value, were exploited through exchange or sale to external colonial warehouses that drained this production for the most complex urban networks such as Manaus and Belém, based on the aviation system, a fundamental mechanism in the Amazon economy after the Pombaline period (CORRÊA, 2006).

The period that extends from 1850 to 1920 corresponds to the period in which the Amazonian urban network gained a new economic and spatial dimension. This historical context has as its backdrop the "boom" of rubber extraction, which reinvigorated both the economy and the urban network (CORRÊA, 2006). The factors that motivated such dynamism are associated with the strong external demand for rubber, the opening of navigation on the Amazon River, the arrival of labour from the Northeast and offers of capital.

Amid this context and factors arising from extractive production, the need for new urban centres and the reinvigoration of existing ones arose. One of them refers to the small village of

[75] *Drogas do sertão* were products extracted from the Amazon Rainforest and sold by the Portuguese during the 17th century. Examples of drugs from the backlands were Brazil nuts, guaraná, parsley, among others. The labour used was indigenous.

Nossa Senhora Santana da Capela, elevated to the category of parish in 1880, the embryo of the settlement that would later be called Urucará.

Law No. 744 of May 12, 1887 elevated the parish of Nossa Senhora Santana da Capela to the category of town, with the name of Vila de Nossa Senhora Santana de Urucará, and the municipality was established in the same year. State Law No. 33, of November 4, 1892, determined that the town of Santana de Urucará would be called simply Urucará. In an administrative division referring to the year 1911, the village is constituted as the headquarters district and by state Decree-Law No. 68 of 1938, the headquarters district is elevated to the status of city with the name of Urucará (IBGE, 2020).

During this period, intra-regional commercial navigation circuits were very dependent on external demands linked to exports. At the beginning of the 20th century, the rubber boom boosted some urban centres in the Amazon, due to the occurrence of latex in the headwaters of the main rivers, Urucará was then inserted into the navigation route of the state of Amazonas. Twice a month, ships from the Amazonas State Navigation and Commerce Company docked in the village of Crispim Lobo de Macedo and supplied rubber from the rubber plantations on the Uatumã and Jatapu rivers (GONÇALVES, 1903). Other export products were also shipped, such as chestnuts, copaíba and andiroba oils.

This fact meant that the cities functioned as mere rubber outposts, not constituting local elites, nor capital accumulations due to the aviation system providing advantages to aviation houses located in Manaus. Consequently, such cities did not form social and territorial divisions of work, nor complementations of functions or exchanges within the urban network, this process being called “proto-urbanisation” (MACHADO, 1999).

From 1912 onwards, Brazilian rubber, which supplied several segments of industrial sectors around the world, began to suffer competition from Asian rubber plantations under English rule, and disputes in the international market made the Brazilian product very expensive, mainly due to the profound differences in production mode. In the crisis, the rubber economy caused a decline in the dynamics of the urban network of the Western Amazon and impacted the economy of small cities linked to the aviation circuit, causing changes in migratory currents and even population depletion in these cities. Urucará, like most cities, possibly suffered few indirect impacts.

With this absence of urban functions and the decline of extractive production, especially due to the decrease in the supply of latex on the international market between the 1910s and 1930s, the municipality of Urucará entered stagnation for long decades, no longer serving the capitalist interests that drained agro extractive riches. Other products of lower value became the main route of connection with regional metropolises. However, the bankruptcy of aviation houses in cities such as Belém and Manaus directly resulted in a decrease in navigation traffic along the Jatapu and Uatumã rivers, a condition that would prevail until the jute boom in the 1960s-70s.

In the first decades of the 20th century, the village of Urucará was configured as a small village composed of an interethnic mix of a few white residents. The majority of the population was made up of a mixture of settlers from Pará and indigenous people. With the boom in rubber production in the headwaters of the region's rivers, some northeastern families further reinforced this intersection, forming a workforce in the rubber plantations, maintaining agriculture as the basis of family support.

Despite the importance that the rubber period (1850 to 1920) had on the Uatumã and Jatapu region, it had a modest impact on the initial urban infrastructure and architecture of Urucara. It timidly structured the initial configuration of the urban plan, but contributed to the consolidation of the commercial and administrative centre.

After the First World War (1914-1918), the Amazon region experienced a period of economic decline, with stagnation of small towns, even though they were not directly involved in latex production. From 1933 onwards, between the stretch of Manaus and Santarém, the implementation of the jute cycle began starting from Parintins (AM), which was the driving force behind experiments in the planting of vegetable fibre intended for the production of sacks for the export of Brazilian coffee. The Federal Government, in 1930, granted permission for Japanese bodies to found the Institute of Agricultural Studies for Japanese immigration in Parintins, in Vila Amazônia, close to the central nucleus (ROSAL, 2000).

These events were essential for the configuration of urban morphology in some riverside cities such as Urucará and Nhamundá, where aspects linked to the jute economic cycle timidly modified the city's forms. Therefore, the creation of the municipality of Urucará is linked to historical legacies in the formation of the Amazon region, having a late occupation and being dependent on the external market on the periphery of the world economy. Outbreaks of momentary appreciation of products on the international market encouraged control of the territory and the imposition of external mercantile logic, which ended up culminating in the accelerated process of urbanisation.

Occupation patterns in Urucará began to change from the mid-1950s onwards, when floods and unavailability of land in the floodplains forced permanent moves of the peasantry to dry land areas. At the time of the 1950 census, the municipality of Urucará had just over 3,672 inhabitants, of which only 649 lived in the capital (18% of the population). Commercial exchange was maintained with the squares of Manaus, Belém, Fortaleza, Rio de Janeiro and neighbouring municipalities. A considerable part of the jute grown in Urucará started to be processed in Parintins, further reducing the mediation functions carried out by Urucará and the accumulation of capital by small business owners and local elites.

Although cocoa production generated wealth for a handful of merchant-bosses who worked at the mouths of the region's main rivers at the beginning of the 20th century, it was the cultivation, heyday and decline of jute during the 1960s - 70s, which left marks on the urban

morphology of the city, showing the flourishing in times of outbreaks of small businesses, firms and manufactures, submerging these with their decline (BECKER, 2013).

The cultivation of jute contributed with more than half of the revenues from agricultural activities, complemented by cassava, cassava, tobacco, beans, cocoa, coffee, corn and banana (BRASIL, 1956). The livestock sector had just over 3,500 pigs, 1,700 cattle, 600 sheep, contributing modestly to the municipality's revenue. Adding to this, the predatory hunting of alligators, deer, jaguars, peccary and other animals that provided skins and hides for export, represented the other link in the Urucará production chain.

In the 60's and 70s, the military government implemented a strategy to increase the occupation of the Amazon to guarantee Brazilian sovereignty over the region. The Brazilian interest in ensuring its presence in the region arose from some factors such as vulnerability in relation to the size of the extensive area, the organisation of revolutionary foci and the internal dynamism of neighbouring countries which, despite being less industrialised, had their investments in their Amazons. In this way, the government began to encourage and subsidise the occupation of land. Silva (2004) considers that the era of so-called “major government projects” for the Amazon has begun, such as the Amazon Radar Project (RADAM); the Superintendence for the Development of the Amazon (SUDAM); the Superintendency of the Manaus Free Trade Zone (SUFRAMA) and the Banco da Amazônia (BASA). All of these projects were prepared in accordance with the guidelines of the National Security Doctrine whose slogan was “integrate not to deliver”.

The State created and monitored several programs for the region in accordance with the capital, through an articulated expansion project. Various tax incentives made it possible to transfer economic groups to the region. In this sense, the SUDAM project benefited big capital; Small extractive and agricultural producers did not receive this benefit. The author explains that the incentives offered by the State generated the concentration of income, the impoverishment of the masses and the expropriation of land from Indigenous people and squatters (PICOLI, 2006).

The new protagonists of the process of regional (development) were civil and military territorial managers, large national and international capital. “The region’s traditional elites, especially those linked to extractivism, are marginalised” (GONÇALVES, 2005, p.95).

Although they began in the 1950s, road construction, connecting the Amazon to the rest of the country, increased during the military period. In 1965, construction began on BR-364 (Cuiabá-Porto Velho) and, in 1967, improvements were carried out on BR-010 (Belém- Brasília), having been paved in 1969. In 1970, the Plan was created of National Integration (PIN) that made the Transamazônica (BR-230) and Cuiabá-Santarém (BR-163) viable (MEIRELLES FILHO apud SILVA, 2004). Gonçalves (2005) highlights that the roads are built by large companies, linked to the military in the construction of “Big Brazil”.

This strategy altered the population and economic dynamics of many villages and towns in the Amazon region, including the other town involved in the project Tapera. The municipality of Nhamundá, as it neighbours Urucará, had a similar development as its neighbour town.

The origins of the municipality of Nhamundá date back to the primitive Indian settlements – in the first decades of the 16th century – tcháwhiyána, hixkariana, sákáka, kamáeyana, chiriwiyána, kumuyána, wari condurizes and, jamundás, whose tuxauá was called Jamundá, which, given the struggle. The small island has in its genesis the historical encounter between the Spanish and the great indigenous warriors, compared to the Amazons, narrated in Greek mythology. The event, present in the main history books, gave its name to the state of Amazonas. The municipality has beautiful waterfalls and beaches, as well as rivers and lakes full of fish that attract sport fishermen. The municipality is in the Fishing Book of Records: the largest freshwater peacock bass, of the vazzoleri species, was caught in the Paratucu River, in the Alto Nhamundá region.

The essential features of such groups are easily delineated from what Peter Rivière (1984) summarised for the Guianas region: small and impermanent villages, rule of matrilocal residence, rituals that involve the gathering of several villages and during which narratives are updated mythological, dances, games and games. In this context, it is difficult to speak of an “ethnic” group, with defined borders, whether from a linguistic or “cultural” point of view, as the numerous marriages between these groups in the region necessarily promote a “mixture” throughout of the historical process, in which people move between villages and adopt various housing locations throughout the cycle[76].

Nowadays, in the municipalities of Urucará and Nhamundá, the economy is predominantly driven by agriculture, with a diverse range of over 40 cultivated species, and by fishing, extraction of over 100 products such as copaíba and various timbers are harvested.

In examining the community without the project in the municipalities of Nhamundá and Urucará, a nuanced understanding of the region's history and development emerges. The historical trajectory of these municipalities has been shaped by a dynamic interplay of environmental, social, and economic factors. Exploring the historical landscape of Nhamundá and Urucará illuminates the need for holistic approaches to community development that address both immediate needs and the enduring legacy of regional evolution. As these municipalities navigate their developmental paths, an inclusive and context-sensitive approach becomes imperative to foster sustainable progress that encapsulates the aspirations of the local communities.

[76] Olhares e perspectivas que fabricam a diversidade do passado e do presente: por uma arqueologia etnográfica das bacias dos rios Trombetas e Nhamundá (openedition.org)

Table 55. Number of families that inhabit the streams in the Tapera project area.

Water bodies (creek or river)	N°. of persons
Tapera River	26
Maripá River	68
Paratucu River	310

The primary data mobilised here are the result of the application of the MVS methodology in field activities during the month of March 2023. Four activities were carried out based on the MVS questionnaire, with open and closed questions, covering a total of 14 families that make up the territorial sample. The profile of the interviewees was 50% male and 50% female (Figure 30). Regarding the age of the interviewees, the age bracket between 41 and 50 years old corresponded to the majority, corresponding to 50% of the interviewees. The age range between 26 and 30 years corresponded to 25% of the interviewees, and above 51 years also corresponded to 25%, as presented in Figure 31. All interviewees stated that they were born, grew up and live in the region during the nut fruiting and gathering season.

Sustainable Livelihoods

As outlined in section 2.1.11, the methodology utilised to delineate the baseline and its subsequent monitoring followed the Sustainable Livelihoods framework. 25 indicators were defined, categorised into five dimensions: Human, Social, Environmental, Physical, and Financial. Table 56 displays these indicators along with their respective averages, derived from the completion of the questionnaires.

Table 56. Indicators and averages resulting from the application of the questionnaires with the communities.

Types of assets/dimensions	Information to be gathered for baseline description (Indicators)	Average
Human Dimension	H1 - Community Skills	1.00
	H2 - Food security	0.27
	H3 - Labor safety	0.86
	H4 - Access to education	0.45
	H5 - Preservation of cultural traditions	0.98
Social Dimension	S1 - Participation in decision making	0.91
	S2 - Resolution of internal conflicts	0.78
	S3 - Participation of women in decision-making	0.88
	S4 - Access to public policies	0.45
	S5 - Access to health services	0.61
Environment Dimension	E1 - Biodiversity in the region	0.84
	E2 - Climate change impacts	0.96
	E3 - Situation of rivers and watercourses in the region	0.81
	E4 - Access to drinking water	0.66

	E5 - Waste management	0.62
Physical Dimension	P1 - Access to the community	0.60
	P2 - Community's infrastructure	0.33
	P3 - Challenges of maintenance of physical structures	0.82
	P4 - Management of physical spaces	0.17
	P5 - Physical spaces for collective decision-making	0,45
Financial Dimension	F1 - Sources of income	1.00
	F2 - Financial stability	0.43
	F3 - Access to credit services and financial support policies	0.25
	F4 - Opportunities for local economic development	0.56
	F5 - Financial challenges	0.98

In the context of the Tapera project, a safe sample was achieved, when 104 members of 5 different communities distributed in the region directly related to the project were interviewed. The fieldwork ensured the systematic application of the MVS, providing a solid and meaningful foundation for assessing the project's impact and establishing a comprehensive plan for future monitoring.

Analysis of responses reveals that communities are strongly characterised by traditional activities such as agriculture and fishing, but also shows a diversity of skills and practices that contribute to community sustainability and livelihoods. These activities reflect not only how members meet their basic needs, but also how they interact with the environment.

The communities identify themselves as having access to a valuable array and a rich diversity of natural resources. This serves as a fundamental support for their livelihoods. In the framework of the MVS, this dimension is characterised by the benefits derived from nature,

emphasising its pivotal role in sustaining the residents of these localities. This was demonstrated by the openness of community members to engage in an upcoming project centered around the conservation of natural resources. It reinforces their comprehension that nature remains the central source and strategy for their sustenance.

In terms of community skills, it is noted that agriculture and fishing are the most recurrent activities, standing out as the main forms of subsistence. These traditional practices demonstrate a strong connection with the environment and dependence on primary activities for sustenance. However, food security appears to be a moderate concern, indicating potential challenges in ensuring consistent access to nutritious food. Access to education raises concerns as well, suggesting possible barriers to widespread educational opportunities. On a positive note, the preservation of cultural traditions is highly valued, indicating a strong commitment to maintaining cultural heritage from generation to generation.

Active participation in decision-making indicates a strong sense of community involvement. The ability to resolve internal conflicts is relatively high, suggesting social engagement from the communities' members. Women's participation in decision-making is well-represented, contributing to gender-inclusive governance. When it comes to the access to public policies, the results from the questionnaires indicate potential challenges in benefiting from governmental policies, as well as access to health services, suggesting areas for improvement in healthcare accessibility.

Concerning the environmental dimension, the communities are highly aware of and impacted by climate change, commenting on droughts and increasing heat, indicating a need for resilience-building measures. Access to drinking water is a moderate concern, and waste management practices could benefit from improvements. Accessibility to the community is moderately satisfactory, with potential areas for improvement in transportation infrastructure. Communities' infrastructure is a strong concern, suggesting challenges in acquiring and maintaining physical structures. Financial stability is a moderate concern, suggesting challenges in maintaining consistent economic well-being. Access to credit services and financial support policies is a notable issue, indicating potential barriers to financial assistance, emphasising the need to address economic obstacles.

In summary, while the communities exhibit strengths in cultural preservation, community involvement, biodiversity, and income diversity, there are challenges in areas such as food security, education access, infrastructure maintenance, and financial stability. These findings provide a foundation for targeted interventions and community development strategies to enhance overall livelihoods.

Commercial Level

- All the families identified in the study collect the forest subproducts (breu resin, jatoba fruits, tonka seeds, nuts, ipe roxo barks etc.) during the harvest season. None of the families interviewed sell their products directly to the market in the city of Urucará. The main buyer of these products is the cooperative Agrofrut, appearing as the main buyer, due to its access to national and international markets, and ability to create a market for these specific products.
- The collection of these products occurs in the family forest parcels, where the kinship group formed by grandparents, parents, siblings, children and grandchildren gather to perform the practice. Within the same kinship group, there are different family nuclei. Each family group has its regular places, the place where the trees are. For example: Mr. Roberto has 4 children, as his children grow to adulthood and start families, the area of trees is divided. It is common for relatives to get together to help collect products from other family groups and share the costs and profits of the harvest.

Religious Level

- The municipality of Urucará is a community steeped in rich cultural traditions and a vibrant religious life. The predominant religious affiliation in Urucará is Catholicism, with a significant part of the population regularly participating in Mass and other religious activities. The main Catholic church in Urucará, notable for its architectural beauty and historical significance, stands as a central hub for the town's religious gatherings and celebrations.
- In addition to the Catholic community, Urucará also has a substantial Protestant population. Various Protestant denominations have their presence in the town, each with its own church and congregation. These Protestant churches contribute significantly to the spiritual and communal life of Urucará, hosting regular services and community events.
- One of the most celebrated cultural events in Urucará is the "Festa do Divino Espírito Santo," held annually. This festival, dedicated to the Holy Spirit, is a fusion of religious devotion and cultural festivities, featuring religious processions, folk dances, and traditional music. The event typically occurs in the first week of June and is a time for the community to come together in a vibrant display of faith, culture, and tradition.
- The Festa do Divino is not only a spiritual celebration but also a reflection of the rich cultural tapestry of Urucará, showcasing the unique blend of Indigenous, Portuguese, and Afro-Brazilian influences that shape the local culture. The festival is a vivid example of how religious traditions in Urucará are interwoven with the broader cultural and historical context of the region, making it a vital and dynamic community in the heart of the Amazon.
- The municipality of Nhamundá is a vibrant community with a rich cultural and religious life. The predominant religion in Nhamundá is Catholicism, with the majority of the population attending

mass regularly at the main church located in the heart of the city. This church, known for its historic architecture and lively community gatherings, serves as a central point for religious activities and celebrations.

- In addition to Catholicism, there is a significant presence of Protestantism, with several churches scattered throughout the municipality. These churches also play an active role in the community, organising various events and social programs.
- One of the most significant cultural events in Nhamundá is the annual "Festa de São Pedro," held in late June. This festival, dedicated to Saint Peter, the patron saint of fishermen, is celebrated with a mix of religious ceremonies and secular festivities, including boat processions along the Nhamundá River, traditional music, dance, and a variety of local cuisine. This event not only reflects the religious devotion of the community but also highlights the importance of the river and fishing to the local economy and culture.
- Overall, the religious and cultural life in Nhamundá is a testament to the diverse and dynamic spirit of its people, blending traditional beliefs with contemporary practices to create a unique and vibrant community atmosphere.

Cultural Level

- No social leisure activities were identified in the territory, such as sports practices, other than religious celebrations.
- Nhamundá's cultural calendar is very diverse, starting in January with the city's anniversary, in May the Nhamundá Agricultural Exhibition (ExpoaNh), in June the festival of the city's patron saint, Santo Antônio, in August the festival of the patron saint, Nossa Senhora Assunção, in September the traditional Tucunaré Fishing Festival and in December New Year's Eve.[77]

Family Level

- The family groups that inhabit the igarapés are related to each other.

4.1.2.High Conservation Values (CM1.2)

The concept of High Conservation Values (HCVs) was developed by the Forest Stewardship Council[78] (FSC) for the certification of timber products from responsible forest management, according to principles, criteria, and standards that reconcile environmental and ecological safeguards with economic benefits and viability[79]. HCVF are forests of outstanding and critical importance due to their high environmental, socioeconomic, biodiversity or landscape values. HCVFs could therefore include, for example, slope forests in the European Alps protecting

[77] Conheça Nhamundá – Prefeitura de Nhamundá (nhamunda.am.gov.br)
[78] Home | Forest Stewardship Council (fsc.org)
[79] Obtenha a certificação | Forest Stewardship Council (fsc.org)

human settlements, the sacred burial grounds of a North American First Nation people, habitats of threatened orang-utans in Southeast Asia, or large landscape forests in Siberia[80]. The Tapera project is entirely within an area of high conservation value for the above mentioned community, directly related to three HCV criteria:

- HCV 4 - Ecosystem services: basic ecosystem services in critical situations, including protection of water catchments and control of erosion of vulnerable soils and slopes;
- HCV 5 - Community needs: key areas and resources to maintain the basic needs of local communities (subsistence, food, health, water, etc.);
- HCV 6 - Cultural values: areas of special cultural, archaeological or historical significance nationally and globally and/or of cultural, ecological, economic or religious/sacred importance to local communities.

Table 57. Identification of areas of high conservation value within the Tapera project.

High Conservation Value	• Dryland area where the trees, white breu, cumaru, and purple ipê trees of the riverside families are located (HCV 4; HCV 5); • Lakes and streams that flow between communities in the region (HCV 4; HCV 5); • Area of presence of animals for subsistence hunting (HCV 5); • Place for reproduction of the traditional way of life (HCV 6).
Qualifying Attribute	The entire area of the Tapera project being protected favours the extractive activities. The conservation also favours the increase of local fauna, used as an important food resource by the communities. These factors together favour the reproduction of the local populations' way of life.
Focal Area	Improved surveillance of property, remote monitoring of forest cover, monitoring and further studies of biodiversity, and activities to intensify community engagement with forest preservation and forest resources.

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

The forest area that the project aims to preserve would be vulnerable to gradual invasions for deforestation to sell land for cattle pasture, strongly affecting the local biome, an invasion that the stakeholders would not be able to prevent without the presence of the project. This would

[80] Conservation broch2.2.07.indd (panda.org)

increase municipal deforestation rates and affect the community's livelihood, generating impacts that would drive rural exodus.

Illegal hunting in the scenario without the project is estimated to continue on the rise, threatening the local biome and directly impacting the diet of communities, which will have fewer animals for subsistence, increasing the possibility of periods of famine during the seasons when hunting is the main source of food, a factor that will affect the local HDI, decreasing the quality of life by increasing food insecurity, making communities more dependent on canned food, causing direct impact on health and welfare, or even motivating communities to perform the rural exodus. It would also affect species that are considered Vulnerable, Endangered or Critically Endangered and that are endemic to the area. For the riverine communities we highlight the implementation of strategies aimed at improving the quality of life, which would not occur in the absence of the project, such as: implementation of a community photovoltaic system, implementation of a water collection and distribution system, implementation of residential bathrooms, internet supply system to improve communication, educational and health infrastructure and support to improve the commercialization of the nut.

In the absence of the project, mortality rates may be largely affected by dysentery, worm infections from drinking untreated water, keeping the quality of life in lower categories, with the constant risk of families suffering from infant mortality, a serious issue that requires great efforts to keep at the lowest possible margins. The communities in the area are affected, as seen in Section 2.1, by high levels of infant mortality. In addition, without the legal medical support that the project foresees, there will continue to be a greater chance of deaths among the extractive workers who are victims of work-related accidents, mainly due to snake bites.

Limited access to electricity limits the possibility of the communities to deal with most of the problems they experience. Without the possibility of having a refrigerator and freezer, the riverine dwellers live a more immediate routine in the search for food, making it impossible to stock food for consumption in periods of scarce fishing, hunting, and agriculture. The lack of constant energy also limits the use of machinery to access drinking water, being a problem of difficult solution without adequate equipment and energy necessary for consumption. Without the actions of the project it is estimated that this problem will persist, since there is no solution in sight for the near future. In addition, stable access to energy and internet will enable the realisation of online courses and school tutoring, improving educational indicators and bringing growth opportunities to young riverine people, a factor that does not present a scenario of improvement in the absence of the project. Due to the high cost of maintaining the activities that ensure the monitoring and security of the forest areas, it would be unfeasible for landowners to bear such costs and efforts in the long term and on a large scale, and it would not be possible to prevent unplanned deforestation and uncontrolled invasions. Thus, the scenario with the presence of the Tapera project will guarantee

the allocation of resources necessary for the conservation and protection of the project area, ensuring various benefits for the community and biodiversity in the region.

4.2. Net Positive Community Impacts

4.2.1.Expected Community Impacts (CM2.1)

The International Association for Impact Assessment (IAIA, 2003)175 defines social impacts, for the purposes of impact assessment, as changes to one or more of the following:

- People's livelihood – how they live, work, have fun and interact on a daily basis;
- Culture – your beliefs, customs, values and shared language or dialect;
- Community – its cohesion, stability, character, services and facilities;
- Their political systems – the extent to which people participate in decisions that affect their lives, the level of democratisation that is taking place and the resources made available for this;
- Environment – the quality of the air and water that people use; availability and quality of food they eat; the level of danger or risk, dust and noise to which they are exposed; the adequacy of sanitation, their physical security and their access to and control over resources;
- Health and well-being - health is a state of complete physical, mental, social and spiritual well-being and not merely the absence of disease or infirmity;
- Personal and property rights – particularly if people are economically affected or experience personal disadvantage which may include a violation of their civil liberties;
- Fears and aspirations – their perceptions about their safety, their fears about the future of their communities and their aspirations for their future and the future of their children.

The IAIA also defines social impact assessment as "*the processes of analysing, monitoring, and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked for these interventions. Its primary purpose is to create a more sustainable and equitable biophysical and human environment*"[81].

The impacts on communities presented below include benefits, costs, and risks, and are related to community, social, cultural, environmental, and psychological aspects. In addition to the observed impacts, consultations were held with community members seeking to capture their

[81] C:\IAIA\Pubs\SP2-2 page.PDF

perception of the possible positive and negative changes that the project will bring. The impact evaluation activities took place in conjunction with family meetings and public consultation with the community between November 29, 2023 and December 9, 2023. Regarding the positive impacts, it was emphasised that forest preservation is essential to sustain the reproduction of their way of life and the well-being of riverside communities. The maintenance of biodiversity favours extractivism, in addition to making hunting and fishing more abundant, besides helping to preserve a mild climate, improving the quality of life.

Table 58. Description of impacts of project activities foreseen for specific community groups.

Community Group	Extractivist families from the Maripá, Tapera, and Paratucu.
Impact(s)	• Improved household infrastructure with the deployment of household photovoltaic systems and internet access points; • Increased instantaneous communication between communities in emergencies, events, negotiations and integration of populations in cyber environments and distance education; • Improved health with access to safe drinking water promoted by the implementation of treated water collection and distribution systems and dry pit toilets; • New learning that adds value to the commercialised products and generates new income alternatives, providing more work opportunities and improvement in the families' income; • Strengthening of associationism and community management capacity; • Strengthening the inclusion of socially vulnerable groups in productive activities.
Type of Benefit /Cost/Risk	**Benefit:** these impacts are directly related to the project, expected to occur in the short, medium and long term, presenting benefits for the extractivists who will learn processing techniques, management and marketing of their business, with direct support from trained professionals. These activities will also help the riverside dwellers with their family agriculture. The social organisation will be favoured,

	creating a favourable environment for the generation of new businesses and the expansion of the activities carried out. **Cost:** no significant cost is expected from the community groups, only the time that the producers must invest in the development of the activities is considered a cost for the communities. **Risk:** The risk identified is related to deforestation that has invaded areas surrounding the project. There is the possibility of riparian and extractivist communities suffering threats from criminals for being part of the project and thus assisting the inspection teams in the areas.
Change in Well-being	Positive impact, indirect and of great magnitude.

4.2.2.Negative Community Impact Mitigation (CM2.2)

The Tapera project does not cause negative impacts on local communities and communication channels have been established to clarify doubts, receive suggestions, and receive complaints.

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

The viability of access to safe drinking water implies directly in the reduction of infant mortality rates from contaminated water consumption, and also affects the reduction of dysentery cases in all age groups. Improving the quality of life in these communities with accessible drinking water is an important step towards achieving more complex community goals. In addition, access to toilets with dry toilets will improve the basic sanitation of the communities, promoting a decrease in cases of worms and solitary worms, as well as providing decent housing conditions.

The implementation of solar panels, guaranteeing electric energy without charge, will have a considerably large impact on the well-being of the communities. This energy will bring the basis for a series of changes in the local routine and structure, giving access to the use of household appliances such as refrigerators, freezers, and fans, appliances of constant use that were unfeasible in a mode of using generators for only a few hours a day. The introduction of refrigerators and freezers in the livelihood of these communities will guarantee an advance in food preservation, giving the communities the possibility of storing food in a hygienic and safe way, reducing the immediate need for hunting or fishing to obtain protein for consumption, ensuring that

the communities have less need to consume perished food, increasing the quality of life and reducing cases of foodborne infections.

Internet access will ensure better daily communication between the riverside communities, with solar panels access can be throughout the day, unlike the restrictions that the energy generator has in the daily routine, this will ensure that the community can be more integrated into events, access to websites of government agencies for services and schedules, digital inclusion of communities the social networks in a solid way. It is expected that through the saving of resources such as oil and gasoline for generators, the communities will have a greater availability of these resources for mobility, making possible commuting that was previously unfeasible due to the limited use of gasoline and oil available. The energy autonomy, added to the internet access in the communities and the support in the educational restructuring in the territory, will present a considerable improvement in local education. These actions constitute the basic infrastructure needed to facilitate the education of the community, improving literacy, reducing the school dropout rate, and adjusting the age/grade. Education is also fundamental to staying in the territory, improving family ties and reducing the exodus to the urban environment, where living conditions tend to be of high social vulnerability. The courses for training in production processing, in the search for new commercial partnerships, and in the development of the brand itself, relying on marketing and building new commercial relationships, will cause an increase in the income of the producing families, from the appreciation of the product and the reduction of dependence on a single buyer. These actions together will generate increased income for riverside families, improving the quality of life, strengthening the association and the permanence in the territory.

4.2.4. High Conservation Values Protected (CM2.4)

The project's activities consist in the conversation of the forest used as an area for extraction of products by the communities of Urucará, Nhamundá and São Sebastião and will serve to maintain the reproduction of their way of life and improve the supply of ecosystem services, such as extraction of forest products, hunting, and fishing.

4.3. Other Stakeholder Impacts

4.3.1. Impacts on Other Stakeholders (CM3.1)

The development of the Tapera project is not expected to cause negative impacts on other stakeholders. It may cause positive impacts for other stakeholders. In this sense, the positive impact on the well-being of these other stakeholders will be related to the project's benefits activities. In order to share the positive impacts with all stakeholders, the project intends to:

- Benefit all stakeholders through forest conservation in the project are;
- Increase the commercialization of local extractivism products;
- Promote technical training not only for traditional communities, but also serve interested communities that live in the municipality headquarters and practice extractivism.

Although not anticipated to occur, negative impacts can be listed as:

- Conflict between the time dedicated to day-to-day activities and that available for conducting training and participating in the project;
- Failure in communication between the technical team and the community and, consequently, misunderstandings between the parties.

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

As mentioned, the Tapera project is not expected to cause negative impacts on other stakeholders. The negative impacts listed above are unlikely to occur. As a mitigating measure, the project proposes that the development of the project happens in a participative way, allowing the free exercise of the manifestations of the other stakeholders, as well as an efficient and permanent communication between the project developer and all the stakeholders.

4.3.3. Net Impacts on Other Stakeholders (CM3.3)

The Tapera project is not expected to negatively impact other stakeholders. As stated above, the project only intends to positively impact other stakeholders. By preserving the forest area used by extractivists and allowing access to local communities, the project will have positive impacts on communities and other stakeholders by encouraging traditional ways of life as well as their maintenance and strengthening. The project aims to serve all stakeholders and is intended to achieve the inclusion and well-being of the communities and other stakeholders.

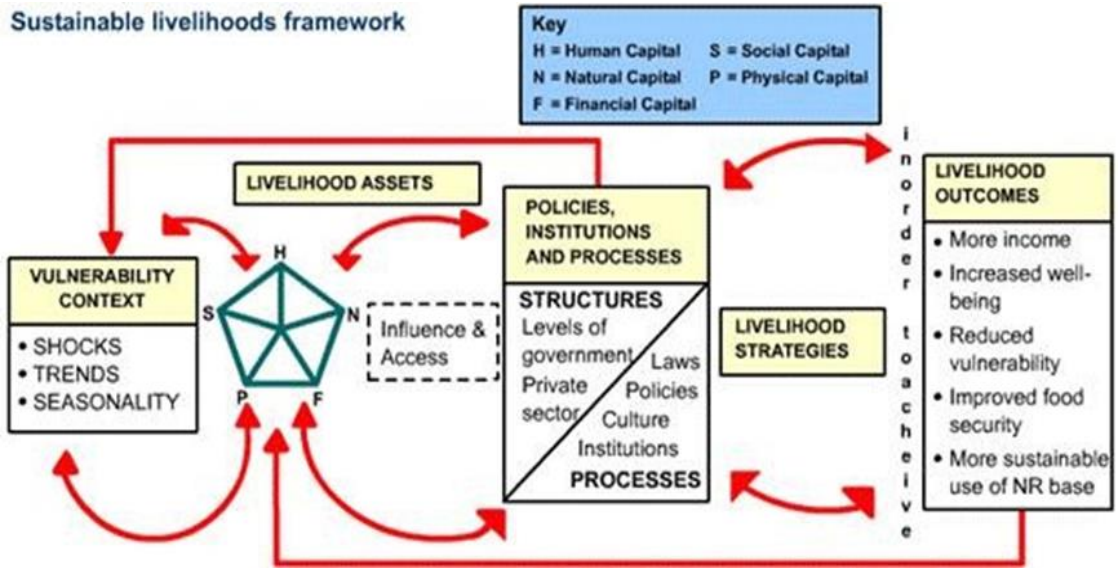
4.4. Community Impact Monitoring

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

The Sustainable Livelihoods (SLM) methodology adopted makes it possible to recognize the future aspirations for change of the community members in line with the forest conservation and protection measures. Because of its multidimensional aspect (human, social, environmental, physical, and financial), the baseline assessment allows the project to consider precisely that the fragile foundations are strengthened and the expected changes come with a structured tying together of these changing dimensions. This will occur from a governance that transversely considers the participation of communities in the process of deliberation of local projects and their

monitoring following the light of changes that are sustainable. Figure 63 presents the conditional processes between improvement in the dimensions of the MVS with access to and influence of policies, management, structure, and laws.

Figure 63. Processes for improvement in the MVS dimensions



An exogenous driver or factor can have an impact as a major force that strengthens, empowers, or disrupts and creates an unbalance on this tenuous web of interactions between what was available in their livelihoods and what they can make happen to improve access and/or strengthen that asset base. Carbon credit projects, to generate maximum positive impacts, must be chosen and recognized in their viability in accordance with the communities' way of life, either by ensuring or enhancing access to the assets of the five dimensions, while maintaining balance and respecting the dreams and goals of the collectivity. Since most extractivists and riverbank dwellers are from socioeconomically vulnerable social groups, the projects to strengthen their assets in the five dimensions should push individual, family, and community forces towards rebalancing and positive impacts, so that the intervention process of the projects does not cause an insurmountable corrosion of available livelihoods. It must then be avoided that riparian and extractivist people have their asset bases and their aspirations and strategies for the future damaged.

Considering the role of the company that designs and implements the carbon credit project as a guarantor to supply elements that strengthen and encourage livelihoods and human rights associated with them, the methodology and expected results of this study and analysis need to account for the complexity of the interaction of internal and external factors with indicators that consider measuring this complex tangle of assets, aspirations, dreams, interests that are

immaterial and material, so that the resident and user population of the carbon credit project areas knows how to promote their rights and livelihoods in order to positively achieve even greater strengthening of their assets for the autonomous and independent continuation of their family and community life.

As a starting option for the dialogue about the indicators for measuring the process and results of community carbon credit projects, with the description of the baseline and future monitoring, the methodology should cover its effects on the defence of rights, aspirations, needs and livelihoods of people, families and communities in the project territories that result from the investigation on the before and after each project prepared and executed by Orgânica Consultoria. This can be made possible, of course, through an in-depth dialogue between the parties that are interested in making the actions resulting from the projects a differential in terms of qualified information, effective social participation, and the achievement of community development aspirations.

In January 2021, Organica Consultoria prepared a comprehensive diagnosis as an initial step in discussing the indicators for measuring the processes and results of community carbon credit projects. This diagnosis included a detailed description of the baseline and future monitoring methodologies, emphasising the impact of these projects on the defence of rights, aspirations, needs, and livelihoods of individuals, families, and communities within the project territories. The analysis was based on extensive research comparing conditions before and after the implementation of each project. The goal of this initiative is to foster an in-depth dialogue among all stakeholders, ensuring that the outcomes of these projects contribute significantly to the provision of quality information, effective social participation, and the realisation of community development goals. This approach underscores the commitment to a participatory and rights-based framework in addressing environmental and social challenges.

Table 59. Dimensions, indicators, and corresponding averages stipulated from the application of the MVS questionnaires.

Types of assets/dimensions	Information to be obtained for baseline description (Indicators)
Human Dimension	H1 - Family food security
	H2 - Use and appreciation of traditional/local ecological knowledge
	H3 - Access to new knowledge

	H4 - Satisfaction and motivation with work and life in the territory
	H5 - Work safety
Social Dimension	S1 and S2 - Relationships with community members, partners and institutions
	S3 - Visibility and opportunity for young people
	S4 - Participation and appreciation of women in productive activities
	S5 - Access to public policies aimed at strengthening their ways of life
Environmental Dimension	A1 - Access to water for human and animal drinking
	A2 - Access to land suitable for the various traditional uses and their aspirations
	A3 - Conservation and use of the forest and wild fauna
Physical Dimension	P1 - Individual production
	P2 - Collective production infrastructure
	P3 and P4 - Individual/family infrastructure for housing, transport and well- being
Financial dimension	F1 - Income
	F2 - Price of products and working capital, when applicable
	F3 - Commercialization
	F4 - Access to lines of credit and other financial aid policies

Sustainable livelihoods help to reference important aspects of the integrality of the lifestyles and aspirations of people, families and communities living and/or using the territories of the carbon credit projects. Subsequently, it will be possible to elaborate the projects in partnership with the communities in a dialogical way through informed and enlightened participation, respecting

the autonomy and the way of seeing and living of each group in the territory. Clear and precise indicators will be adopted that can help measure the progress and results achieved each year, considering the positive impacts of the intended carbon credit project.

The evaluation will be done through the annual systematic application of the questionnaire based on the MVS, with a sample of up to 25% of the community members benefited, considering that the indicators measured in the baseline survey below the average 0.5 (from zero to one) should indicate a positive growth impact of 20% per year for the indicators of the human, social and physical dimensions, and 15% per year for the indicators of the financial dimension.

For indicators that in their baseline received an average score above 0.5, the expected improvement is that the score will rise in general for indicators in all these dimensions by 5% per year.

This metric is justified by the fact that the resource base of all five dimensions, with the exception of the natural dimension (have forest, hunting, fishing, ecosystem services that give them subsistence) were rated with an average score below 0.5, proving to be insufficient for a sustainable basis for their livelihoods and indicating that more rapid change is needed in order to ensure stability especially so that young people and women do not give up and become willing to emigrate.

In this case, reaching the median level of the component indicators of the MVS dimensions will create a more sustainable livelihood base, considering that programming from this level will be slower because it will depend on a series of factors outside the governance of the project, and will have greatly reduced the risk of the people of these communities giving up on being extractivists and forest stewards with the project.

4.4.2.Monitoring Plan Dissemination (CM4.3)

The indicator monitoring plan will be disclosed by email and in meetings with the communities. All results will be available for public consultation on the internet and summaries will be communicated to communities and other stakeholders through informative materials. The monitoring and verification results of this project will be published on the Verra platform. The process will be agreed with the communities in participatory workshops with the bulletin informing the progress of the project.

4.5. Optional Criterion: Exceptional Community Benefits

4.5.1.Exceptional Community Criteria (GL2.1)

As described in sections **2.1.8** Stakeholder Identification (G1.5) and **2.1.19** Permanence of Benefits (G1.11), 108 people living along the rivers Tapera, Maripa, and Paratucu Rivers around

the municipalities of Urucará and Nhamundá were identified as beneficiaries of the project. The project will have the communities as protagonists in the definition of socio-environmental programs and activities in the territories, enabling the extraction of non-timber products and access to projects for improving the production chain, associativism, and improving the quality of life.

As described in section 2.1.6 Social Parameters (G1.3), the riverine dwellers live in a region of social vulnerability, in which there are people below the poverty line, defined as individuals who live on less than R$ 499,00[82] per month.

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

As described in section **4.2.1** Expected Impacts for Communities (CM2.1), the project has activities that generate short and long term benefits for the communities. As short-term benefits, the communities will be benefited with direct jobs in the surveillance of the project area, in addition to training and courses aimed at strengthening the production chain, new income alternatives, associativism and female empowerment. In addition, structuring actions will be implemented to provide water security, basic sanitation, electricity, internet access, transportation, and education and health infrastructure. These actions together generate benefits that last from the medium to the long term.

The actions taken in the short term will generate the following benefits in the medium term: (i) Water Security; (ii) Basic Sanitation; (iii) Energy autonomy; (iv) Access to means of communication; (v) Reduced effort in household and income generation jobs; (vi) Educational development through access to remote classes and technology-mediated classroom instruction; (vii) Decreased school dropout and age-grade distortion; (viii) Learning in the use of new technologies and management techniques for agroforestry products; (ix) Increased capacity and speed in transporting production; (x) Added value to the marketed product; (xi) Decreased dependence on a single buyer, ensuring the sale of fairer prices; (xii) Adding value to associated products; (xiii) Increased income due to the construction of new business relationships, development of own brand and activities to promote products; (xiv) Resilience to crisis through diversification of production.

In the long term, the project tends to provide the following impacts: (i) decrease in the rate of water-borne diseases, such as diarrhoea, cholera and diseases caused by worms; (ii) decrease in women's workload in water collection and domestic activities; (iii) disseminate social technologies; (iv) increase permanence in the territory; (v) improve access to rights and citizenship; (vi) strengthen family autonomy; (vii) improve educational indices; (viii) strengthen associationism;

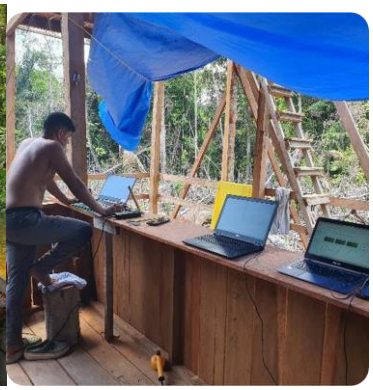
[82] Banco Mundial publica relatório sobre pobreza e equidade no Brasil | As Nações Unidas no Brasil

(ix) add value to the productive chain; (x) increase the value of carbon credits by increasing the socio-environmental value and bio-economy of the projects; (xi) strengthen the ways of life of traditional local communities and their economic and cultural reproduction; (xii) reduce rural exodus and urban marginalisation; (xiii) mitigate the risks of extreme climate events; (xiv) improve quality of life.

Figures 64.a, 64.b, 64.c, 64.d, 64.e, 64.f, 64.g. Implementation of the Project´s benefits





4.5.3.Community Participation Risks (GL2.3)

Regarding the risks associated with the participation of communities in the Tapera REDD+ project, as described in section 4.2.1 Expected Impacts for Communities (CM2.1), it was pointed out possible threats suffered by invaders of lands that are close to the project area. As pointed out in section 4.2.2 Mitigation of Negative Impacts on Communities (CM2.2), as a way to mitigate the possible risk of threats, it is proposed the creation of a channel for reporting possible threats, directly directed to a specialised team that will take the appropriate legal actions to safeguard the integrity of the community.

In relation to the risks associated with not carrying out the project, as described in section 4.1.4 Scenario Without the Project: Community (CM1.3), the project will ensure the allocation of resources necessary for the conservation and protection of the project area, ensuring various benefits for the community and biodiversity in the region. For the community, we highlight the implementation of strategies aimed at improving the quality of life of local communities, as described in the previous section. It is noteworthy that by preserving the forest area used for extractivism and subsistence and that is at imminent risk of deforestation, the project tends to provide the strengthening of the ways of life of local traditional communities and their economic production.

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

The project will guarantee the allocation of resources necessary for the conservation and protection of the project area, ensuring several benefits for the community and biodiversity in the region. For the community, we highlight the implementation of strategies aimed at improving the quality of life of local communities, as described in the previous section. It is noteworthy that by preserving the traditionally occupied area that is in imminent risk of deforestation, the project tends to provide the strengthening of the traditional local communities' ways of life and their socioeconomic production.

In the annual investment forecast meetings and in the semi-annual evaluation, the riverine community will have their participation not only encouraged, but also facilitated on the issue of transportation, so there is a growing trend of empowerment of this specific group regarding governance in the municipal region and in the Tapera REDD+ project. The initial way to manage the risks of these groups not receiving the benefits of the project in an equitable way was to design a participatory management of the project by including a representative of this sector in the Steering Committee, monitoring the actions and investments to ensure that the benefits are being distributed equitably.

4.5.5.Benefit Sharing Mechanisms (GL2.6)

The process of socio-economic diagnosis, public consultation, and communication with the extractivist in the territory occurred in an open and participatory manner with no distinction of sex or gender. In this sense, there was a concern on the part of the technical team to enable women's participation throughout the project development process. During the meetings, activities, and interviews, there was participation and influence of the women of the community on decision-making and on the development of the actions to be adopted in the territory.

To enable equal participation between men and women in the activities and benefits of the project, knowing that women's activities are more associated with housework and child-rearing, while men are more dedicated to activities outside the domestic environment, there should be an equal distribution of places for the training courses. Places for capacity building in social technologies will be designated and secured for women by establishing participatory quotas of 45% of the total number of places. To ensure female participation in the training, the presence of children will be welcomed.

As a way of ensuring gender equality and improving the quality of life of the riverine and extractivist women in the project, a support network for women who are victims of domestic violence and attempted femicide will be implemented in the communication channel. This channel will be a space where only women will work so that there will be a comfortable welcome for the victims, where they can express themselves and report abuses and aggressions. These reports will be received by a professional who will forward the necessary actions to the psychosocial support. The search for this action aims at the possibility of a space where these women can talk about issues that they cannot or have no interest in sharing with the closest person they trust, usually the husband or the father and mother, being a safe, accessible, and cost-free place for these women.

The project will seek, through training, to expand the possibility of creating a riverine women's association in the project areas, in order to enable a union among the women of the communities so that a space can be created to help each other with psychophysiological issues that occur in the communities, enabling a greater range of representation and community support among women, thus ensuring the exposure of problems hidden by the limitation of communication that these women currently have as their place of speech. The organisation of the activities and net impacts on the women are presented in the table below.

Table 60. Activities and Impacts directed towards women.

Activities	Impacts
Training courses with exclusive openings for women.	Increased scope of professional opportunities for riverside and extractivist women in the project.
Reporting channel on Whatsapp for reports of assaults and attempted feminicides.	Improved safety and decreased gender vulnerability suffered by the riverside and extractivist women in the project.
Immersion in associative structures to enable the creation of a women's association for women.	Expansion of safe spaces for riverine and extractivist women in the project, ensuring greater representation and debate towards their problems and challenges that are out of the question in traditional media today.

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

The Tapera REDD+ project is focused on training local multipliers, through the dissemination of knowledge and information about the project in all its phases, building efficient and assertive communication with the communities, and guaranteeing the maturity of the communities in the appropriation of the actions that involve their territory. Stakeholders want and need to be involved in the design, implementation, monitoring, and evaluation throughout the life of the project. As detailed in section 2.5.3 Free, Prior, and Informed Consent (G5.2), all stages of the project are carried out with participatory and propositional consultations, including pre-mobilization, mobilisation, execution, and publicising.

The public meetings of the project design had moments of clarification of the benefits, costs, and risks provided by the project, as presented in section 2.3.7 Stakeholder Consultations (G3.4). In addition, the periodic meetings to be held in the communities will also seek to reassess the benefits, costs, and risks. The public meeting is the legal and normative tool developed for the collective participation of the communities, in which they deliberate on their willingness to be involved, at what level this will take place, and what the expectations are in terms of benefits. For the definition and approval of the project's actions, public consultations were held by parent groups in the territory of the Tapera river, and a public hearing in the city of Urucará, the 7th of december 2023, in which, after explaining the project and clarifying all the doubts of the communities, their consent, support, and participation were received. The results of the public hearings can be seen in detail in section 2.3.7 Stakeholder Consultations (G3.4).

As detailed in section 2.3.8 Ongoing Consultation and Adaptive Management (G3.4), the project has developed a permanent channel of communication and consultation between the project proponents and the communities, and other stakeholders. Communication takes place instantaneously by email and/or messaging applications. Prior to each verification, communities and other stakeholders will be contacted and consulted to receive updates about project activities and results. Added to this transparency and communication factor is the presentation of the project monitoring results in periodic meetings with the communities, in addition to the availability of summarised information in the appropriate language and in public on the websites of Verra and of the proponent Orgânica Consultoria.

Based on the socio-economic diagnosis, the result of interviews and meetings held with the participating communities, with the objective of knowing the local reality and the expectations of the target audience, the main social demands and mitigating actions capable of promoting improvements in local infrastructure and quality of community life were identified.

As pointed out in section 2.1.11 Project Activities and Theory of Change regarding community infrastructure, the project will facilitate the transfer of social technologies, through a) acquisition and implementation of a family photovoltaic system; b) implementation of water collection and distribution systems with the use of filters for treatment; c) construction of toilets with dry septic tanks; d) implementation of internet access systems; e) acquisition of an equipped ambulance boat.

The communities involved will also benefit from training and courses directed to: a) strengthening the productive chain of native products, such as breu resin, jatoba fruits, tonka seeds, nuts, ipe roxo barks, and Amazon nut, adding value to the product and potentiating the capacity of community management; b) increasing the income of the extractivist families, strengthening associations; d) encouraging the training and engagement of young people and women in economic activities, increasing inclusion and strengthening vulnerable social groups. As a result, the project activity will have a positive impact by strengthening the autonomy of families, providing decent conditions for community infrastructure, ensuring better conditions for permanence in the territory, and developing new knowledge that provides the improvement of productive capacities.

During these meetings, all the benefits, costs, and risks were presented in the appropriate language to the communities participating in the project. In these meetings, the communities expressed their perspectives, conditions, and needs about participating in the project, thus influencing the project design and development process. As agreed in a meeting with the communities, the project's benefit sharing reaches all participating communities.

In regard to the Tapera REDD+ project's costs and funds, the process of generating carbon credits and the revenue from their sale will be made available in a transparent manner for access

via the project's website. The information about the process of generating carbon credits and the revenue from their sale will also be made available in meetings between the technical team and the communities.

4.5.7.Governance and Implementation Structures (GL2.8)

The public project design meetings had moments of clarification of the benefits, costs, and risks provided by the project, as presented in section 2.3.7 Stakeholder Consultations (G3.4). In addition, periodic meetings in the communities will seek to reassess the benefits, costs, and risks.

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

As detailed in section 2.4.1 Project Governance Structures (g4.1), the communities will participate in the project management through the communication channels developed and periodic meetings in the communities, respecting the right to Free, Prior and Informed Consultation.

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

The Tapera REDD+ project is designed to enhance the technical skills of community members significantly, incorporating social technologies tailored for the traditional families living along the Maripá, Tapera, and Paratucu rivers. This initiative focuses on improving the production chain, bolstering community associations, and facilitating the economic integration of vulnerable groups. The training and educational programs offered will concentrate on several key areas: a) augmenting the value and management efficiency of Amazonian forest subproducts, thereby enhancing the production chain; b) boosting the earnings of families engaged in extractive activities and reinforcing the role of associations; c) promoting the involvement and training of youth and women in economic ventures, thus increasing their inclusion and fortifying the position of socially vulnerable groups. Ultimately, this project aims to empower local families by fostering their independence, securing their continued presence in their native territories, and imparting new skills that will elevate their productive capabilities.

5. BIODIVERSITY

5.1. Without-Project Biodiversity Scenario

5.1.1. Existing Conditions (B1.1)

The Amazon is renowned for its immense biodiversity, offering vital ecosystem services crucial for sustaining climate, managing water and biogeochemical cycles, storing carbon, and preserving various species. It is believed that the Amazon is home to approximately 10% of the planet's biodiversity, including both endangered and unique species.

The Amazon's significance for biodiversity is attributed to its vast expanse, encompassing a multitude of environments and housing a plethora of both land and water habitats. This diversity leads to a rich assortment of plant and animal life, with an estimated 45,000 plant and vertebrate species identified in the Amazon area.

The project's location, situated in the Uatumã and Jatapu River basins, is notable for its significant natural ecosystems and biological diversity. However, research on the fauna in this area is still in its early stages, suggesting a lack of comprehensive understanding of its biodiversity. To assess the potential fauna and flora of the region, we utilised secondary data from studies conducted by the Management Plans of nearby Conservation Units, specifically the RDS Uatumã and the APA Nhamundá and performed on ground research.

Given the scarcity of direct data for the project area, we plan to initiate primary data collection at the start of the project and continue throughout its duration through environmental monitoring. This will help us gain a deeper insight into the unique biodiversity of the project area. The initial assessments for the fauna and flora are detailed below.

Fauna

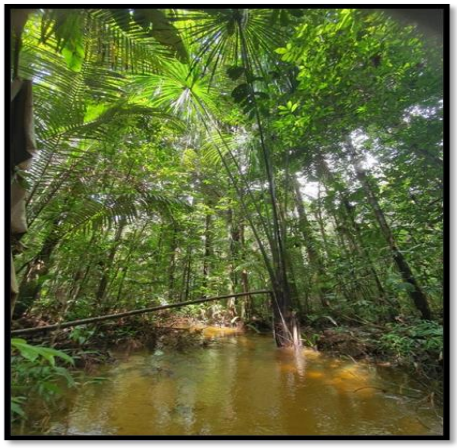
The Amazon fauna has a very large diversity of species; however, many areas of the Amazon region do not have a more specific catalogue of the species living in certain locations. The fauna report catalogued vertebrate and invertebrate species existing in the forest area of the Tapera region, located 52.56 km from the municipality of Urucará-AM.

The cataloguing of species will be specifically focused on the groups of Arthropoda, Herpetofauna, Avifauna and Mastofauna, with the following specific objectives: characterising the diversity of fauna in the Tapera region; identify the species of the groups mentioned above that exist in the region; and generate data on the existing fauna in the Tapera region.

Arthropoda, Herpetofauna, Avifauna and Mastofauna.

Fauna and flora must be discussed separately, as flora is the place where the species' natural habitat occurs and where they can exercise their ecological niche. Due to the wide variety of trees in the Tapera region and because it is considered a closed forest area, the number of different species present in the region is high.

Figures 65a., 65.b, 65.c, 65.d. Jungle Tapera Project Forest

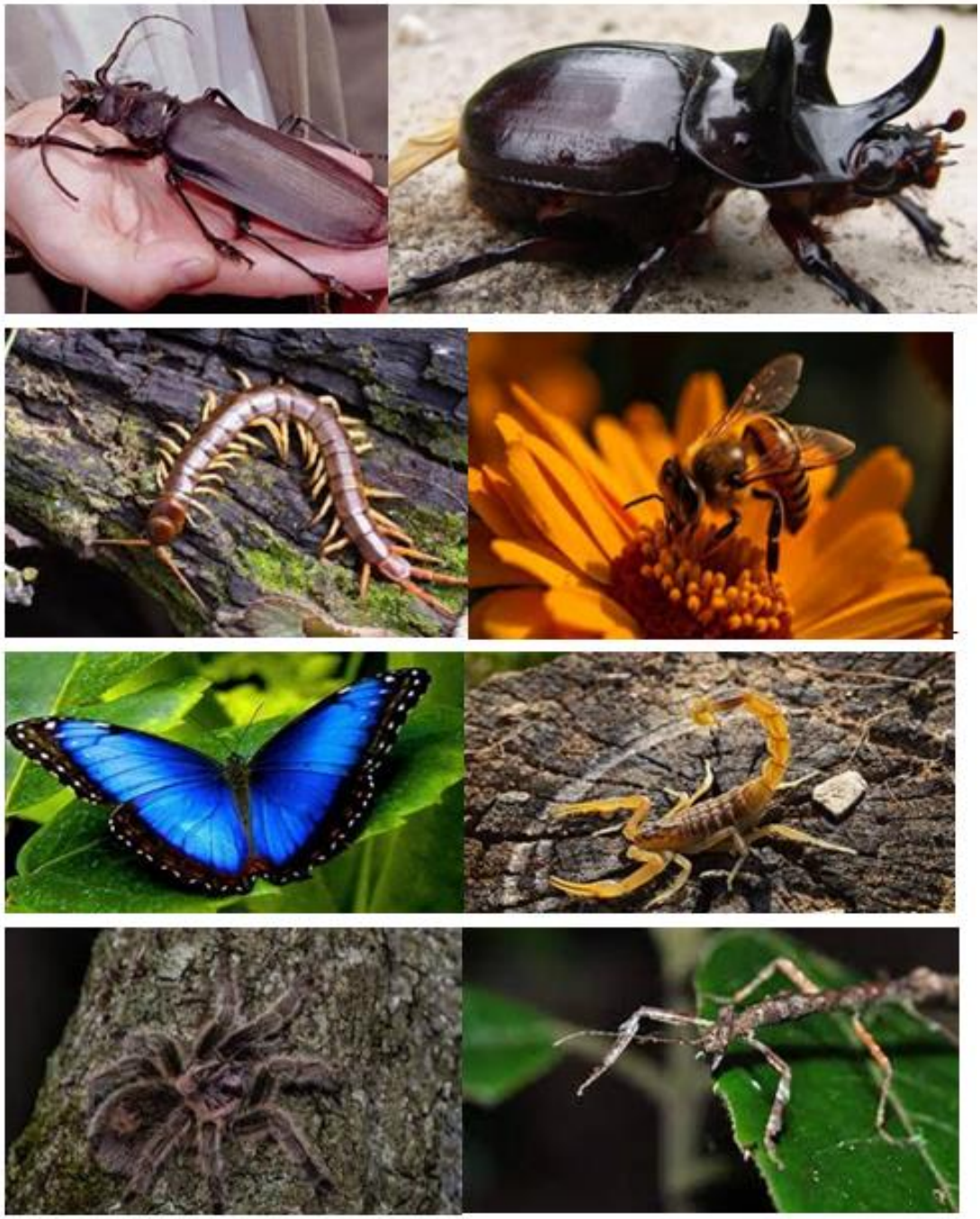





ii) Arthropoda

Arthropods (Phylum Arthropoda) are invertebrate animals that have great evolutionary success, with it being estimated that there are around one billion billion different species (10^{18}) living on the planet (SANTOS, 2023). The species of this phylum have an extremely high reproductive capacity, having great biological success in terms of reproduction. Arthropods are divided into five groups: arachnids, insects, crustaceans, chilopods and diplopods. Each group has distinct characteristics and important functions for biodiversity, being present in different types of food chains, and in the Amazon, the incidence of these different types of arthropods is very rich, especially insects.

Figure 66: Arthropods



iii) Herpetofauna

Herpetofauna is a branch of Zoology that studies the order of amphibians and reptiles. Brazil is considered the country with the greatest wealth of Herpetofauna species. At least 1026 species of amphibians are known (988 Anurans, 5 Caudatas and 33 Gymnophiona) and 773 species of reptiles (731 Squamata – 73 Amphisbaenas, 266 lizards and 392 Snakes; 36 Testudines and 6 Crocodylia), according to data from the Brazilian Society of Herpetofauna – SBH (SEGALLA et. al., 2014; COSTA & BÉRNILS, 2015).

Figure 67: Amphibians and Reptiles



iv) Avifauna

It comprises the group of birds from a given region. This group has a wide variety of species. In the Amazon, the local bird fauna has some of the species considered endemic to the region. Birdlife is present in greater quantities in environments where there are trees and natural environments (PEREIRA et al., 2009).

Figure 68: Variety of species of birds



v) **Mastofauna**

Group that comprises mammals, which can be small, medium and large. The Amazon is the biome with the greatest wealth of small, medium and large mammals in Brazil, housing approximately 60% of the species that occur in the country. Around 400 species of mammals occur in the Amazon, and approximately 57% of these are endemic (Paglia et al. 2012). The richness of the Amazon flora means that the Mastofauna group can perform its ecological functions within the food chain without difficulty.

Figure 68: Variety of species of mammals



Data collection and processing

Arthropoda

The cataloguing of the species of the Phylum Arthropoda was carried out through an active search at the research site. The active search occurred seasonally: July to August 2022 (summer) and October to December 2023 (winter). Captures occurred during the day, from 8 am to 3 pm, through photographic records, traps that were set up in the forest with the aim of capturing species present in the location. The

diverse types of traps used for collection were puçá, suspended net, interception and fall traps (sampling method) and pitfall.

Figure 69: Arthropod Traps. Image A – suspended hammock; Image B – trap for Coleopetera; Image C – Puça; Image D – Pitfall trap.



In table 53 below, the species found during the fauna survey of the arthropod species found at the research site are catalogued.

Table 61: Species found in the region - Arthropoda

TABLE 01 – SPECIES FOUND IN THE REGION – ARTHROPODA						
Common name	**Family**	**Genus**	**Scientific Name**	**VU[83]**	**EAM[84]**	**Amount**
Besouro Hércules	Dynastidae	Dynastes	Dynastes hercules			155
Besouro-rola-bosta	Scarabaeidae	Digitonthophagus	Digitonthophagus gazella			78
Besouro-serra-pau	Cerambycidae	Macrodontia	Macrodontia cervicornis			32
Gafanhoto	Romaleidae	Tropidacris	Tropidacris grandis			76
Louva-Deus	Mantidae	Mantis	Mantis religiosa			34
Bicho-pau	Phasmatidae	Cladomorphus	Cladomorphus phyllinum			23
Cigarra	Cicadidae	Cicada	Cicada orni			09
Grilo	Gryllidae	Acheta	Acheta domesticus			23
Borboleta azul	**Nymphalidae**	**Morpho**	**Morpho didius**	**X**		**56**
Mutucão	Tabanidae	Chrysops	Chrysops relictus			56
Tucandeira	Formicidae	Paraponera	Paraponera clavata			33

Herpetofauna

Reptiles and amphibians were recorded mainly through 2 sampling methods: Active Search and Auditory Transects (CAMPBELL; CHRISTMAN, 1982). The active search took place for both types of species during the day, from 8 am to 4 pm. For the amphibian group, auditory transects were specifically used, which consists of locating species through their vocalisation.

[83] VU: Vulnerability, at risk of extinction
[84] EAM: Endemic to Amazonas

Figure 70. Image A – interception trap; Image B - Phyllobates lugubris



Table 62. Species found in the region - Herpetofauna

TABLE 02 – SPECIES FOUND IN THE REGION – HERPETOFAUNA						
Popular Name	**Family**	**Genus**	**Scientific Name**	**VU[85]**	**EAM[86]**	**Amount**
Jabuti	**Testudinidae**	**Chelonoidis**	**Chelonoidis denticulata**		**X**	**27**
Cobra coral	Elapidae	Micrurus	Micrurus corallinus			25
Surucucu-pico-de-jaca	**Viperidae**	**Lachesis**	**Lachesis muta**		**X**	**18**
Jararaca	Viperidae	Bothrops	Bothrops jararaca			08
Cascavel	Viperidae	Crotalus	Crotalus durissus			03
Sapo cururu	Bufonidae	Rhinella	Rhinella diptycha			45
Sapo	Hemiphractidae	Hemiphractus	Hemiphractus scutatus			56
Perereca	Dendrobatidae	Phyllobates	Phyllobates lugubris			40
Rã	Hylidae	Osteocephalus	Osteocephalus castaneicola			14

[85] VU: Vulnerability, at risk of extinction
[86] EAM: Endemic to Amazonas

Cobra-cega	Amphisbaenidae	Amphisbaena	Amphisbaena alba			08
Osga	Gekkonidae	Hemidactylus	Hemidactylus frenatus			09

Avifauna

For the Avifauna group, three methods were used: active search, auditory transects and the suspended interception net. Active searches and auditory transects took place through photographic records during the day, from 8 am to 3 pm. The same net was used to capture bats during the night to collect data on this mammalian species.

Figure 71. a) Image A and B – suspended mica line net, trap for bird and mammal fauna.



Table 63. Species found in the Project region - Avifauna

Species found in the region - Avifauna						
Popular Name	**Family**	**Genus**	**Scientific Name**	**VU**	**EAM**	**Amount**
Gavião real	**Accipitridae**	**Harpia**	**Harpia harpyja**	**X**	**X**	
Jacu Penélope	Cracidae	Penelope	Penelope jacquacu			12
Jacu-de-spix	Cracidae	Penelope	Penelope jacquacu jacquacu			21
Jacu-estalo	Cuculidae	Neomorphus	Neomorphus geoffroyi	X		

Mutum	Cracidae	Pauxi	Pauxi tuberosa			08
Tucano-toco	Ramphastidae	Ramphastos	Ramphastos toco			09
Bem-ti-vi	Tyrannidae	Pitangus	Pitangus sulphuratus			18
Arara vermelha	Psittacidae	Ara	Ara chloropterus		X	08
Arara azul	Psittacidae	Anodorhynchus	Anodorhynchus hyacinthinus			
Arara juba	Psittacidae	Guaruba	Guaruba guarouba	X		
Uirapuru	Troglodytidae	Cyphorhinus	Cyphorhinus aradus	X		02
Coruja (Caburé-da-amazônia)	Strigidae	Glaucidium	Glaucidium hardyi		X	05
Gavião Carcará	Falconidae	Caracara	Caracara plantus			07
Gavião-pedrês	Accipitridae	Buteo	Buteo nitidus			10
Pica-pau	Picidae	Campephilus	Campephilus rubricollis			08

Mastofauna

The methods used to obtain information on the Mastofauna were the use of traps, as well as the interception and fall net, active search, road sampling, which consists of travelling trails looking for species that are moving along it and by vocalisation.

Table 64. Species found in the Project region - Mastofauna

Species found in the region - Mastofauna						
Popular Name	**Family**	**Genus**	**Scientific Name**	**VU**	**EAM**	**Quant.**
Tatu-canastra	Dasypodidae	Priodontes	Priodontes maximus	X		03
Onça-pintada	Felidae	Panthera	Panthera onca	X	X	
Gato maracajá	Felidae	Leopardus	Leopardus wiedii	X		
Anta	Tapiridae	Tapirus	Tapirus terrestris		X	10
Tatu	Dasypodidae	Dasypus	Dasypus novemcinctus			20
Veado	Cervidae	Mazama	Mazama americana			15

Macaco-prego	Cebidae	Cebus	Cebus apella robustus	X		20
Brown howler monkey	Atelidae	Alouatta	Alouatta guariba			25
Macaco-aranha-de-cara-branca	Atelidae	Ateles	Ateles marginatus	X	X	09
Mucura	Didelphidae	Didelphis	Didelphis marsupialis			25
Tamanduá-bandeira	Myrmecophagidae	Myrmecophaga	Myrmecophaga tridactyla	X		08
Morcego	Phyllostomidae	Desmodus	Desmodus rotundus			10
Paca	Cuniculidae	Cuniculos	Cuniculus Paca			16
Cutia	Dasyproctidae	Dacyprócta	Dasyprocta Aguti			28
Porco-queixada	Tayaçúideos	Tayassu	Tayassu Pecari			10
Macaco sauim-de-coleira	Cebidae	Seguinus	Saguinus Bicolor	X		58

Arthropods were found in abundance in the region. Its importance is mainly due to being one of the main pollinator groups, contributing significantly to the maintenance and recovery of biodiversity. As it is a broadleaf forest, the region presents a continuous flowering of different tree species, contributing significantly to the food chain of which these species are part.

For the Herpetofauna group, in general, results were obtained that pointed to the occurrence of species commonly recorded in the state of Amazonas, and some species present high abundance. Even so, it is essential to maintain vegetation where different species of amphibians and reptiles can use as a passage, feeding and reproduction area.

In the Avifauna group, it is important to highlight the presence of migratory birds, which have adapted to the conditions of the region. The Tapera forest has conditions such as food, water, and a canopy over 25 metres high that makes access difficult for birds in terms of animal trafficking. At the Itaúba Property, traces of the presence of *Harpya harpyja* - an endangered species - and Hyacinth Macaw were recorded.

In relation to Mastofauna, the Tapera forest presents full conditions for the establishment of the species. One of the factors is the distance between the Tapera region and the urban area of the municipality of Urucará. Therefore, it is essential that the remaining vegetation are preserved and that they present conditions, especially those that require large areas, as well as the jaguar that during the visitation period was not seen, however, traces of its presence were found in various points in that locality.

At this first moment, it is important to highlight that this data collection regarding the wild fauna of the Tapera REDD+ Project area is not completed as it consists of an area of difficult access and due to climatic reasons and the great diversity existing in the region, new expeditions for more detailed information.

However, since then, serious measures and actions must be taken to maintain existing ecological processes, connecting the main protected areas and the remnants of native vegetation, adding and respecting the cultural preservation of the human population that lives around the project.

Flora

The forest formation in the Tapera project area is all Ombrophylous Forest: Lowland Dense Ombrophylous Forest (100%), as presented in section **2.1.5**.

The Lowland Dense Ombrophylous Forest is a formation that occurs at altitudes ranging from 5 to 100m, and is composed of more widely spaced trees, with a low-density shrub stratum and characterised by phanerophytes and woody lianas[1]. The characterization of the flora in the region was conducted using secondary data obtained from the IBAT - Integrated Biodiversity Assessment Tool database[1]. About 98 (morphological) tree species were recorded^{202}, distributed among 271 genera and 15 botanical families: Burseraceae: 1 species; Sapotaceae: 1 species; Lecythidaceae: 3 species; Annonaceae: 1 species; Acanthaceae: 1 species; Ehretiaceae: 1 species; Chrysobalanaceae: 1 species; Lauraceae: 1 species; Fabaceae: 2 species; Myristicaceae: 1 species; Bignoniaceae: 1 species; Moraceae: 1 species; Araliaceae: 1 species; Rubiaceae: 1 species and Cupressaceae: 1 species. The following species are endemic to the Amazon:

- Protium heptaphyllum (Breu) is native to the Amazon.
- Pouteria caimito (Abiurana) is found in the Amazon basin.
- Eschweilera parviflora (Matamatá) is part of the Lecythidaceae family, which includes many species endemic to the Amazon.
- Bocageopsis multiflora (Envira Preta/Envira Vermelha) is often found in the Amazon.
- Inga sp. (Ingá) includes species widespread in the Amazon rainforest.
- Virola surinamensis (Virola) is known to occur in the Amazonian regions.
- Euterpe oleracea (related to Ripeira) is endemic to the Amazon and is known as Açaí.

Table 65. Vegetation according to inventory 1 per species

Species	Common Name	Family	VU/EN	Qty, per species
Protium heptaphyllum	Breu	Burseraceae		435
Pouteria caimito	Abiurana	Sapotaceae		370
Eschweilera parviflora	Matamatá	Lecythidaceae		290
Bocageopsis multiflora	Envira Preta/Envira Vermelha	Annonaceae		210
Trichanthera gigantea	Canela de Garça	Acanthaceae		174
Cordia trichotoma	Louro Amarelo	Ehretiaceae		153
Licania floribunda	Caraipé	Chrysobalanaceae		138
Ocotea nigrescens	Louro-PStraight	Lauraceae		130
Inga sp.	**Ingá**	**Fabaceae**	**EN**	**119**
Virola surinamensis	**Virola**	**Myristicaceae**	**VU**	**88**
Euterpe edulis	**Ripeira**	**Arecaceae**	**VU**	**82**
Eschweilera atropetiolata	Castanharana	Lecythidaceae		79
Zygia racemosum	Angelim Bordado	Fabaceae		79
Maquira sclerophylla	Muiratinga	Moraceae		69
Parinarium barbatum	Macucu	Rosaceae		66
Myrtus spp.	Murta	Myrtaciae		59
Swietenia macrophylla King	**Mara-mara**	**Meliaceae**	**VU**	**57**
Talisia esculenta	Pitomba	Pitomba		54
Minquartia guianensis	Acariquara	Olacaceae		53
Himatanthus sucuuba	Sucuúba	Apocynaceae		52
Gibasis pellucida	Noira	Apocynaceae		51
Cinchona	Quina-quina	Rubiaceae		48
Cecropia pachystachya	Embaúba	Urticaceae		42

Species	Common Name	Family	VU/EN	Qty, per species
Chrysophyllum oppositum	Caramuri	Sapotaceae		42
Socratea exorrhiza	Louro Paxiúba	Arecaceae		41
Laurus nobilis	Louro Cheiroso	Rosaceae		40
Pseudopiptadenia psilostachya	Faveira-Folha-Fina	Leguminosae		40
Xylopia frutescens Aub	Envira Branca	Annonaceae		38
Inga paraensis	Ingarana	Fabaceae		35
Aniba canelilla	Preciosa	Lauraceae		34
Parinari montana	Uxirana	Chrysobalanaceae		33
Psidium guajava	Goiabeira	Myrtacea		33
Bastardiopsis densiflora	Louro Gamela	Malvaceae		32
Protium apiculatum	Breu Vermelho	Burseraceae		29
Bactris gasipae	Tata Punha	Arecaceae		27
Buchenavia capitata	Tanibuca	Combretaceae		27
Goupia glabra	Cupiúba	Goupiaceae		27
Andira parviflora	Sucupira Vermelha	Fabaceae		26
Aspidosperma polyneuron	Pau Caboclo	Apocynaceae		26
Alibertia edulis	Puruí	Rubiaceae		25
Ceiba pentandra	Saiuda	Malvaceae		25
Dimorphandra macrostachya	Paracuúba	Leguminosae		25
Dipteryx odorata	Cumaru	Fabaceae		25
Dialium guianense	Jutaí	Caesalpiniaceae		24
Hymenolobium petraeum	Angelim Pedra	Leguminosae		24
Anadenanthera macrocarpa	Gipi	Fabaceae		23
Herrania mariae	Cacaurana	Esterculiáceas		21
Plinia cauliflora	Jaboticaba	Myrtacea		21

Species	Common Name	Family	VU/EN	Qty, per species
Simarouba amara	Marupa	Simaroubaceae		21
Cryptocarya minima	Louro Abacate	Lauraceae		20
Endopleura uchi	Uxi Liso	Humiriaceae		17
Mouriri ulei	Socoró	Melastomataceae		17
Iryanthera grandis	Arurá Vermelho	Myristicaceae		16
Vismia brasiliensis	Lacre	Hypericaceae		16
Lithraea molleoides	Bugreiro	Anacardiaceae		15
Astronium lecointei	Muiracatiara	Anacardiaceae		14
Mezilaurus itauba	**Itaúba**	**Lauraceae**	**VU**	**14**
Couma macrocarpa	Sorva	Apocynaceae		13
Caryocar glabrum	Piquiarana	Caryocaraceae		12
Anacardium excelsum	Cajuaçu	Anacardiaceae		11
Annonaceae guatteria	**Envira**	**Annonaceae**	**EN**	**11**
Aspidosperma desmanthum Benth	Araracanga	Apocynaceae		11
Lecythis lurida	Jarana	Lecythidaceae		11
Maytenus guianensis	Xixuá	Celastracea		11
Scheelea phalerata	Bacuri	Arecaceae		11
Schizolobium amazonicum	Paricá	Fabaceae		11
Bowdichia virgilioides	Sucupira Amarela	Fabaceae		10
Couratari guianensis	Tauari branco	Lecythidaceae		10
Handroanthus albus	Ipê Amarelo	Bignoniaceae		10
Tachia guianensis Aubl	Caferana	Gentianaceae		10
Brosimum potabile	Amapazeiro	Moraceae		9
Didymopanax angustissimum	Morototo	Araliaceae		9
Ocotea rubra	Louro Vermelho	Lauraceae		9

Species	Common Name	Family	VU/EN	Qty, per species
Onychopetalum periquino	Envira Vermelha	Annonaceae		9
Plathymenia foliolosa	Amarelinho	Fabaceae		9
Annona neoinsignis	Cortiça	Annonaceae		8
Clarisia racemosa	Guariúba	Moraceae		8
Couratari spp	Tauari	Lecythidaceae		8
Manilkara bidentata	Balata	Sapotaceae		8
Vitex montevidensis	Tarumã	Lauraceae		8
Osteophloeum platyspermum	Arura Branco	Myristicaceae		7
Bowdichia racemosa	Sucupira Preta	Leguminosae		6
Coussapoa asperifolia	Caimbé	Cecropiaceae		6
Crataeva benthami	Catauari	caparidaceae		6
Hymenaea courbaril	Jatobá	Fabaceae		6
Ocotea barcellensis	Louro Mamuri	Lauraceae		6
Morus	Amora	Moraceae		5
Protium icicariba	**Breu PStraight**	**Burseraceae**	**EN**	**5**
Theobroma subincanum	Cupui	Fabaceae		5
Byrsonima crassifolia	Muruci	Malpighiacea		4
Copaifera guianensis	Copaiba	Fabaceae		4
Handroanthus avellanedae	Ipe roxo	Bignoniaceae		4
Hevea brasiliensis	Seringueira	Euphorbiaceae		4
Rapanea ferruginea	Pororoca	Myrsinaceae		4
Trattinnickia burserifolia	Breu Sucuruba	Burseraceae		4
Bellucia dichotoma Cogn	Muuba	Melastomataceae		3
Brosimum rubescens	Pau Rainha	Moraceae		3
Calophyllum brasiliense	Muruci	Malpighiacea		3
Erisma uncinatum	Cedrinho	Vochysiaceae		3

Species	Common Name	Family	VU/EN	Qty, per species
Eugenia myrciantes	Laranjinha	Myrtaceae		3
Ormosia paraensis	Tento	Cyperaceae		3
Parkia paraensis	Arara-tucupi	Leguminosae		3
Platymiscium Duckei Huber.	Miraúba	Malvaceae		3
Protium heptaphyllum March	Breu	Burseraceae		3
Sclerolobium paniculatum	Tachi Branco	Fabaceae		3
Sterculia Pruriens	Tacacazeiro	Esterculiáceas		3
Carapa guianensis	Andirobinha	Meliaceae		2
Cariniana micrantha	Tauari Vermelho	Lecythidaceae		2
Copernicia prunifera	Copaiba	Fabaceae		2
Dinizia excelsa Ducke	Angelim vermelho	Leguminosae		2
Lecythis pisonis	Castanha Sapucai	Lecythidaceae		2
Ocotea glomerata	Abacatão	Lauraceae		2
Poecilanthe parviflor	Coraci	Fabaceae		2
Spondias mombin	Taperebarana	Anacardiaceae		2
Vatairea sp.	Angelim fava	Leguminosae		2
Aspidosperma nitidum Benth	Carapanaúba	Apocynaceae		1
Bertholletia excelsa	**Castanha do Am**	**Lecythidaceae**	**VU**	**1**
Calycophyllum spruceanum Benth	Mulateira	Rubiaceae		1
Calycophyllum spruceanum Benth.)	Mulateiro	Rubiaceae		1
Cinchona spp.	Quina	Rubiaceae		1
Ficus trigona L.f.	Apui Parazita	Moraceae		1
Joannesia princeps	Pelo de Cutia	Euphorbiaceae		1
Manilkara guberi	Maçaranduba	Sapotaceae		1

Species	Common Name	Family	VU/EN	Qty, per species
Mauritia flexuosa	Diguia	Arecaceae		1
Pachira aquatica Aubl	Mungubeira	Malvaceae		1
Peltogyne spp.	Roxinho	Fabaceae		1
Sacoglottis guianensis	Uxi Torrado	Humiriaceae		1
Siparuna guianensis Aubl	Capitiu	Sapotaceae		1
Solanum corymbiflorum (Sendtn.)	Maniva de viado	Solanaceae		1
Thuja Occidentalis	Davida	Cupressaceae		1

The analysis of this forest inventory reveals several key points about the species distribution and diversity in the area:

Species Richness and Diversity: The inventory lists a total of 98 different species, indicating a high level of biodiversity. This diversity is vital for the ecological health of the forest, as it supports various wildlife and contributes to the stability and resilience of the ecosystem.

Dominance of Certain Species: The most abundant species, Protium heptaphyllum (Breu), constitutes 10.46% of the total, suggesting that this species is particularly well-adapted to the local conditions. Other dominant species include Pouteria caimito (Abiurana) and Eschweilera parviflora (Matamatá), each making up 8.89% and 6.97% of the forest, respectively. These dominant species can greatly influence the forest's structure and the availability of resources for other species.

Family Representation: The inventory includes a wide range of families, with significant representation from Burseraceae, Sapotaceae, Lecythidaceae, Annonaceae, and Acanthaceae. This variety in families indicates a healthy ecosystem with a variety of functional roles played by different plants.

Potential for Sustainable Use: Some of these species may have economic value, such as fruit-bearing trees or timber-yielding species. Sustainable management practices could be developed to harness these resources without compromising the forest's ecological balance.

Indicator of Environmental Health: The presence and health of these species can be indicators of the overall health of the forest ecosystem. Changes in their population sizes or health could signal changes in the environment, which might require investigation or intervention.

In conclusion, this forest inventory reflects a rich and diverse ecosystem with a mix of dominant and rare species. It highlights the importance of continued monitoring and management to maintain biodiversity and ecological balance, and it also presents opportunities for sustainable use and conservation initiatives.

Table 66: Vegetation according to inventory 2 per species

Species	Common Name	Family	VU/EN	Qty. per species
Protium heptaphyllum	Breu	Burseraceae		488
Bellucia dichotoma	Tintarana	Melastomataceae		354
Pouteria caimito	Abiurana	Sapotaceae		304
Myrsine guianensis	Pororoca	Primulaceae		209
Ocotea sp.	Louro	Lauraceae	VU	193
Herrania mariae	Cacaurana	Malvaceae		180
Virola surinamensis	Virola	Myristicaceae	VU	166
Andira parviflora	Sucupira Vermelha	Fabaceae		148
Scheelea phalerata	Bacuri	Arecaceae		115
Endopleura uchi	Uxi	Humiriaceae		99
Gustavia augusta	Murrão	Lecythidaceae		88
Bocageopsis multiflora	Envira Preta/Envira Vermelha	Annonaceae		87
Euterpe edulis	Ripeira	Arecaceae	VU	86
Rapanea Ferruginea	Pororoca	Myrsinaceae		80
Ocotea canaliculata	Louro Pimenta	Lauraceae		74
Vantanea parviflora	Uxirana	Humiriaceae		72
Lecythis pisonis	Castanharana/Castanha Sapucaia	Lecythidaceae		72
Coussapoa asperifolia	Caimbé	Urticaceae		71
Simarouba amara	Marupá	Simaroubaceae		61
Dipteryx odorata	Cumarú	Fabaceae		61
Dialium guianense	Jutaí	Caesalpiniaceae		60
Minquartia guianensis	Quariquara	Coulaceae		59
Attalea maripa	Najazeiro	Arecaceae		57

Species	Common Name	Family	VU/EN	Qty. per species
Aspidosperma discolor	Carapanaúba	Apocynaceae		57
Psidium longipetiolatum	Araça Vermelho	Myrtaceae		55
Hymenolobium sp.	Angelim	Fabaceae		52
Aniba burchellii	Louro Rosa	Lauraceae		51
Licania octandra	Caripé	Chrysobalanaceae		50
Tachigali glauca	Taxizeiro	Caesalpiniaceae		45
Ocotea tabacifolia	**Louro Abacate**	**Lauraceae**	**EN**	**40**
Bertholletia excelsa	**Castanheira**	**Lecythidaceae**	**VU**	**40**
Sorbus domestica	Soveira	Rosaceae		36
Brosimum rubescens	Murapiranga	Moraceae		35
Caryocar villosum	Pequiá	Caryocaraceae		33
Mezilaurus itauba	**Itaúba**	**Lauraceae**	**VU**	**33**
Bowdichia nitida	Sucupira	Fabaceae		32
Plathymenia foliolosa	Amarelinho	Fabaceae		32
Inga paraensis	Ingarana	Fabaceae		31
Annonaceae guatteria	**Envira**	**Annonaceae**	**EN**	**29**
Psidium sp.	Araça	Myrtaceae		27
Cinchonopsis amazonica	Quina	Rubiaceae		24
Talisia esculenta	Pitombeira	Sapindaceae		23
Pouteria guianensis	Abiu	Sapotaceae		21
Ormosia paraensis	Tento	Fabaceae		19
Artocarpus heterophyllus	Jaqueira	Moraceae		19
Nectandra grandiflora	Caneleira	Lauraceae		19
Oenocarpus mapora	Bacabeira	Arecaceae		19

Species	Common Name	Family	VU/EN	Qty. per species
Brosimum potabile	Amapá	Moraceae		19
Myrtus spp.	Murta	Myrtaciae		18
Carapa guianensis	Andiroba	Meliaceae		18
Mora paraensis	Paracaúba	Fabaceae		15
Vismia brasiliensis	Lacre	Hypericaceae		15
Rinorea flavescens	Canela de Garça	Violaceae		14
Didymopanax angustissimum	Morototó	Araliaceae		13
Maytenus guianensis	Chichuá	Celastraceae		13
Osteophloeum platyspermum	Arurá	Myristicaceae		12
Parkia multijuga	Arareira	Fabaceae		12
Himatanthus sucuuba	Sucubeira	Apocynaceae		11
Byrsonima crassifolia	Murici	Malpighiaceae		11
Swietenia macrophylla	**Maramara**	**Meliaceae**	**VU**	**11**
Astronium lecointei	Maracatiara	Anacardiaceae		11
Sacoglottis verrucosa	Uxi Coroa	Humiriaceae		10
Vitex montevidensis	Tarumã	Lauraceae		10
Manilkara huberi	Maçaranduba	Sapotaceae		10
Ocotea nigrescens	Louro Preto	Lauraceae		10
Inga sp.	**Ingá**	**Fabaceae**	**EN**	**10**
Anacardium giganteum	Cajuaçu	Anacardiaceae		10
Mouriri guianensis	Socoró	Melastomataceae		9
Trema micrantha	Piriquiteira	Cannabaceae		9
Clarisia racemosa	Guariúba	Moraceae		9
Alibertia edulis	Puruí	Rubiaceae		7
Cedrela odorata	**Cedro**	**Meliaceae**	**VU**	**7**

Species	Common Name	Family	VU/EN	Qty. per species
Virola duckei	Ucuubeira	Myristicaceae		6
Couratari oblongifolia	Tauarí	Lecythidaceae		4
Ceiba pendrata	Saiúda	Malvaceae		4
Aniba canelilla	Preciosa	Lauraceae		4
Aniba parviflora	Louro Gamela	Lauraceae		4
Cecropia pachystachya	Imbaúba	Urticaceae		4
Goupia glabra	Cupiúba	Goupiaceae		4
Copaifera multijuga	Copaíba	Caesalpiniaceae		4
Zygia racemosa	Angelim Bordado	Fabaceae		4
Pera glabrata	Sapateiro	Euphorbiaceae		3
Handroanthus serratifolius	Pau d'arco	Bignoniaceae		3
Hymenaea courbaril	Jatobá	Fabaceae		3
Amburana acreana	**Amburana**	**Fabaceae**	**VU**	**3**
Caraipa densifolia	Tamaquaré	Calophyllaceae		2
Bowdichia racemosa	Sucupira Preta	Leguminosae		2
Swartzia recurva	Muirajibóia	Fabaceae		2
Citrus aurantium	Laranjinha	Rutaceae		2
Cecropia sp.	Imbaúba	Urticaceae		2
Parkia sp.	Farveira	Fabaceae		2
Xylopia frutescens Aub	Envira Branca	Annonaceae		2
Parkia decussata	Arara-Tucupi	Fabaceae		2
Persea americana	Abacateira	Lauraceae		2
Croton Urucarana	Urucurana	Euphorbiaceae		1
Tachigali paraensis	Taxirana	Fabaceae		1
Bagassa guianensis	Tatajuba	Moraceae		1
Geissospermum sericeum	Quinarana	Apocinaceae		1

Species	Common Name	Family	VU/EN	Qty. per species
Joannesia princeps	Pelo de Cútia	Euphorbiaceae		1
Cynometra bauhiniifolia	Jutairana	Fabaceae		1
Astrocaryum jauari	Jauari	Lauraceae		1
Theobroma grandiflorum	Cupuaçu	Sterculiaceae		1

The analysis of this second forest inventory highlights several notable aspects of the species composition and diversity in this forest area:

Species Richness and Diversity: This inventory lists a total of 96 different species, indicating a high biodiversity similar to the first inventory. Such diversity is crucial for ecosystem health, supporting various wildlife and contributing to ecological resilience and stability.

Dominant Species: Protium heptaphyllum (Breu) remains the most abundant species, comprising 10.08% of the total, slightly less than in the first inventory. This consistency suggests that this species is very well-adapted to the local conditions. Other dominant species include Bellucia dichotoma (Tintarana) and Pouteria caimito (Abiurana), which represent significant portions of the forest, indicating their ecological importance.

Changes in Species Representation: Compared to the first inventory, there are shifts in the representation of certain species. For instance, Myrsine guianensis (Pororoca) and Ocotea sp. (Louro) have become more prevalent, suggesting changes in the forest dynamics or environmental conditions.

Family Diversity: The inventory includes a wide range of families, with significant representation from Burseraceae, Melastomataceae, Sapotaceae, Primulaceae, and Lauraceae. This variety suggests a healthy ecosystem with diverse functional roles played by different plant families.

Conservation Implications: The presence of both common and rare species underlines the need for comprehensive conservation strategies. Protecting the less represented species is as important as managing the dominant ones to maintain the forest's biodiversity.

Sustainable Use Potential: Some of these species may have economic or medicinal value. Sustainable management could be crucial for utilising these resources while ensuring the ecological balance is maintained.

Indicator of Environmental Health and Changes: The presence and abundance of certain species can indicate the overall health of the forest and changes in environmental conditions. For instance, an increase or decrease in specific species could signal alterations in the ecosystem that might require further study or intervention.

In conclusion, this second forest inventory depicts a rich and diverse ecosystem, similar to the first, with a mixture of dominant and rare species. The data highlights the importance of continuous monitoring, adaptive management, and conservation efforts to preserve the biodiversity and ecological balance of the forest. It also underscores the potential for sustainable use of forest resources, provided that it is done in a way that does not compromise the forest's health and diversity.

The Tapera Project area is home to an array of vulnerable and endangered flora and fauna species, each playing a crucial role in the ecological balance of the region. Among the fauna, species such as *Chelonoidis denticulata, Harpia harpyja, Priodontes maximus, Tapirus terrestres, Alouatta guariba, Myrmecophaga tridactyla, Tayassu Pecari, Guaruba guarouba, Neomorphus geoffroyi, Ateles marginatus, Cebus apella robustus*, and *Trichechus inunguis* are all classified as Vulnerable (VU), with *Ateles marginatus* and *Cebus apella robustus* additionally noted as Endangered (EN). These species range from the majestic harpy eagle to the distinctive giant anteater, each contributing uniquely to the region's biodiversity.

In terms of flora, the reserve is home to several species classified as Vulnerable or Endangered, including *Inga sp*.,*Virola surinamensis*, *Euterpe edulis*, *Swietenia macrophylla*, *Mezilaurus itauba*, *Annonaceae guatteria, Protium icicariba,* and *Bertholletia excelsa*. These plants are not only ecologically significant but also hold immense value for their medicinal properties and as vital components of the local ecosystems.

The existence of these species, many of which are endemic to the area, underscores the importance of conservation efforts. Protecting these species is crucial for maintaining the ecological balance and ensuring the continued health and diversity of the region's ecosystems. Their Vulnerable and Endangered statuses serve as a reminder of the fragility of nature and the responsibility to safeguard these irreplaceable treasures for future generations.

Table 67. List of trees families endemic to the Brazilian territory and their respective endemism in the Amazon.

Family	Scientific Name	Popular Name	Endemism in the Amazon
Fabaceae	*Mora paraensis*	-	Endemic
Fabaceae	*Schizolobium parahyba var. amazonicum*	Angico	Endemic
Fabaceae	*Vatairea heteroptera*	Angelim	Non-endemic
Fabaceae	*Zollernia paraensis*	Pracauba, Pracuúba, Jenipapinho	Non-endemic
Lauraceae	*Aniba canelilla*	precious bark	Non-endemic
Lecythidaceae	*Eschweilera ovata*	-	Non-endemic
Malvaceae	*Quararibea amazonica*	-	Endemic
Moraceae	*Castilla ulei*	Caucho rubber	Endemic
Moraceae	*Naucleopsis jamariensis*		Endemic
Myrtaceae	*Myrcia aliena*		Endemic
Nyctaginaceae	*Guapira venosa*		Non-endemic
Phytolaccaceae	*Gallesia integrifolia*	Pau-alho	Non-endemic
Piperaceae	*Piper hispidinervum*	long-pepper	Non-endemic
Rubiaceae	*Duroia hirsutissima*	-	Endemic
Rubiaceae	*Psychotria carthagenensis*	Amyruca	Non-endemic

Siparunaceae	*Siparuna glycycarpa*	-	Non-endemic
Violaceae	*Rinorea longistipulata*	Canela-de-Velho	Endemic
Vochysiaceae	*Erisma bracteosum*	-	Endemic

In the secondary survey, a total of 13 tree species threatened with extinction were registered according to the official lists, three of which are exclusive to the IUCN international list[87], one to the national list of the Ministry of the Environment (MMA), and eight species present in both lists (Table 60). Among the threatened species, two are endemic to the Amazon phytogeographic domain, namely: *Annonaceae guatteria* and *Virola surinamensis*.

Table 68. List of threatened species in the Tapera project region (VU = Vulnerable, EN = Endangered).

Family	Scientific Name	Popular Name	Threat Category
Annonaceae	*Annonaceae guatteria*		VU (IUCN, 2018)
Bignoniaceae	*Handroanthus serratifolius*	Yellow lapacho	EN (IUCN, 2020)
Fabaceae	*Amburana acreana*	cerejeira	VU (IUCN, 1998; MMA, 2022)
Lauraceae	*Mezilaurus itauba*	Itaúba	VU (IUCN, 1998; MMA, 2022)
Lecythidaceae	*Bertholletia excelsa*	Brazil nut	VU (IUCN, 1998; MMA, 2022)
Meliaceae	*Cedrela odorata*	Spanish cedar	VU (IUCN, 2017; MMA, 2022)
Meliaceae	*Swietenia macrophylla*	Mahogany	VU (IUCN, 1998; MMA, 2022)
Myristicaceae	*Virola surinamensis*	Baboonwood, Ucuuba, Ucuhuba	EN (IUCN, 1998); VU (MMA, 2022)

[87] IUCN Red List of Threatened Species

Most of the threatened species listed above are timber species of high commercial value that have been suffering from strong extractive pressure along with a continuing decline in the extent and quality of their habitat. The table below shows the main uses of each species:

Table 69. Main uses of threatened species in the Tapera project region.

Scientific Name	Popular Name	Uses
Amburana acreana	cerejeira	Noble wood used in the manufacture of luxury furniture.
Annona calcarata	Biribá	Rare species threatened mainly due to the loss of its natural habitat. No information on its use was found.
Bertholletia excelsa	Brazil nut	Wood used for light internal construction (floors and walls); Seeds exploited for industrial purposes (cosmetics manufacturing) and food.
Cedrela odorata	Cedro	Wood is widely used in civil construction, in the furniture industry and in the production of essential oils due to its unique and highly beneficial aroma for health. [4]
Handroanthus capitatus	Ipê	Wood widely used in civil construction and considered one of the most valuable in the market.
Handroanthus serratifolius	Yellow lapacho	Excellent quality wood for furniture production.
Mezilaurus itauba	Itaúba	Resistant and highly durable wood, being the main raw material for the construction of medium and large vessels; It is also used for external constructions (bridges, posts and piles), in civil construction (beams, slats, boards), in the manufacture of furniture and in the manufacture of, for example, train wagons, barrels and casks.
Sarcaulus vestitus		Specific information about its use was not found. Logging is considered its main threat.[5]

Swietenia macrophylla	Mahogany	One of the most commercialised mahogany species, being valuable and widely exploited in Brazil. [1]
Virola surinamensis	Baboonwood, Ucuuba	A highly exploited wood, considered the second most economically important wood in the Amazon basin region; It presents other resources exploited by pharmaceutical industries to produce cosmetics and pharmaceutical products.

The use of non-timber resources is widespread in the region. The most extracted products are oils, gums, latex, resin, roots, leaves, bark, straw, stem, and fruit, and they have as main uses: food, construction, household utensils, medicinal, crafts, religious worship (e.g. preparation of the "Ayahuasca" for Santo Daime cults) and as hunting blind for their consumption and commercialization. According to the secondary data, 10 tree species were identified as being of great use and importance for the communities in the region, and which present potential for sustainable use and income generation. According to the data collected by the socio-environmental team, it was identified that the local communities near the project area conduct the exploitation of breu resin, copaiba oil, tonka beans, nuts, but also for sustainable practices such as subsistence fishing and hunting.

Species of commercial interest

Several species listed in the inventories have commercial interest, either for their timber, fruit, medicinal properties, or other uses. Here are some notable ones:

Table 70: Species of commercial interest

Name	Commercial use
Protium heptaphyllum (Breu)	Known for its resin, which has various medicinal and industrial applications
Pouteria caimito (Abiurana)	Valued for its wood and also its edible fruit.

Name	Commercial use
Virola surinamensis (Virola)	The wood of this tree is commercially valuable. Additionally, it has ethnobotanical uses
Euterpe edulis (Ripeira)	Known as the source of the heart of palm, a popular food item. It's also a source of açaí berries.
Dipteryx odorata (Cumaru)	Known for producing tonka beans, which are used in perfumes and as a vanilla substitute. The wood is also valuable.
Swietenia macrophylla (Mara-mara)	A species of mahogany, highly valued for its wood.
Bertholletia excelsa (Castanheira)	Known for Brazil nuts, which are economically significant.
Carapa guianensis (Andiroba)	The seeds are used to produce andiroba oil, which has medicinal properties. Its wood is also commercially valuable.
Cedrela odorata (Cedro)	Known for its aromatic wood, used in furniture and cigar boxes.
Hevea brasiliensis (Seringueira)	The primary source of natural rubber.
Ocotea sp. (Louro)	Some species in this genus are valued for their timber.
Aniba canelilla (Preciosa)	Known for its essential oil, used in perfumery.

Name	Commercial use
Hymenaea courbaril (Jatobá)	The wood is highly prized for construction and furniture making.
Manilkara bidentata (Balata)	Known for its hard, durable wood and balata gum, similar to gutta-percha.
Copaifera spp. (Copaiba)	The resin (copaiba oil) is used medicinally and in cosmetics.
Aspidosperma polyneuron (Pau Caboclo)	Valued for its wood.
Theobroma subincanum (Cupui) and Theobroma grandiflorum (Cupuaçu)	Relatives of the cacao tree, known for their fruit, used in food products
Couratari spp. (Tauari)	The wood is used in construction and furniture.

These species are of commercial interest due to their diverse applications in various industries, including timber, food, medicine, and cosmetics. However, it's important to note that the exploitation of these species must be done sustainably to ensure their conservation and the ecological balance of the forests.

Protected and Priority Areas for Conservation

The Urucará municipality includes a portion of the 938,720 ha Uatuma Biological Reserve, which was established in 2002 to protect the biological diversity of the dense rainforest ecosystem in the basin of the Uatumã River and Jatapu River. Forest ecosystems in Urucará municipality currently suffer rapid levels of planned and illegal deforestation driven by increasing demand for timber globally, expansion of agriculture and cattle ranching, and poor enforcement of forest protection laws.

In addition to the protected areas, there are also areas considered priority for the Conservation and Protection of biodiversity close to the project area, varying in level of biological importance and priority of action (high, very high and extremely high), according to the Ministry of the Environment (MMA) (Figure 42). The Priority Areas for conservation, established by Ordinance Nº 5.092/2004[1], are considered a public policy instrument that aims to help in the decision making process, in an objective and participative manner, besides supporting the planning and implementation of actions for the conservation of Brazilian biodiversity[2].

The Tapera project area, according to MMA (2018), is located close to an area of "High" relevance for the conservation and protection of biodiversity (AMZ-838) and two other areas of "Extremely High" relevance (AMZ-363 and AMZ-011) (Figure 42). As the project is located in the region with the highest rates of deforestation in the Amazon (Arc of Deforestation)[3], the implementation of the project in this region is extremely important for the conservation of biodiversity.

5.1.2. High Conservation Values (B1.2)

According to the survey of secondary data in the region, the High Conservation Values - HCV were defined, according to the HCV Resource Network guide. The table below presents information on the high conservation values related to biodiversity in the project region.

Table 71. High Conservation Value (HCV) related to Flora biodiversity within the Tapera project zone.

High Conservation Value	HCV 1 - Endemic and threatened Flora species
Qualification Attribute	In the project region, endemic flora species to Brazil and to Amazon were recorded, as well as species threatened with extinction at the international level according to the International Union for Conservation (IUCN) and at the national level according to the Ministry of Environment (MMA). According to the data survey, 9 species are considered threated: Vulnerable (VU): *Inga sp.; Virola surinamensis; Euterpe edulis; Swietenia macrophylla (Mahogany); Mezilaurus itauba; Protium icicariba; Bertholletia excelsa (Brazil Nut).* Endangered (EN): *Annonaceae guatteria; Virola surinamensis* Endemic Species

	The species Protium heptaphyllum (Breu) and Pouteria caimito (Abiurana) stand out, as they are restricted to the Amazon Domain in the Brazilian territory and are threatened with extinction.
Focus area	In project areas where potentially threatened species populations occur.

Table 72. High Conservation Value (HCV) related to Flora biodiversity within the Tapera project zone.

High Conservation Value	HCV 1- Endemic and threatened fauna species
Qualification Attribute	Several threatened and endemic fauna species were recorded in the region. Regarding the threatened status of species, 14 threatened species were identified, considering the IUCN classification : Vulnerable (VU): *Chelonoidis denticulate; Harpia harpyja (Harpy Eagle); Priodontes maximus (Giant Armadillo); Tapirus terrestris (South American Tapir); Alouatta guariba (Brown Howler Monkey); Myrmecophaga tridactyla (Giant Anteater); Tayassu pecari (White-lipped Peccary); Guaruba guarouba (Golden Parakeet); Neomorphus geoffroyi; Trichechus inunguis (Amazonian Manatee)* Endangered (EN): *Ateles marginatus (White-cheeked Spider Monkey) and And Cebus apella robustus.* Many of the listed species, such as the Harpy Eagle, the Amazonian Manatee and Golden Parakeet, are endemic to the Amazon region, playing unique roles in its ecosystem.
Focus area	In all project areas.

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

The municipalities of Urucará and Nhamundá are located in the Amazon region, where there has been a significant expansion of the agricultural frontier within the state. The main access road, Urucará to São Sebastião, is flanked by deforested land, as well as the banks of the main rivers (Tapera, Maripá, Paratucu). Since the roads facilitate the opening of new frontiers, leading to disorderly occupation, increased deforestation, and subsequent socio environmental impacts.

Deforestation in the municipalities of Urucará and Nhamundá, located in the state of Amazonas, can be attributed to several factors. In the Project Area, key drivers of deforestation include legal conversion of

forests, illegal logging, timber harvesting, and land clearance for agricultural expansion. As previously discussed in this document, deforestation has escalated in recent years in the municipality of Urucará, particularly along the Urucará – São Sebastião road. This surge is primarily linked to a significant concentration of timber industries in São Sebastiao, specialising in clandestine wood sourced from the Urucará municipality via road access.

According to the history of land use and occupation in the region, the scenario without the Tapera project, which comprises 24 private properties, tends to be the replacement of areas of native vegetation by areas of pasture, in compliance with the provisions of Law 12.651/12[233], where the owner has the right to deforest about 20% of his area, as shown in section **2.5.**

In the absence of the project, the region faces the imminent threats of deforestation and degradation, posing severe impacts on biodiversity. The resulting fragmentation and loss of habitat could lead to the displacement and decline of species, particularly those with limited mobility and specialised characteristics. This, in turn, may result in the population decrease or even extinction of critically important species for conservation, such as endemic Amazon species or those at risk of extinction.

Against this backdrop, the implementation of the REDD+ project becomes crucial for forest conservation. The project involves monitoring activities within a region historically prone to increased deforestation and acknowledged for its biological importance. By conserving the area, the project ensures the preservation of continuous forest environments, facilitating gene flow among species and providing essential ecosystem services to local communities.

5.2. Net Positive Biodiversity Impacts

5.2.1. Expected Biodiversity Changes (B2.1)

Table 73. Expected changes in biodiversity resulting from Tapera project activities.

Biodiversity Element	Vegetation
Estimated Change	Reducing deforestation and conserving habitats
Change Justification	The Tapera project aims to prevent deforestation and forest degradation, protecting a vegetation area of great biological importance. The factors that will contribute to change refer to forest conservation, periodic remote monitoring, and improvement of heritage surveillance in the area during project activities.

Biodiversity Element	Fauna and Flora
Estimated Change	Conservation and maintenance of biodiversity
Change Justification	The conservation of the project area will ensure the maintenance of local forest benefits, avoiding the loss of species (fauna and flora) and habitats in the region, and maintaining the connectivity between the environments. The factors that will contribute to change are related to the conservation of the area, monitoring and deepening the knowledge of biodiversity in the project area, environmental education actions with local communities aimed at raising awareness and engagement in the conservation of local fauna and flora.

5.2.2.Mitigation Measures (B2.3)

The Tapera project aims to preserve the forest cover in the project area, contributing to the maintenance or improvement of HCV attributes (Table 52) and to the conservation of biodiversity in the region. For that, it is necessary to improve the knowledge of the structure and composition of the communities, mainly of the threatened and endemic species recorded in the region, and this will be accomplished through the monitoring of the fauna and flora groups in the project area.

In addition, to ensure the conservation of biodiversity, measures such as enhanced surveillance in the area to prevent invasions, deforestation, and illegal practices that harm flora and fauna will be taken, along with regular monitoring of forest cover through satellite imagery to detect any changes in land use in the area.

As the project advances, knowledge of the structure of the faunal and floristic communities will be deepened and additional measures can be proposed to safeguard the conservation of biodiversity.

Table 74. Measures for the maintenance and improvement of the HCV attributes identified in the Tapera project area.

HCVs	Maintenance and Improvement Measures
HCV 1 - Protected, priority and key biodiversity areas (KBAs)	- Improvement of heritage surveillance in the area; - Remote monitoring of the area; - Periodic monitoring of fauna and flora; - Engagement and awareness of local communities; - Scientific understanding of the biodiversity in the project area.
HCV 1 - Endemic and threatened Flora species	
HCV 1 - Endemic and threatened species of fauna	

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

The implementation of the Tapera project foresees the conservation of a 55.192,77 ha area of Amazon rainforests of great biological importance, resulting in positive impacts on the biodiversity of the region.

Such impacts are attributed to several factors, such as the reduction of deforestation and habitat degradation, biodiversity monitoring, improvement of heritage surveillance in the area, and the engagement and awareness of local communities.

The protection of the area allows the maintenance of local forest benefits, maintaining vegetation cover and the structure and composition of biodiversity. The implementation of the project, in addition to conserving biodiversity, will allow a greater knowledge about the local fauna and flora based on surveys carried out in the scope of the planned environmental monitoring, ensuring a better scientific knowledge of the region. Furthermore, the conservation of the area favours the maintenance of continuous forest environments, ensuring the maintenance of the gene flow of the species.

As presented in section **5.1.3**, the region where the project is located has a history of land use and occupation change, with a high rate of deforestation and degradation. In the absence of the project, the area would probably be deforested, considering the owner's right to clear about 20% of the area, causing several negative impacts on biodiversity due to fragmentation and loss of habitats and, thus, species. The proposed project activities would not be developed, which demonstrates that the scenario with the project guarantees net positive impacts for biodiversity compared to not implementing the project in the region.

5.2.4. High Conservation Values Protected (B2.4)

As presented in section **5.1.2,** the project area has high conservation values related to HCV 1 - Species Diversity. The proposed project activities aim to maintain and conserve biodiversity, ensuring the protection of 55.192,77 ha, not negatively affecting any of the identified HCVs.

5.2.5. Species Used (B2.5)

Not applicable. No new species, other than those native to the area, will be used within the scope of the Tapera project.

5.2.6. Invasive Species (B2.5)

Not applicable. The Tapera project will not introduce or increase the population of invasive species in the area affected by the project.

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

Not applicable. No invasive species will be introduced within the scope of the Tapera project.

5.2.8. GMO Exclusion (B2.7)

Not applicable. The Tapera project guarantees that no GMOs will be used for the purpose of generating reductions or removals of GHG emissions within the scope of the project.

5.2.9. Inputs Justification (B2.8)

Not applicable. No fertilisers, chemical pesticides, biological control agents, or other inputs will be used in the Tapera project.

5.2.10. Waste Products (B2.9)

The Tapera project activities have no intention of generating solid waste in the area. However, if any generation of waste is required in the project area, the criteria for classifying solid waste will be followed in terms of their potential risks to the environment and human

5.3. Offsite Biodiversity Impacts

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

Negative impacts outside the Tapera project zone will not be considered. The biodiversity conservation activities within the scope of the project does not foresee any actions that cause a negative impact on the

ecosystem, both within the project area and outside the project zone. Therefore, the implementation of mitigation actions will not be necessary.

5.3.2. Net Offsite Biodiversity Benefits (B3.3)

As mentioned in the section above, the Tapera project does not foresee negative impacts of its activities on biodiversity outside the project zone. Therefore, a comparative analysis between the unmitigated negative impacts outside the project zone and the positive impacts within the project zone will not be necessary.

5.4. Biodiversity Impact Monitoring

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

The monitoring of biodiversity is an important tool for the evaluation and follow-up of the project's activities, providing relevant information about the structure and composition of the fauna and flora communities during its implementation.

For flora monitoring, the characterization of tree vegetation will be carried out through forest inventory using permanent plots of 0.25 ha (20 x 125 m). The number of plots will be defined after field recognition of the project area and the allocation of the plots will be based on the physical and environmental characteristics of the area, which will be defined through satellite analysis and validated in the field. At each plot, all tree individuals with a diameter at breast height (DBH) greater than or equal to 10 cm will be tagged, measured, and identified to species level, when possible, by a botanical expert. At each monitoring campaign, the plots will be revisited and the tree individuals sampled again. If there are recruits (i.e. individuals that were not present at the first sampling but reached the minimum DBH in the following campaign), they will be included in the sampling (tagged, measured and identified). In addition, remote monitoring of the area will be carried out annually using satellite images to assess the conservation status of the project area, more specifically, if there have been changes in forest cover.

For fauna, the Herpetofauna, Mammalian fauna and Avifauna groups will be monitored utilizing non-interventional methods. In order to obtain species records, linear transects will be carried out in the project area, where data will be collected through direct and indirect records in two periods of the day (morning and afternoon).

The survey of herpetofauna (amphibians and reptiles) in the transects will be performed through the Visual Active Search method, which involves walking slowly through visually accessible microhabitats with a higher probability of finding the animals. Additionally, the Active Search method will be used in reproductive sites, and opportunistic encounters will be recorded.

The mammalian fauna will be surveyed and monitored using the Active Search method along the transects to record animals in motion and their traces, such as footprints, faeces, burrows, vocalisations,

hair, carcasses, and nail marks. Furthermore, trap cameras (photographic traps) will be fixed at sampling points defined in the field to record medium and large animals.

The avifauna monitoring will be performed following the Mackinnon Lists methodology[1]. This method involves recording all the species seen and/or heard along pre-existing trails, which will be traversed randomly. In addition to this, occasional records of bird species during the survey campaign will also be included to supplement the information on the area's species richness.

The monitoring of the project area's flora and fauna is planned to take place continuously throughout the project's duration. An overview of the monitoring plan is detailed in table below:

Table 75. Summary of the biodiversity monitoring plan for the Tapera project area.

Biodiversity parameters to be monitored	Variables to be monitored	Methodology	Frequency
Flora	• Species diversity • Vegetation conservation status • Number of threatened and endemic species	• Forest Inventory	• Periodic monitoring campaign
Flora	• Vegetation conservation status • Area (ha) preserved	• Remote monitoring by satellite images	• Annual monitoring
Avifauna	• Species richness • Number of threatened and endemic species	• Mackinnon's Lists • Indirect Records	• Periodic monitoring campaign

Mammalian fauna	• Species richness • Number of threatened and endemic species	• Active Search • Trap Cameras	• Periodic monitoring campaign
Mammalian fauna	• Species richness • Number of threatened and endemic species	• Active Search • Trap Cameras	• Periodic monitoring campaign

5.4.2. Biodiversity Monitoring Plan Dissemination (B4.3)

The findings of the biodiversity monitoring will be made available on both the project website and the Verra website, for public knowledge. Communication campaigns will also be launched to inform the local communities about the results.

5.5. Optional Criterion: Exceptional Biodiversity Benefits

5.5.1. High Biodiversity Conservation Priority Status (GL3.1)

In the Tapera project region, the presence of threatened species of flora and fauna that meet the Gold Level criteria was verified, such as species classified as "Endangered" (EN), according to the IUCN Red List:

- Flora: Annonaceae guatteria (EN – Endangered); · Protium icicariba (EN – Endangered); Inga sp. (EM – Endangered)
- Fauna: Ateles marginatus (EN Endangered); Saguinus Bicolor (CR - Critically Endangered

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

Table 76. Population trends of the trigger species identified in the Tapera project region.

Trigger Species	Ateles marginatus (EN Endangered);

Population Trend at the Start of the Project	Ateles marginatus is endemic to the Brazilian Amazon, occurring between the Rio Tapajós (right bank) and its tributary, the Rio Teles Pires (right bank) and the Rio Xingu (left bank), south of the Rio Amazonas (Kellogg and Goldman 1944, Ravetta 2008, Ravetta 2009). This is the least known of the Amazonian spider monkeys. It is listed as Endangered based upon an inferred or suspected population reduction upwards of 50% (for the period 2006–2050) due to projected and corresponding habitat declines in both protected and unprotected areas, as well as associated declines and population extirpations due to continued high levels of hunting. This combination of factors has impacted one previous generation (15 years; 2006-2020) and will likely impact two succeeding generations (30 years; 2021-2051) in the tropical forests of Brazilian Amazonia.
Without-project Scenario	In the absence of the Tapera project, the population of *Ateles marginatus* would probably continue to decline due to habitat loss from deforestation and environmental degradation that has been occurring in the region.
With-project Scenario	The project, by monitoring and conserving the area, will prevent deforestation and forest degradation, and thus the loss of habitat for this species. In addition, conservation and monitoring of the area will prevent predatory hunting of the species in the project area.
References	https://www.iucnredlist.org/species/2282/191689524 https://repositorio.unesp.br/items/7c1c77f4-dc5f-43e2-a484-1df580133a12 https://repositorio.ufpa.br/jspui/handle/2011/4150

Trigger Species	Saguinus Bicolor

Population Trend at the Start of the Project	Saguinus bicolor is considered Critically Endangered due to a projected population reduction of 80% or more in the next 18 years (three generations) due to serious multiple threats suffered within a very concentrated range in and around the city of Manaus: deforestation and habitat fragmentation related to expanding rural settlements and agriculture, livestock production, urban development, an expanding energy matrix and road network, routine collection for the pet trade, competition with the Golden-handed Tamarin (Saguinus midas), and high mortality due to predation by dogs and cats, disease, and electrocution on transmission lines. This species is commonly seen in fragmented habitats, more than in primary forests (Gordo 2012). Saguinus bicolor groups survive in small, highly degraded forest patches around housing estates and in the suburbs of Manaus. Saguinus midas populations are gradually replacing S. bicolor in the extremes of S. bicolor's range (Ayres et al. 1980, 1982; revision in Röhe 2006). Gordo (2012) estimated the population size in 30 forest fragments of different size, observing that the individual density decreases when fragment size increases. Small fragments like Park Mindu Fragment with 46 ha have two groups and eight individuals; Park Sumaúma with 56 ha has two groups with 15 individuals; RS Pinto fragment with 3 ha has one group with five individuals; University fragment with 776 ha has 24 groups with 145 individuals; and Reserva Ducke with 10,000 ha has 620 individuals in 120 groups. It is suspected that the population will suffer a reduction of at least 80% over the next three generations (18 years) due to serious multiple threats suffered within a very concentrated range in and around the city of Manaus, including: deforestation and habitat fragmentation related to expanding rural settlements and agriculture, livestock production, urban development, and an expanding energy matrix and road network; routinely collection for the pet trade; competition with the Golden-handed Tamarin (Saguinus midas); high mortality due to predation by dogs and cats; disease; and electrocution on transmission lines.

Without-project Scenario	In the absence of the Tapera project, the Ateles chamek population would likely continue to decline due to habitat loss from deforestation and environmental degradation that has been occurring in the region.
With-project Scenario	The Tapera project, by monitoring and conserving the area, will prevent deforestation and forest degradation, and thus the loss of habitat for this species. In addition, conservation and monitoring of the area will prevent predatory hunting of the species in the project area.
References	https://www.iucnredlist.org/species/42697/192592444

APPENDICES

Appendix 1: Stakeholder Identification Table

Table 77: Stakeholder Identification

Categories	Group of Stakeholders Involved in the Project	Project Rights	Interests in your participation in the project	Relevance to the project
Project Proponent	*Orgânica Consulting*	Responsibility for Implementation, Orgânica Consulting plays an active role from the conception to the monitoring of the project, including its construction and development; Sale of Carbon Credits: The company is responsible for selling the carbon credits generated by the project,	Financial returns from the sale of carbon credits; Improved quality of life for the communities involved; Implement social, environmental and economic improvement actions those involved	As a project proponent, your participation is of the utmost importance for the development of actions related to the project.

Categories	Group of Stakeholders Involved in the Project	Project Rights	Interests in your participation in the project	Relevance to the project
		resulting from the emission reductions		
The owners	*Urupolpas*	Interest in protecting forest ecosystems. Involvement with associations and cooperatives to map and protect existing forests; Motivation to finance and actively participate, with a view to financial benefits.	Interest in protecting forest ecosystems. Involvement with associations and cooperatives to map and protect existing forests Motivation to finance and actively participate, with a view to financial benefits.	A crucial role in making the project viable, providing resources and logistical support. Participation is essential for the success of forest management and the generation of benefits for family farmers.
The owners	*Nat'Orgânico*	Rights to carbon credit revenues;	Interest in maintaining projects aimed at sustainable development	Crucial for ensuring that the project complies with environmental and legal regulations, contributing to the

Categories	Group of Stakeholders Involved in the Project	Project Rights	Interests in your participation in the project	Relevance to the project
		Right to obtain the CCB & VCS label.	in line with the company's proposal It aims for financial returns from the project, as it is providing financial resources for the project	sustainability and legality of operations. It is essential for the implementation of the project, as it is responsible for land and financial planning and monitoring

The owners	Agrofrut	Right to use the property to apply improved management techniques Right to obtain CCB & VCS seal	Interest in contributing to the social organisation of the region and promoting economic, social and sustainable development Interest in monitoring and following the progress of communities	Relevant to the economic, social and sustainable development of the region; Relevant for improvements in sustainable management techniques, positively impacting their conditions; Relevant for effective project monitoring and information sharing among stakeholders.

Public authorities	Town hall of Urucará, Nhamundá, São Sebastião do Uatum; Amazonas State Environmental Protection Institute (IPAAM) of Parintins; Development Institute Sustainable Agriculture and Forestry of Parintins (IDAM)-Urucara and Nhamundá; Secretary of the Environment Rural Production of Nhamundá, and	Partnership in the implementation and/or improvement of public policies with local stakeholders. Rights to Verify the Veracity and Legality of the Information Provided on Stakeholders; Improve the progress of possible project obstacles.	Strengthen the relationship with beneficiary communities; Raising awareness of the benefits of REDD+ projects and the project in particular on the dimensions of communities, climate and biodiversity; Spread and intensify control over areas of deforestation.	Responsible for generating accessible data for use in the project; Purpose is environmental management, implementation, and execution of national and state environmental policies; The prefectures are responsible for the application of local public policies that can influence, mainly, the quality of life of the project's beneficiary population or the progress of the project's planned activities. Validate the project's work in the communities.

	Urucará and Parintins; National Research Institute Applied (INPA)- FOREST MANAGEMENT LABORATORY – LMF of Manaus.			

The beneficiaries	Communities Involved: Marajazinho; Boa Esperança; São João, Tapera; Jerusalém; Apeua.	Participation and Consultation: The right to be informed and consulted about project activities that are linked to their communities and lands; Fair Compensation: Right to fair compensation for environmental services provided, such as the reduction of greenhouse gas emissions due to forest preservation; Sustainable Development: Participation in decisions related to sustainable development, aiming to improve the living conditions of local communities in an equitable manner;	Greater control over deforestation on and around their properties	They are of paramount importance to the project because they are the community that lives and sustains itself around or within the project areas, indirectly and directly influencing the progress of the project. Essential for controlling project areas. They contribute to reducing deforestation

		Training and Education: Access to training and education programs that can strengthen local capacities for informed and meaningful participation in the project.		

Categories	Group of Stakeholders Involved in the Project	Project Rights	Interests in your participation in the project	Relevance to the project
Third Secor	**Agrofrut (producers' association).**	Stakeholders are partners in defending social rights and sustainable development.	Make project stakeholders aware of their rights; Strengthening association relations.	Works to improve relations.

Appendix 2: Project Activities and Theory of Change Table

Table 78: Project Activities and Theory of Change Table

Activity description	**Outputs (short term)**	**Outcomes (medium term)**	**Impacts (long term)**
Training about Drying Mechanization in Agricultural Production	Increase in awareness and understanding of mechanization techniques among the small producers	Consistent and controlled processing conditions, resulting in higher-quality agricultural products	Access to new markets, generating new economic partnerships for small producers and economic growth for the community
Training about Fair Trade Practices	Gain of knowledge about fair pricing, ethical trading, and the importance of sustainable and socially responsible production	The dissemination of fair compensation and ethical trading activities among the community	Fair income distribution and ethical labor practices contribute to better living standards for small producers
Training about Agroindustry - Hygiene and Quality	Implementation of proper sanitation methods, personal hygiene practices and facility cleanliness	Establishment of a quality-focused agroindustry within the community.	Enhanced market competitiveness
Training about Practices for Organic Certification	Introduction to the certification requirements for organic, allowing small	Transition to certified organic production in a	Establishment of sustainable agriculture practices within the community, allowing organic crop

Activity description	**Outputs (short term)**	**Outcomes (medium term)**	**Impacts (long term)**
	producers to become familiar with the documentation and practices needed to achieve and maintain organic certification	bigger scale within the community	diversity and soil health management, thus contributing to long-term sustainability in the region.
Training about Irrigation and Solar Energy	Gain of knowledge about efficient water management practices and operation of solar-powered irrigation systems	Increase of crop yields and water access	Economic empowerment and environmental conservation
Training for the Use of Agroindustry Machinery	Acquirement of operational skills	Improvement in the quality of agricultural products processed locally	Improvement of production and overall economic growth for the community
Training for the Implementation of New Crops	Learning of practical skills related to cultivation management	Diversification of harvests within the community, allowing small producers to experience an increased variety in their agricultural output	Increasement of income for small producers and opening of new markets and opportunities

Activity description	**Outputs (short term)**	**Outcomes (medium term)**	**Impacts (long term)**
Training for Machinery Operation - Fruit Processing	increasement of knowledge among small producers regarding the functions and capabilities of fruit processing	Optimization of fruit processing and improvement in the quality and diversification of products	improvement of products quality, leading to higher income levels and the development of a more robust local economy
Training for Machinery Operation - Oil Extraction	Dissemination of knowledge about the importance of safety measures and implementation of safety protocols	Facilitation of a more efficient extraction process	Increasement of outcomes related to the diversification of oil-based products, reduction of waste through efficient extraction, optimization of resource use and minimization of environmental impact

Appendix 3: Project Risks Table

The risk analysis was carried out using the VCS Risk of Non-Permanence Tool AFOLU, version 4.1, dated August 29,2023

Internal Risk

Table 79: Project Management Risks

Risk Factor	Description of the Risk and/or Mitigation Factor	Risk Rating
a)	Not applicable. Planting trees is not a project activity for which GHG credits will be issued.	0
b)	Ongoing enforcement to prevent encroachment by outside actors is required to protect more than 50 percent of stocks on which GHG credits have previously been issued.	2
c)	The management team includes individuals with significant experience in all the skills required to successfully carry out the project's activities.	0
d)	The management team is entirely based in the country..	0
e)	The management team includes individuals with experience in AFOLU project design and implementation, carbon accounting and reporting under the VCS Program.	0

Risk Factor	Description of the Risk and/or Mitigation Factor	Risk Rating
f)	Not applicable. The project does not have a plan in place.	-2
Total Project Management (PM) (a + b + c + d + e + f)]		0

Table 80: Financial Viability Risks

Financial Viability		
Risk Factor	Description of the Risk and/or Mitigation Factor	Risk Rating
a)	Not applicable. The return on the project is less than 20 years	0
b)	Not applicable. The return on the project is less than 10 years.	0
c)	Not applicable. The return on the project is less than 7 years.	0
d)	Not applicable. The return on the project is less than 4 years.	0

e)	The payback period is four years or less from the current assessment. The financial spreadsheet has been made available to the project auditors. Evidence of financial health is available to the auditors.	0
e)	Not applicable. The project has secured more than 15% of the financing needed to cover total cash before the project's break-even point.	0
f)	Not applicable. The project has secured more than 40% of the financing needed to cover the total cash before the project's break-even point.	0
g)	Not applicable. The project has secured more than 80% of the financing needed to cover the total cash before the project's break-even point.	0
h)	The project has secured 80% or more of the financing needed to cover total cash before project break-even.	0
i)	Not applicable. The project has secured 80% or more of its total cash available as necessary financial resources, other than acquired funds, before the project's break-even point.	0
Total Financial Viability (FV) [as applicable, ((a, b, c or d) + (e, f, g or h) + i)] The total cannot be less than zero.		0

Table 81. Opportunity Cost Risks.

Opportunity cost		
Risk Factor	Description of the Risk Factor and/or Mitigation	Risk rating
a)	Not applicable. The NPV of the most profitable alternative land use activity is expected to be 20% or less than that associated with project activities.	0
b)	Not applicable. The NPV of the most profitable alternative land use activity is expected to be 20% or less than that associated with project activities.	0
c)	Not applicable. The NPV of the most profitable alternative land use activity is expected to be 20% or less than that associated with project activities.	0
d)	NPV of the most profitable alternative land use activity is expected to be 20 percent or less than that of project activities.	0
e)	Not applicable. The NPV of the most profitable alternative land use activity is expected to be 20% or less than that associated with project activities.	0
f)	Not applicable. The NPV of the most profitable alternative land use activity is expected to be 20% or less than that associated with project activities.	0

g)	The positive community impacts of project activities are demonstrated	0
h)	Net community impacts of project activities are demonstrated	0
i)	Mitigation: The project is protected by a legally binding agreement (see i) Section 2.2.4) to continue management practices that protect credited carbon stocks during the project's crediting period.	0
Total opportunity cost (OC) [as applicable, (a, b, c, d,f,g or h) + i]		0

Table 82: Project Longevity Risks.

Project Longevity		
Risk Factor	Description of the Risk Factor and/or Mitigation	Risk rating
a)	Not Applicable	0
b)	There is a legal contractual agreement to maintain project activities and maintain the project area as forest for at least 30 years from the project start date. The land owner is legally able to maintain project activities throughout the life of the project. Project area management and financing plans consider project	0

	operation for a period of 30 years.	
Total Project Longevity (PL)		0

Table 83: Internal rists

Internal Risk	
Total Internal Risk (PM + FV + OC + PL)	0

External Risks

Table 84: Land and Resources Tenure Risk

Land and Resources Tenure		
Risk Factor	Description of the Risk Factor and/or Mitigation	Risk rating
a)	Ownership and access/use rights to resources are maintained by the same entity.	0
b)	Not applicable. Ownership and access/use rights to resources are maintained by the same entity.	0
c)	Not applicable. Country Government not intervene on project area in the past 20 years	0

d)	Not applicable. Country Government not intervene on project area in the past 20 years	0
e)	Country Government not intervene on project area in the past 20 years	0
f)	Not Applicable. No disputes exist	0
g)	Not Applicable. No disputes exist	0
h)	No disputes exist	0
i)	Not Applicable. No disputes exist	0
j)	Not Applicable. No disputes exist	0
k)	No disputes exist	0
l)	Not applicable. It has been shown that the possible impacts upstream and at sea are insignificant or effectively mitigated.	0
m)	It has been shown that the possible impacts upstream and at sea are insignificant or effectively mitigated.	0
n)	MItigation: The project area is protected by a legally binding agreement (e.g. a license, conservation easement, conservation easement or	

	protected area) to continue management practices that protect carbon stocks during the project crediting period	
Land and Resources Tenure (LT) [as aplicable, ((a ou b) + (c, d ou e) + (f, g ou h) + (i,j ou k) + (l ou m) + n]		0

Table 85: Stakeholders Engagement Risk

takeholders Engagement		
Risk Factor	Description of the Risk Factor and/or Mitigation	Risk rating
a)	More than 50% of families living in the project area and dependent on the project area were consulted.	0
b)	More than 20% of families living within a 20 km radius of the project's geographical limits and who are dependent on the project area were consulted.	0
c)	The project generates positive impacts for communities and is in the CCB certification process.	0
d)	The project generates positive impacts for communities and is in the CCB certification process.	0
Total Stakeholders Engagement (EC) [as aplicable,{(a or b) + (c or d)}]		0

Table 86. Political Risk.

Political Risk		
Risk Factor	Description of the Risk Factor and/or Mitigation	Risk rating
a)	Not applicable. Governance score is -0.46	0
b)	Governance score is -0.46	4
c)	Not applicable. Governance score is -0.46	0
d)	Not applicable. Governance score is -0.46	0
e)	Not applicable. Governance score is -0.46	0
f)	Brazil is implanting the REDD+ Readiness or another activities	-2
Total Political (PC) [as aplicable [(a, b, c, d ou e) + f)]		2

Table 87. Total External Risk

External Risk	
Total External Risk (LT + CE + PC)	

Natural Risk

Table 88. Fire Natural Risk

Natural Risk - Fire	
Significance	No losses. There are no registries of fire on the project area in the last decade.

Table 89. Pest and Disease Outbreaks Risk

Natural Risk - Pest and Disease Outbreaks (PD)	
Significance	No losses. The project does not foresee an increase in pests and diseases, since no forest management will be carried out in the area, nor will new species be introduced or planted in the area.
Probability	1
Score (LS)	0,25

Table 90. Extreme Climate Risk

Natural Risk - Extreme Climate	
Significance	No losses. The climatic conditions necessary for the formation of hurricanes, cyclones, tornadoes and floods are not present in the project region, so such events have a low possibility of occurring.
Probability	1
Score (LS)	0,25

Table 91. Geological Risks

Natural Risk - Geological Risks	
Significance	No Losses. Neither volcanoes nor active tectonic faults are present in the project area
Probability	1
Score (LS)	0,25

Table 92. Total Natural Risks.

Score for each natural risk applicable to the project (Determined by (LS × M))	
Fire (F)	0,25
Pest and Disease Outbreaks (PD)	0,25
Extreme Weather (W)	0,25
Geological Risk (G)	0,25
Other Natural Risk (ON)	0,25
Other Natural Risk (ON)	0,25
Other Natural Risk (ON)	0,25
Sea Level Risk (SLR)	0,25
Multiplier Factor	1
Total Natural Risk (as applicable), F + PD + W + G + ON+ SLR)	2