SURUÍ
FOREST CARBON PROJECT

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Partners

Technical Coordination

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PROJECT DESCRIPTION

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PROJECT DESCRIPTION

Table of Contents

PROJECT DESCRIPTION

Acronyms

ACT - Amazon Conservation Team

AFOLU - Agriculture, Forestry and Other Land Use

CCBS - Climate, Community and Biodiversity Standards

FUNAI - National Indigenous Foundation

FUNASA - National Health Foundation

FUNBIO - Brazilian Biodiversity Fund

GHG - Greenhouse gases

HCV - High Conservation Value

IDESAM – Institute for Conservation and Sustainable Development of Amazonas

INCRA - National Institute of Colonization and Agrarian Reform

INPE - National Institute for Space Research

IPCC - Intergovernmental Panel on Climate Change

IUCN - International Union for Conservation of Nature

LULUCF - Land Use, Land Use Change and Forestry

MMA – Brazilian Ministry of the Environment;

PCFS - Suruí Forest Carbon Project

PES - Payment for Environmental Services

PRODES - Program for Monitoring Deforestation in the Amazon

REDD+ - Reducing Emissions from Deforestation and Degradation coupled with conservation efforts, sustainable forest management and enhancement of forest carbon stocks.

SFB – Brazilian Forest Service

TISS - Sete de Setembro Indigenous Territory

UNFCCC - United Nations Framework Convention for Climate Change

VCS - Verified Carbon Standard

PROJECT DESCRIPTION

1 PROJECT DETAILS

1.1 Summary Description of the Project

Responsible for most of the greenhouse gas (GHGs) emissions in Brazil, the forestry sector accounts for 58% of national emissions[1]. Most of those emissions originate from deforestation in the Amazon. Although there has been recent significant reductions in deforestation rates, forest loss in Amazonia has been occurring at an average rate of 0.56%/yr (1,762,995 ha / year) in the last ten years. From 2000 to 2009, more than 17.6 million hectares were destroyed in the Brazilian Amazon[2], which corresponds to an area the size of Uruguay.

The State of Rondônia (RO), which contains most of the Suruí Forest Carbon Project (PCFS) and where the Suruí have economic access and relationships with stakeholders, is one of the states that lost the most forest in the Brazilian Amazon. More than 2.4 million hectares were deforested between 2000 and 2009, which accounts for approximately 14% of total deforestation in the Brazilian Amazon[3] during this period. The other fraction of the PCFS is located in the State of Mato Grosso which accounted for 36% of Amazon deforestation during the same period.

The Paiter Suruí indigenous people inhabit the northeast of Rondônia, a region that comprises the western flank of a long corridor of indigenous lands surrounded by consolidated agricultural areas. Surui contact with non-Indians first occurred in 1969. The construction of the BR-364 highway that connects Cuiabá (MT) and Porto Velho (RO) in 1968 opened about 240,000 km^2 of land in Rondônia and started a migration process that brought about 65,000 people per year between 1980 and 1983 and even rose to over 160,000 migrants per year between 1984 and 1986[4].

In 1975, the National Institute of Colonization and Agrarian Reform (INCRA) created about 2.7 million hectares of settlement projects in Rondônia. This decision led to an extreme rate of deforestation in different regions of the state. In the municipality of Cacoal, one of the municipalities in which the Surui territory is located, an area of approximately 66,950 hectares was cleared in only three years from 1975 to 1978[5].

The Paiter-Suruí

The demarcation of the Paiter Suruí's territory was ratified by Decree No. 88.867 of October 18, 1983, and defined what was called the Sete de Setembro Indigenous Land (TISS). Some farmers, who occupied lands in what is now TISS, were expelled from these areas and these were eventually occupied by the Paiter Suruí. The surrounding region is heavily deforested and pressure from loggers and ranchers on the border of TISS is increasingly intense. The Suruí are currently distributed in 25 villages across an area of approximately 247,845 hectares between the central-eastern region of the State of Rondônia, Municipalities of Cacoal and Espigão D'Oeste, and the northwest region of the State of Mato Grosso, Municipality of Rondolândia.

Contact with non-Indians increasingly changed the capitalist standard into a way of life for the Suruí, with the consumption of manufactured goods and the need for health services and education promoted by the surrounding society. As a result, beyond benefitting from coffee plantations inherited from a portion of their land that once belonged to rural settlements (but that is now incorporated within the Indigenous Land), the Suruí began practicing commercial activities, with logging as their first significant and accessible source of resources. The Paiter Suruí sold wood in their territory for approximately 40 years to purchase goods and services.

Logging has caused profound social changes that include the formation of new villages. From the 2000s, beginning with the depletion of timber resources and the consolidation of most of the surrounding areas by livestock and coffee, the Paiter Suruí people began investing in alternative land uses and means of income generation. In this context, the main driver of deforestation in the TISS has been a change of strategy from

[1] MCT 2009.
[2] PRODES 2011.
[3] PRODES *ibid.*
[4] Mahar 1989.
[5] Brazil CNPq / INPE, *cited by* Fearnside, 1982

the Paiter Suruí people to replace timber with other sources of income, particularly coffee and livestock production.

The Suruí Forest Carbon Project (PCFS)

The PCFS aims to halt deforestation and its associated greenhouse gas (GHG) emissions in an area under intense deforestation pressure in the TISS. The region is located in one of the main centres of the Brazilian Amazon's "deforestation arc", and is shaped by the expansion of consolidated farms requiring new forest areas for agricultural activities. The forests in these regions are primarily limited to protected areas. Logging has shifted northward since the early 2000s[6,7]. The trend indicates that the Indigenous are increasingly turning to alternatives to earn the monetary income once provided by timber. These alternatives include crops such as coffee and extensive livestock systems, and leasing and "sharecropping"[8] with surrounding farmers and ranchers. The most likely future scenario for the TISS is shaped by the interaction between external and internal factors, where productive agreements would lead to a consequential acceleration in the rate of forest cover loss.

The PCFS emerges as a pioneering initiative led by the Paiter Suruí, the Chief Almir Suruí in particular[9], searching for financial mechanisms to ensure the implementation of a forest conservation strategy, the improved quality of life of their populations, and the preservation of their traditional culture.

The project is based on four themes:

1. **Forest Protection and Environment**
2. **Food Security and Sustainable Production**
3. **Institutional Strengthening**
4. **Development and implementation of a financial mechanism - Suruí Fund**

This set of activities is designed to end deforestation in the TISS by attacking its two main roots: the lack of economic alternatives to ensure the well-being of the Paiter Suruí, and the appearance of external actors to conduct illegal activities.

In order to establish the baseline of the project, a projection model of land use change in the TISS was developed. This model is called SimSuruí and is based on system dynamics to represent the existing system in TISS, its agents and their interactions with the surrounding vegetation. The determinant vector of these interactions is expressed by the needs and wants of the natives earning a living alternative to timber sales – the main activities being cattle farming and coffee growing. The model includes five sub-models: demographics, groups of land use change agents, economic dynamics of agent groups, subsistence agriculture, and vegetation dynamics in the TISS. Observing trends in the region, these five sub-models interact to produce the area to be deforested in the baseline scenario (without the project). **The objective of the PCFS is to prevent 13,575.3 hectares of tropical forests from being cleared in the TISS by 2038, to avoid the emission of 7,258,352.3 tCO_2e in the atmosphere and to contribute to the preservation of the Paiter Suruí lifestyle and traditions.**

[6] Schneider et al.2000.

[7] Pereira et al. 2010.

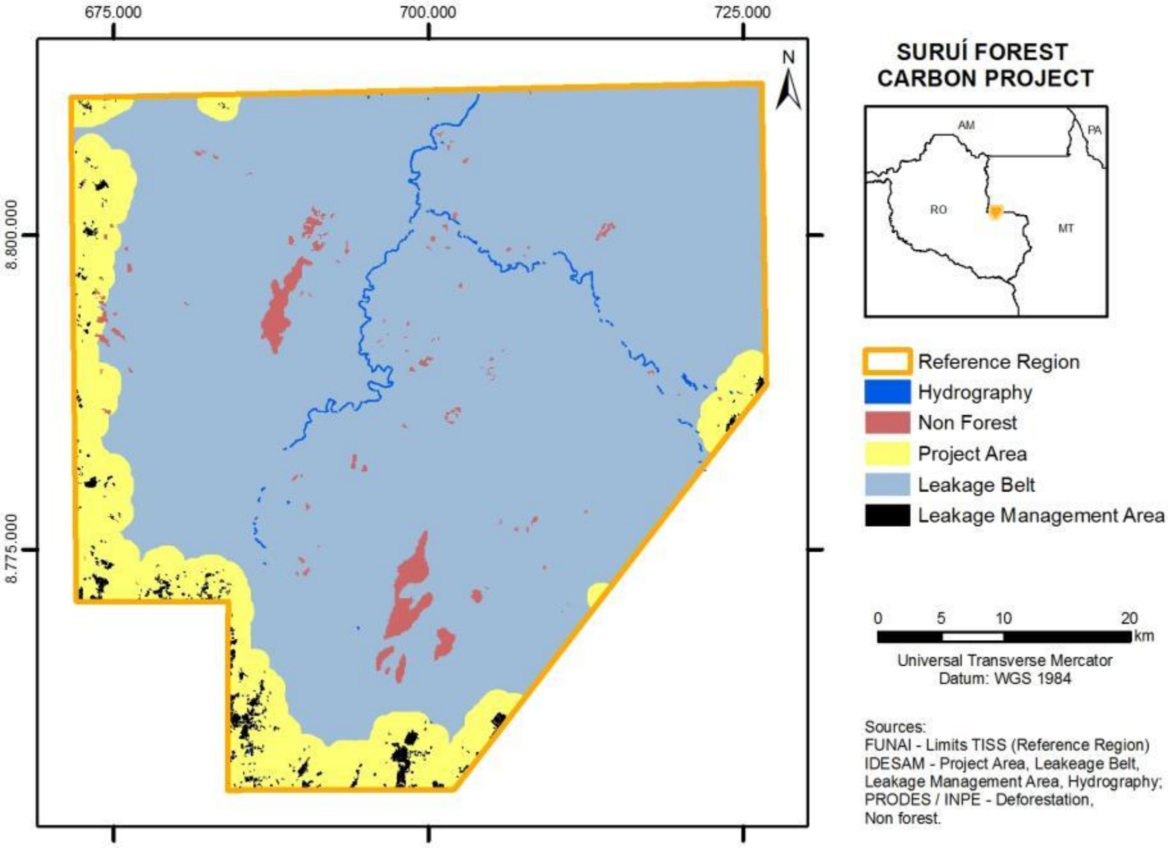
[8] A "moiety" system is an agreement made between indigenous and foreign producers for a production where an individual contributes with land, the other one contributes with work and/or inputs, and production or revenues are divided between them whether it is fifty-fifty or not.

[9] http://www.fastcompany.com/most-creative-people/2011/chief-almir-surui-amazon-tribe

Summary of the Suruí Forest Carbon Project

1. **Project duration:** 30 years
2. **Expected deforestation in the baseline scenario (2009-2038):** 13,575.3 ha
3. **Expected emissions in the baseline scenario:** 7,782,713.1 $tCO_{2\,e}$
4. **Expected deforestation in the Project scenario:** 1,357.5 ha
5. **Expected emissions in the Project scenario:** 524,360.8 $tCO_{2\,e}$
6. **Expected net emissions reductions from the project:** 7,258,352.3 $tCO_{2\,e}$
7. **Area of the Sete de Setembro Indigenous Land:** 247,845 ha
8. **REDD+ Project Area:** 31,994.2 ha
9. **Leakage Belt:** 208,038.9 ha
10. **Leakage Management Area:** 3,416.6 ha
11. **Reference Region:** 247,845 ha

Location of project area, leakage belt, leakage management area and reference region for the PCFS



1.2 Sectoral Scope and Project Type

The PCFS falls within the scope of the AFOLU sector (Agriculture, Forestry and Other Land Use), and in the category of Reducing Emissions from Deforestation and Degradation (REDD) in particular. The proposed type of activity is Avoided Unplanned Deforestation and/or Degradation.

1.3 Project Proponent

The Suruí Forest Carbon Project proponent is the **Metareilá Association of the Suruí Indigenous People**, an institution representing the Paiter Suruí people (Act of Creation and Bylaws of the Metareilá Association can be found in the Supplementary Materials 15, 16 and 17).

The Metareilá Association works to defend and preserve the cultural and territorial heritage of the Paiter Suruí, protect biodiversity and ensure the training of indigenous peoples and leaders to build and strengthen the autonomy of the Paiter people.

Contact Information for the Metareilá Association of the Suruí Indigenous People

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Website: www.surui.org

1.4 Other Entities Involved in the Project

In 2009, a Memorandum of Understanding was signed between the Metareilá Association, Kanindé, ACT-Brazil, Forest Trends, IDESAM and FUNBIO with the goal of uniting the efforts of the participants to provide technical, material, administrative and financial resources for the development of the Suruí forest carbon project. The roles of the institutions are described below:

(i) Kanindé Association for Ethno-environmental Defense:
Technical Skills: Operates in the surveillance and monitoring of Indigenous Lands, providing assistance to indigenous organizations, environmental impact reports, ethno-environmental diagnosis of participatory indigenous lands, environmental education, project design, and public policy monitoring.
Functions in the project: Responsible for the ethno-zoning of TISS. Coordination and organization of activities for Food Security and income generation, monitoring of biodiversity and socio-economic benefits. Communications Office and development of Territorial Protection Plan.

Name of Contact Person: Ivaneide Bandeira Cardozo
Address: rua D. Pedro II, 1892, sala 7 Nossa Senhora das Graças, Porto Velho – RO, Brazil
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E-mail: ivaneide@kaninde.org.br
Website: www.kaninde.org.br

(ii) Amazon Conservation Team - ACT Brazil:
Technical Skills: Operates in the strengthening of traditional communities and environmental conservation. Coordinated the construction of the "Free Prior Informed Consent" process with the Paiter Suruí in addition to providing legal, anthropological and geo-processing assistance to the PCFS.
Functions in the Project: Support to activities for food security and income generation, monitoring of biodiversity and socio-economic benefits, legal advice and communication to the project. Development of the Land Protection Plan, environmental monitoring and carbon stocks (remote sensing).

Name of Contact Person: Marcus Vasco van Roosmalen
Position: President
Address: SAS, Edifício Business Point, Quadra 03, Bloco "C", sala 306, Brasília - DF, Brazil
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Website: http://www.equipe.org.br/

(iii) Forest Trends:

Technical Skills: Works to promote sustainable forest management and conservation through the valuation of ecosystem services. Supports projects and initiatives aimed to develop the market for ecosystem services to improve the living conditions of local communities.

Functions in the Project: Provides support in the formulation and implementation of the project and strategy for raising funds and selling carbon credits generated by the PCFS.

Name of Contact Person: Michael B. Jenkins
Position: President
Address: 1050 Potomac Street NW, Washington, DC 20007, USA
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Website: http://www.forest-trends.org

(iv) Institute for Conservation and Sustainable Development of Amazonas - IDESAM

Technical Skills: Works to promote the enhancement and sustainable use of natural resources in the Amazon, seeking alternatives for environmental conservation, social development and climate change mitigation. The Institute develops projects and activities related to REDD+ and Payment for Environmental Services (PES), having previous experience in the preparation of methodologies, the elaboration of PDDs and project validation.

Functions in the Project: Technical coordination in the elaboration of the baseline scenario and preparation of Project Design Document (PDD) as well as the validation and verification to VCS and CCB standards. Coordination of biomass and carbon inventories and forest monitoring in support of the PCFS (remote sensing). Also supports policy and technical coordination related to REDD for the PCFS.

Name of Contact Person: Mariano Colini Cenamo
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Website: www.idesam.org.br

(v) Brazilian Biodiversity Fund - FUNBIO:

Technical Skills: Working towards the conservation of biological diversity in Brazil. Arranges and prepares economic and financial mechanisms to ensure the long-term financial sustainability of conservation initiatives in addition to enhancing the capacity of local actors to work with the resources that it helped to provide.

Functions in the Project: Responsible for the financial resources management mechanism generated by the Suruí forest carbon projects - Suruí Fund - and other income activities within the Management Plan.

Name of Contact Person: Angelo Augusto dos Santos
Address: Largo do IBAM (sixth floor), Humaita, Rio de Janeiro, RJ
Phone: +55 (21) 2123-5349
e-mail: angelo@funbio.org.br
Website: www.funbio.org.br

(vi) Gãbgir Association of the Paiter Suruí Indigenous People

Technical Skills: Operated an education project on the Paiter language in partnership with the University of Brasilia since 2010. It operates in collaboration with FUNASA (Vigisus) and develops the project "Ponto de Cultura" (1 Workshop in 2010 with the presence of federal and state government) that aims towards the digital inclusion of the Paiter Suruí.

Functions in the Project: Provide support to improve the quality and performance of schools in the TISS.

(vii) Kabaney Association of the Forest People

Technical Skills: Operates since 2005 in the implementation of the Vigisus Project which creates orchards and improves fields. Participates as an advisor to the Council of Agriculture of the municipality of Cacoal (since 2007)

Functions in the Project: Supports the implementation of economic systems for the sustainable use of TISS' natural resources that meet the Paiter Suruí people's needs.

(viii) Garah Pameh Association of the Kabaney Paiter Suruí People

Technical Skills: Developing the project "Ponto de Cultura" with the Rede Povos da Floresta since 2009. Worked in reforestation projects of the Sete de Setembro Indigenous Land (2009) represented the people in the office of Paiter Prefecture Rondolândia / MT Suruí in Indigenous affairs. They are operating a project since 2010 with the National Supply Company (CONAB), which provides school meals from locally produced traditional foods.

Functions in the Project: Supports the implementation of economic systems for the sustainable use of TISS' natural resources that meet the Paiter Suruí people's needs.

(ix) Pamaur Association for the Protection of the Paiter Suruí People's Makor Clan

Technical Skills: Conducting workshops for cultural revival (pictures, images) and working in the Indigenous Health Council for 6 years (awarded the "Indigenous Culture" prize by the Ministry of Culture). Implementing a project of establishing orchards and traditional medicinal plants, in particular for women (2007/2008 - along with Vigisus)

Functions in the Project: Supporting the identification of more effective alternatives to address the health problems faced by the Paiter people.

(x) Yabner Gãbgir Forestry Institute of the Paiter Suruí people

Technical Skills: Awarded by The Nature Conservancy (TNC) for a reforestation project (linked to a carbon project). Two years ago, the project developed its own culture, encouraging fortnightly cultural fairs in their own Indigenous Land with the intent to promote the preservation of traditional foods.

Functions in the Project: Encouraging the revitalization, strengthening and enhancement of traditional cultural property.

The PCFS has a sound administrative and managerial structure. The Metareilá Association (project proponent) and the Brazilian Biodiversity Fund (FUNBIO, manager of the Suruí Fund) have enough experience with project management and institutional stability to allow proper implementation of the project's activities and proper allocation of proceeds from carbon credit transactions in the voluntary market.

The Metareilá Association, founded in 1988, was the first indigenous organization of Rondônia created to defend indigenous rights and particularly the ones of the Paiter Suruí people. In recent years, the Metareilá Association worked in partnership with various institutions including Kanindé, FUNAI, the Ministry of Environment, ACT Brazil, USAID, Aquaverde, IEB, and the Conservation Strategy Fund (CSF Brazil). These partnerships have been signed for the enhancement of traditional culture, sustainable development, and the fight against illegal logging in the Sete de Setembro Indigenous Land.

The National Biodiversity Fund (FUNBIO) was created in 1995 with the mission to provide strategic resources for biodiversity conservation in Brazil. Funbio manages funds from different sources and has always sought the expansion and diversification of this network of lenders. In terms of volume, the main source of funds is international cooperation, amongst others the Global Environment Facility (GEF), the German government (through KfW development bank) and the U.S. Treasury through USAID in particular. It also receives funds from foundations and international NGOs such as WWF and the Gordon and Betty Moore Foundation. Since its creation, Funbio employs available resources to leverage additional resources which may be part of a portfolio or be injected directly into the projects.

1.5 Project Start Date

The start date of the Suruí Forest Carbon Project is June 9, 2009, when the Memorandum of Understanding was signed between the clans in which the Paiter Suruí agreed to close down deforestation and illegal wood sale in the TISS (Supplementary Material 12).

1.6 Project Crediting Period

The start date of the crediting period coincides with the start date of the project on June 9, 2009. The crediting period of the PCFS is 30 years, ending on June 9, 2038.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Table 1. Scale of the Suruí Forest Carbon Project

Project	X
Mega-project	

Table 2. Expected GHG emission reductions with the PCFS

Years	Estimated GHG Emission Reductions or removals (tCO_2e)
2009	100,804.0
2010	99,018.7
2011	142,251.7
2012	134,142.3
2013	124,331.0
2014	133,370.1
2015	141,809.6
2016	127,462.5
2014	110,267.3
2018	111,218.4
2019	116,576.3
2020	118,767.8
2021	208,183.2
2022	254,725.9
2023	252,396.7
2024	399,668.2
2025	392,124.4
2026	312,083.8
2027	296,750.4
2028	373,306.3
2029	325,758.3
2030	260,040.0
2031	215,444.4
2032	257,641.0
2033	236,920.6
2034	303,815.7
2035	335,769.8
2036	329,196.4
2037	487,593.0
2038	556,914.8
Total Estimated ERs	7,258,352.3
Total number of crediting years	**30**
Average annual ERs	**241,945.1**

1.8 Description of the Project Activity

Table 3. Key dates and milestones in Project Implementation

Milestone	Date
Project Start	9 June 2009
Constitution of Suruí Fund in Funbio	December 2010
PDD development	May 2009 - September 2011
Validation	From October 2011
First forward sale of Emissions Reductions (expected)	December 2011
Begin investments and project activities financed by investment and offset sales (see Appendix for implementation schedule)	January 2012
Monitoring (per the monitoring plan)	April / May 2012 and every three years and thereafter
Verification	June 2012, and every three years thereafter

Summary of the main goals of climate, biodiversity and community

The PCFS seeks to consolidate forest conservation in the TISS through financial incentives from REDD + and Payments for Ecosystem Services. It is expected to reduce projected deforestation by at least 90% and to prevent at least 12,217.8 hectares of tropical forests from being cleared by 2038, thus generating 7,258,352.3 t CO_2e of emission reductions.

The project will leverage a range of social benefits, such as the generation of new income sources based on sustainable alternatives, the creation of direct and indirect jobs in monitoring and land management activities, health improvement, education, and preservation and transmission of the Paiter Suruí's culture and cosmology through language, traditional medicine and beliefs.

The Surui territory has high conservation values (HCV), containing endangered or endemic specimens with an intense relationship and use of this diversity by the population, hundreds of specimens being used for food production as well as medicinal and spiritual purposes. The PCFS wants to reverse the scenario of deforestation and extinction of the local species representing these resources, thus contributing to the maintenance of the ethno-environmental corridor composed of several indigenous lands and conservation units.

The project will undertake various activities to control the deforestation currently occurring in the TISS. The activities are divided into four main areas, namely:

1) **Forest Protection and Environment:** Support the monitoring, surveillance and training of the Paiter Suruí for them to defend their territory
2) **Food Security and Sustainable Production:** Organizing the possibilities of sustainable economic use of natural resources in the TISS
3) **Capacity Building:** Contribute to the autonomy of the Paiter Suruí people in TISS land management through the institutional strengthening of their organizations.
4) **Development and implementation of a financial mechanism - Suruí Fund:** financial management for the Suruí Forest Carbon Project, which is an essential tool for implementing the Paiter Suruí People's 50-Year Life Plan[10] in the TISS.

The implementation schedule of project activities is presented in Supplementary Material number 04.

The base of the PCFS is to ensure income generation for the Paiter Suruí people through alternatives not associated with deforestation and natural resource depletion, while ensuring the protection of the territory and the integrity of the Paiter Suruí's traditional ways of life.

[10] Metareilá, 2010.

PROJECT DESCRIPTION

The recent change in the behavior of the Paiter Suruí and of the economic activities in the TISS is documented in the "Plan of Action for Participatory Development of a Rational Economy and Sustainable Management of Natural Resources of the Sete de Setembro Indigenous Land" or "50-Year Life Plan " that identified key activities to promote substantial improvement in the indigenous people’s quality of life, as well as strategic guidelines for its development such as Institutional Strengthening, Food Security, Environment, and Protection and Control of its territory (Table 4).

Table 4. Activities planned for the project and expected impacts to climate, biodiversity and community

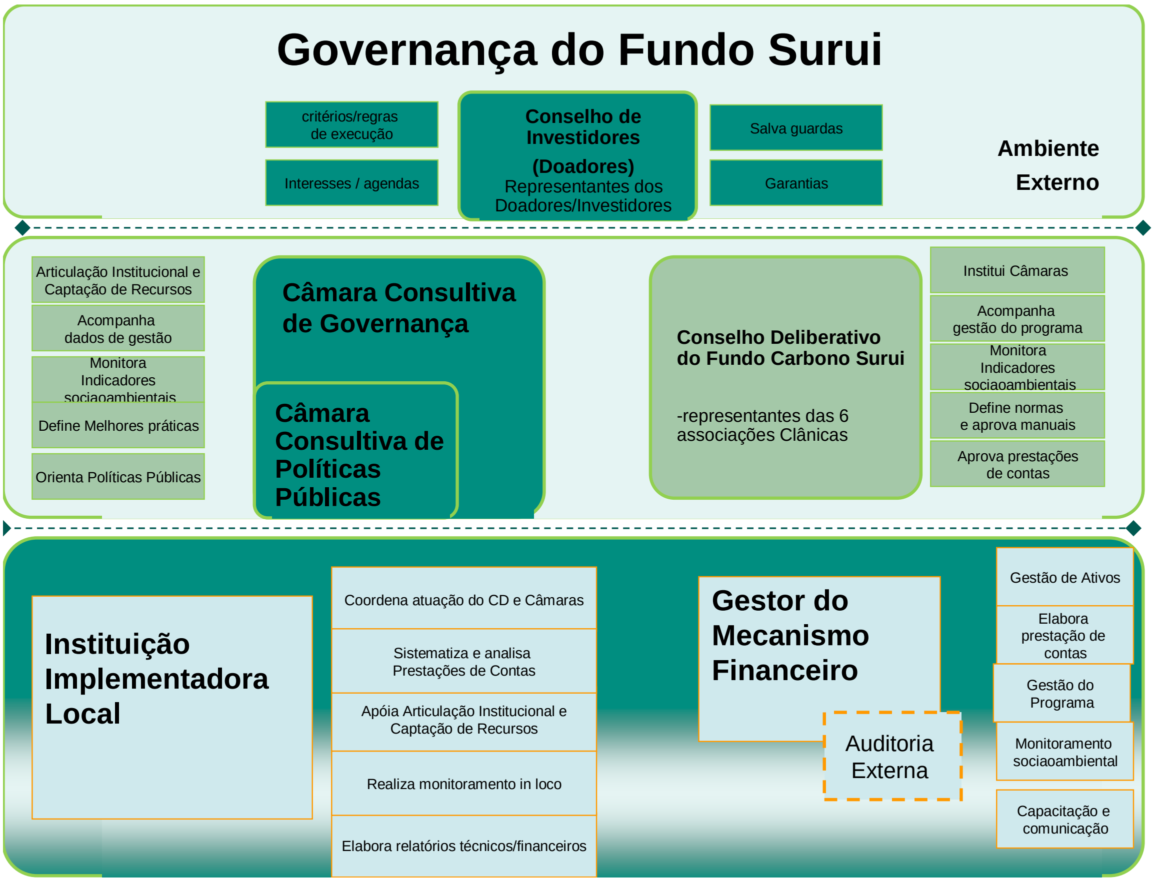
Project Activity	Objective	Specific Activities	Expected impacts	Cost of Activities for the first 5 years in the PCFS (R$)
Forest Protection and Environment	Support the Paiter Suruí and non-indigenous people's monitoring and surveillance capacity to defend their territory	- Mapping risks, threats and vulnerability of Indigenous Lands; - Re-establish and rehabilitate demarcating lines; - Construction of bases for surveillance; - Training of environmental agents; - Provide enforcement with FUNAI and the Environmental Police. - Implement routine surveillance expeditions.	- Elimination of invasions in Indigenous Lands; - End illegal logging in IL; - Forest stocks conservation in IL; - Ensuring the integrity of the territory; - Biodiversity conservation	R$ 1,870,279
Food Security and Sustainable Production	Organize the possibilities of sustainable economic use of natural resources within the Sete de Setembro Indigenous Land	- Diagnose the productive potential and the need for technical assistance; - Promote discussion about the Network of Farmers; - Identify sustainable alternative income generation; - Promote courses in agro-extractive production; - Identify technological problems and pinpoint improvement procedures; - Implement agro-ecological management of plantations; - Structure and improve supply chains; - Prepare communication materials; -Promote reforestation and agroforestry systems, and planting density; - Provide technical assistance for local production; - Analyze the possibility of certification	- Improvement of economic conditions; - Guarantee of alternative sources of income not linked to deforestation and forest degradation; - Ensure diversified sources of food for the Paiter Suruí. - Improving the diet of the Suruí.	R$ 1,060,875
Institutional Strengthening	Contribute to the autonomy of the Paiter-Suruí indigenous people through institutional strengthening of their organizations.	- Plan structure of Support Centers; - Present Plan for approval of the Paiter. - Equip Support Centers (computers, printers, telephones, etc.) and vehicles; - Technical Consultancy (management and administrative organization). - Hire staff	- Improved communication and working structure of associations; - Strengthening unity among associations; - Adequate training of associations to carry out its actions;	R $ 1,341,585
Development and implementation of the Financial Mechanism (Suruí Fund)	Development and implementation of Suruí Fund for the financial management of the PCFS	- Create a financial management model for the Suruí Fund; - Diversify funding sources for implementation of project activities;	- Ensuring long-term financial sustainability; - Suruí Fund operationalization.	R $ 309,703

PROJECT DESCRIPTION

The Suruí Fund

The management model adopted for the PCFS Financial Mechanism (Suruí Fund) will distribute assigned functions between different institutions and decision makers involved in implementing this project. The general structure of the fund is based on four pillars: the deliberating bodies, advisory bodies, an implementing institution and a local manager of the financial mechanism.

Figure 1. Governance Model for the Suruí Fund



The management and operation of the Fund is the responsibility of the Brazilian Biodiversity Fund – FUNBIO - which will make financial transfers to the Paiter Suruí according to the PCFS activities execution schedule. For further details of the Financial Mechanism - Suruí Fund - see Supplementary Material 07.

PCFS Financing Mechanisms

The PCFS aims to ensure the financial sustainability of project activities through a fundraising strategy mixed between public funds and market channels for carbon credit transactions in the voluntary market. The Project aims to prevent the emission of at least 1,224,675 tCO_2 in the atmosphere by 2018 and a total of 7,258,352.3 tCO_2 by 2038. Given the benefits generated by the project, it is possible to structure a robust financial mechanism and ensure its long-term sustainability.

Moreover, one of the strategic guidelines of the project is to ensure a steady income stream through other productive activities supported by the project (see Table 4).

For more detail on the project activities, schedule and budget, see Supplementary Material 04 (schedule of activities) and Supplementary Material 05 (budget of the activities).

1.9 Project Location

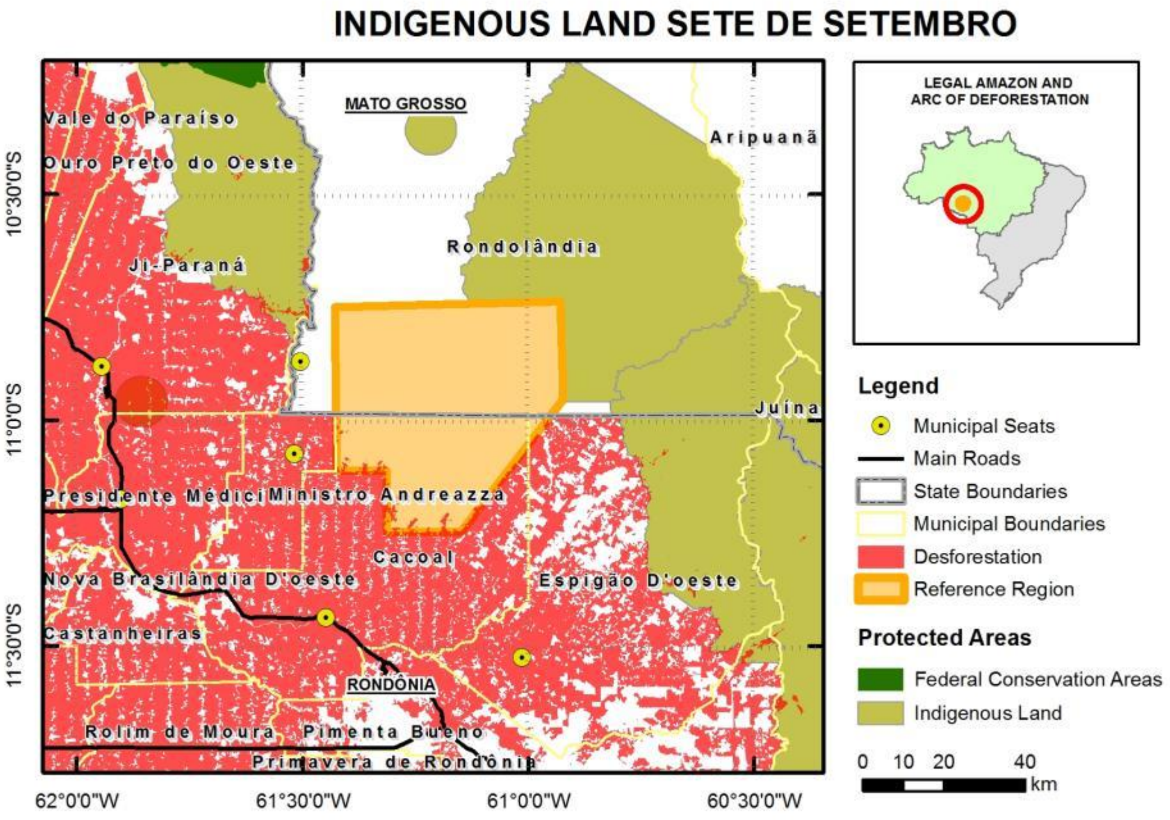
The TISS is located in the Brazilian Amazon at the border between the states of Rondônia and Mato Grosso, in a region of strong deforestation pressure known as "deforestation arc". The Suruí territory is part of a broader ethno-environmental corridor that includes the Aripuanã Indigenous Lands, Aripuanã Park, Sierra Morena, Roosevelt, Zoro, Rio da Flor do Prado and Iquê Ecological Stations, and Igarapé Lourdes Indigenous Land. It is also complemented by the Jarú Biological Reserve (Figure 2).

The right to land of the Paiter Suruí People was officially recognized with the approval of the demarcation of TISS by Decree No. 88.867 of October 18, 1983 and subsequent registration. The TISS covers approximately 247,845 hectares in three different municipalities - Cacoal, Espigão D'Oeste and Rondolândia.

The municipality of Cacoal (RO), which covers most of the TISS, has a population of 78,601 inhabitants[11] and a local economy mainly driven by timber and agriculture industries. Due to the intense exploitation of natural resources in this municipality, 65% of its total area[12] is currently deforested and most open areas are now occupied by pasture and coffee cultures (predominant in the region).

Another part of TISS is located in the municipality of Rondolândia / MT. This municipal area has a population of 3,538 inhabitants[13] and has deforested 15% of its territory[14], largely because of agricultural expansion.

Figure 2. Location of Sete de Setembro Indigenous Land and its surrounding area between the states of Rondônia and Mato Grosso.



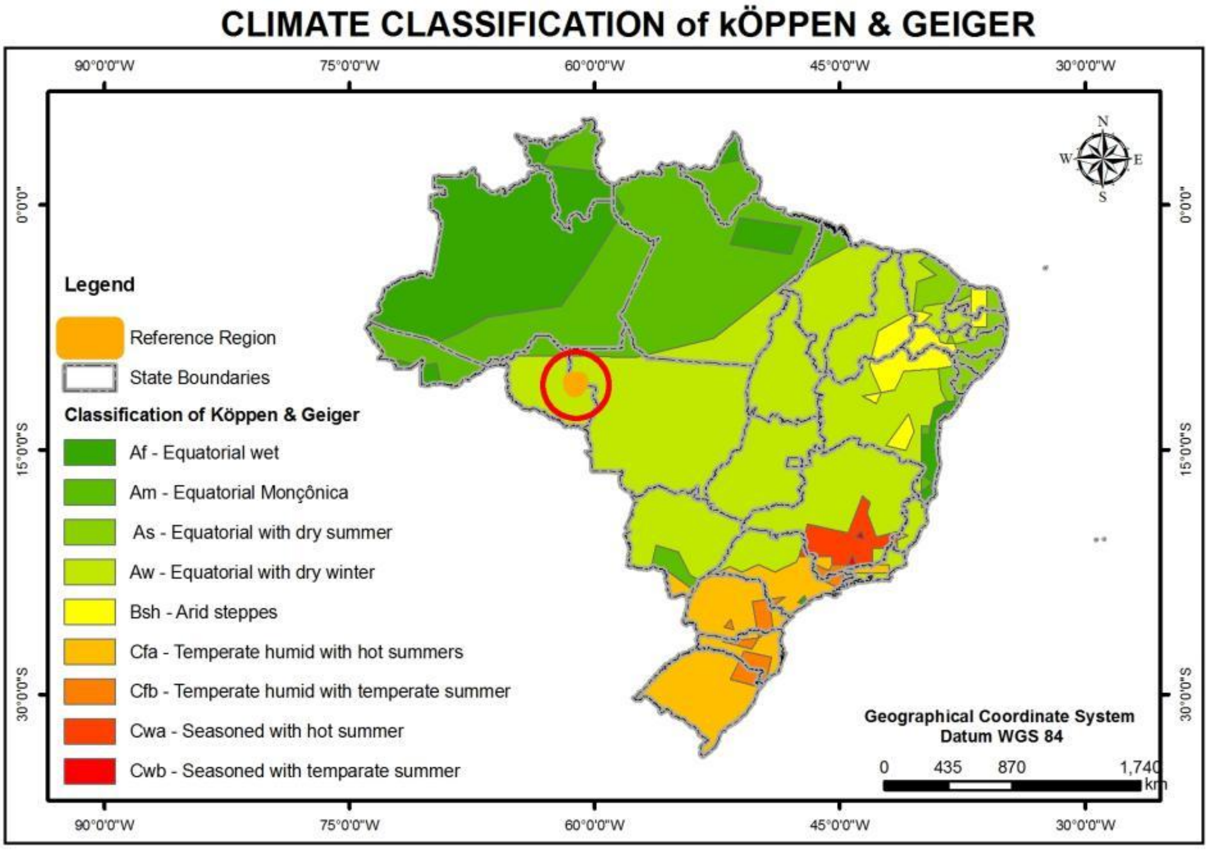
11 IBGE 2010.
12 PRODES *op. cit.*
13 IBGE *op.cit.*
14 PRODES *op. cit.*

1.10 Conditions Prior to Project Initiation

Climate

The TISS is located in a region classified as Equatorial with Dry Winter [15] (Figure 3). The region is characterized by the coldest month's average temperature greater than 18 ° C and at least one month's average precipitation below 60 mm. Annual rainfall is between 2000-2200 mm, compensating for the dry winter, reaching extremes between 1750 and 2750 mm. The average temperature is around 34 °C. Mean relative humidity is between 80% and 85%.

Figure 3. Climatic classification for Sete de Setembro Indigenous Territory [16].



Topography

The predominant topography in the TISS is gently undulating (slope between 3% and 12%) representing 76% of the total area (189,000 hectares). The undulating (slope between 12% and 24%) and strongly undulating topography (slope between 24% and 45%) represent 12% and 10% of TISS, respectively. Flat areas (slope less than 3%) and mountain (slopes greater than 45%) represent only 3% of the total area of IT Sete de Setembro (Figure 4).

Soils, Geology and Geomorphology

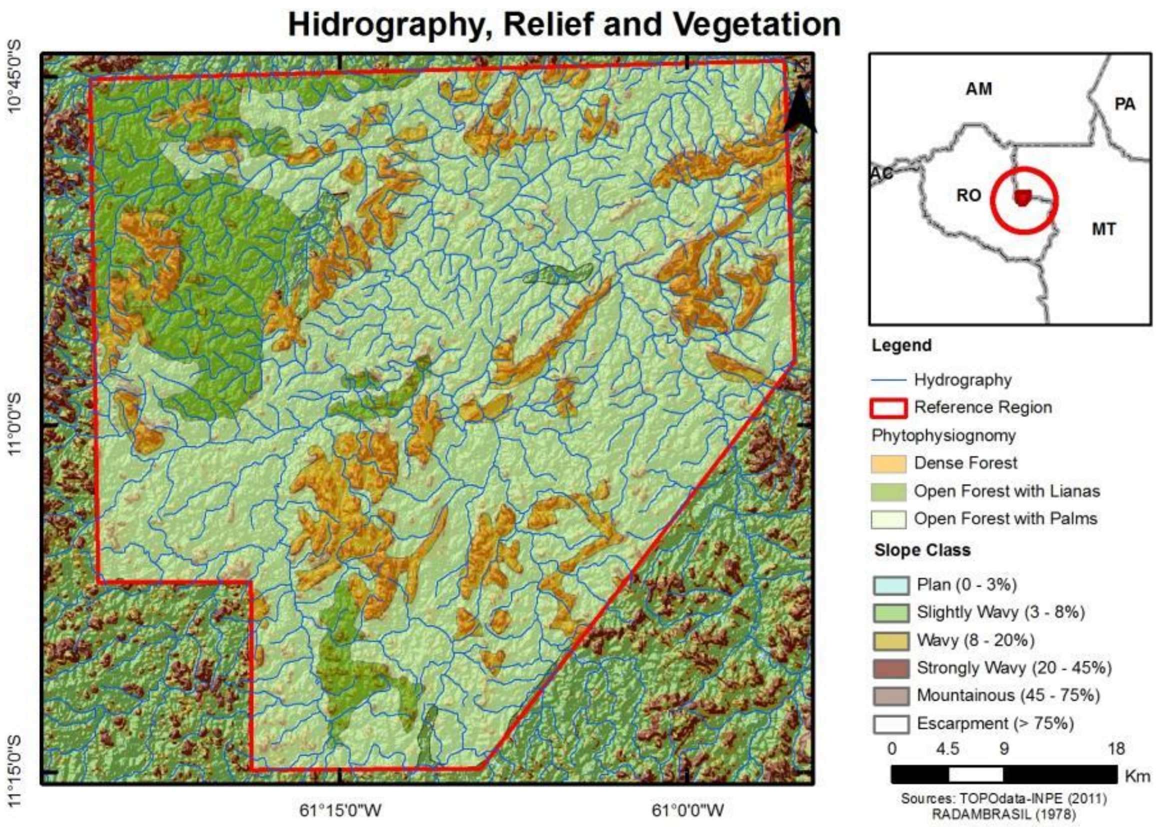
The TISS is among the geological formations of Pimenta Bueno and Serra da Previdência with rocks originating in the Paleozoic Era of the Cambrian Period[17].The soil is predominantly red-yellow podzolic *(Pry),* with variations in Eutrophic in more than 160,000 hectares, small patches of Alico *Pry* are scattered in the TISS, while *Pva* Dystrophic white soils , Alico Plinthic and Litholics are concentrated in the Northeast [18].

[15] Koppen 1948.
[16] Kottek et al.
[17] RADAMBRASIL 1978
[18] RADAMBRASIL *ibid.*

Hydrography

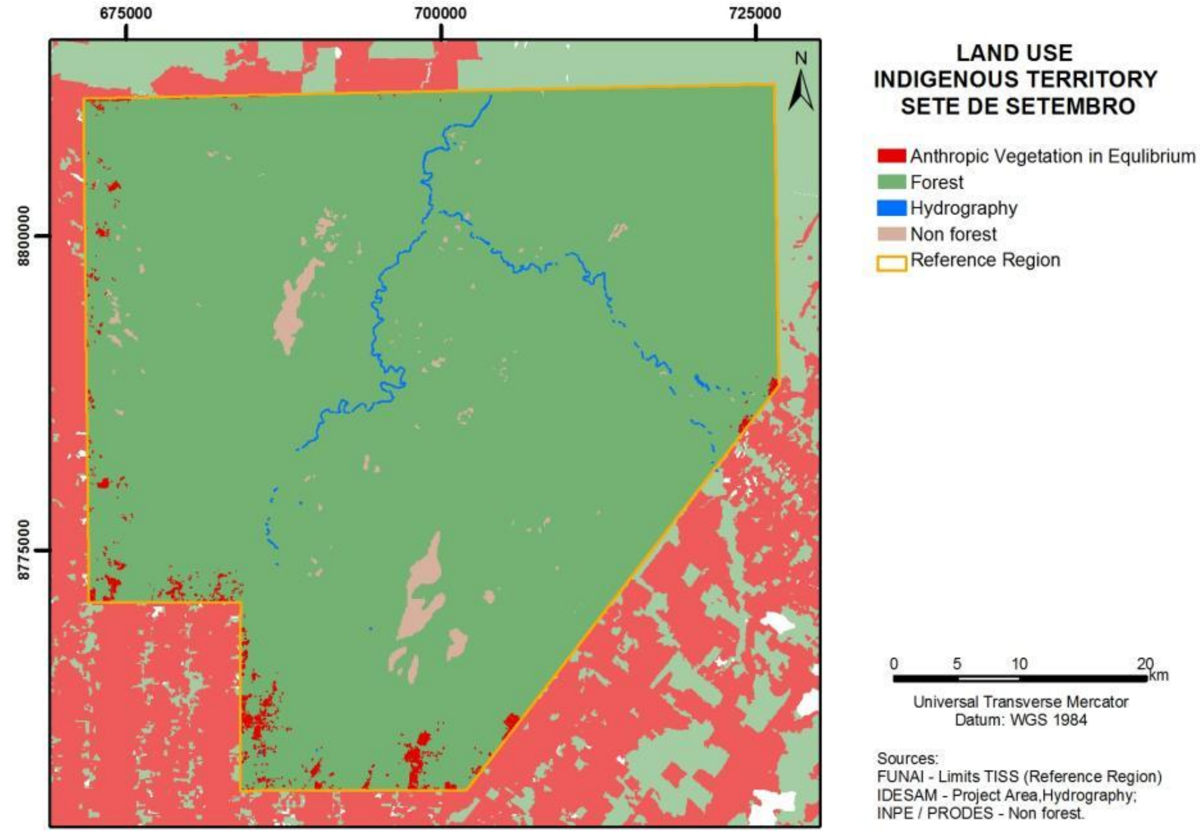
The TISS is located in the Amazon River basin in an important interfluvial region in the sub basin of the Madeira River. Noteworthy is the main tributary of White River, which cuts the IT in south-north direction following the Roosevelt River downstream flows into the Aripuana River, a tributary of the Madeira River. Its main tributaries with environmental and social importance are the Volta Grande River, Buritirana River, and the Fortuna and Fortuninha rivers both located in the southeast, and in the west the rivers Manuel, Gabriel and Catuva.

Figure 4. Topography, Hydrography and Vegetation in the IT Sete de Setembro



Within the TISS there are a variety of anthropic uses, including the areas of villages and pastures, agriculture and secondary vegetation, representing approximately 3,416.6 hectares in 2009 (about 1.4% of the territory) (Figure 5).The average rate of deforestation in this region between 2000 and 2009 was around 0.07% per year (157.3 ha/y). This ratio was calculated based on the clearing of areas of mature rainforests existing in 2000.

Figure 5. Land use and land cover in Sete de Setembro Indigenous Territory in the year 2009



Conditions and types of vegetation in the Project area

The TISS is covered by tropical rain forest vegetation with small patches of non-forest vegetation. The ombrophile vegetation sub-classes according to the definitions set out in the RADAMBRASIL Project (Figure 4) are: (i) - Open sub-montane rain forest, characterized by spaced individual trees and frequent clusters of palm trees, lianas and / or bamboo[19]. In the project area there are two types, with Palms *(Asp)* such as açaí *(Euterpe precatoria)* inajá *(Maximiliana* sp.) Paxiuba *(Iriartea* spp.) and Tucumã *(Astrocarium aculeatum),* and with Lianas *(Asc)* covered wholly or partly by woody lianas, (ii) - Dense sub-montane Ombrophyllous Forest, which is related to the topography, occuring in areas with higher slopes in mountains and hills. It has a uniform structure, with widely spaced trees with amaximum height of 40 meters, with or without palm trees and lianas. The dominant sub-class in the TISS is sub-montane Ombrophyllous Forest with palm trees, representing about 70% of the total area. The rest of the territory is almost equally occupied by the other two sub-classes. The Ombrophyllous Forest area PCFS suffered selective logging, reducing the carbon stock of tree species of commercial value.

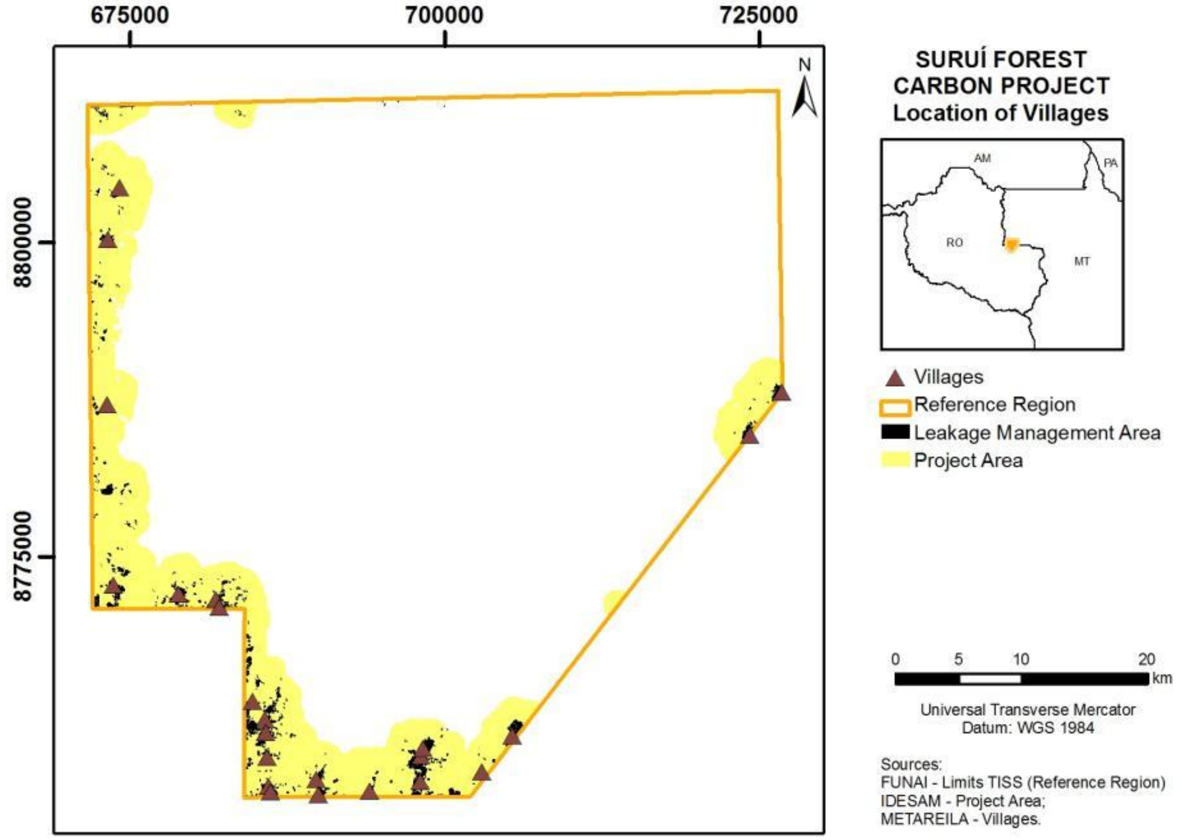
Information on communities

The indigenous people call themselves Paiter Surui, whose Portuguese translation made by the Indians means "real people"[20]. Along with other indigenous peoples of the region, such as the Cinta-Larga, Zoro and Gavião, the Paiter Suruí people speak a language of the Tupi Monde family. They have an organization based on clans, which are the basis of the governance system of political organization and system of kinship and marriage of indigenous people. Clans are Gameb, Gamir, Makor and Kaban, and the transmission of the clan is patrilineal, that is, from father to son.

[19] Veloso et al.1991.
[20] Middlin 1985.

The population of the TISS Paiter Suruí is arranged in 24[21] communities, with approximately 1,231 people (Figure 6). The population is 51% of men and 49% women. The age structure shows 54% of the population Suruí considered "active adults" (from the age of 15 and 80), 45% of children and young dependents (0 to 15 years) and 1% of elderly (over 80 years). This division also demonstrates the difficult recent history of this people who had high mortality rates between 1971 and 1980 from the spread of diseases of modern society, to which the people had no natural resistance[22] .

Figure 6. Location of villages in the TISS.



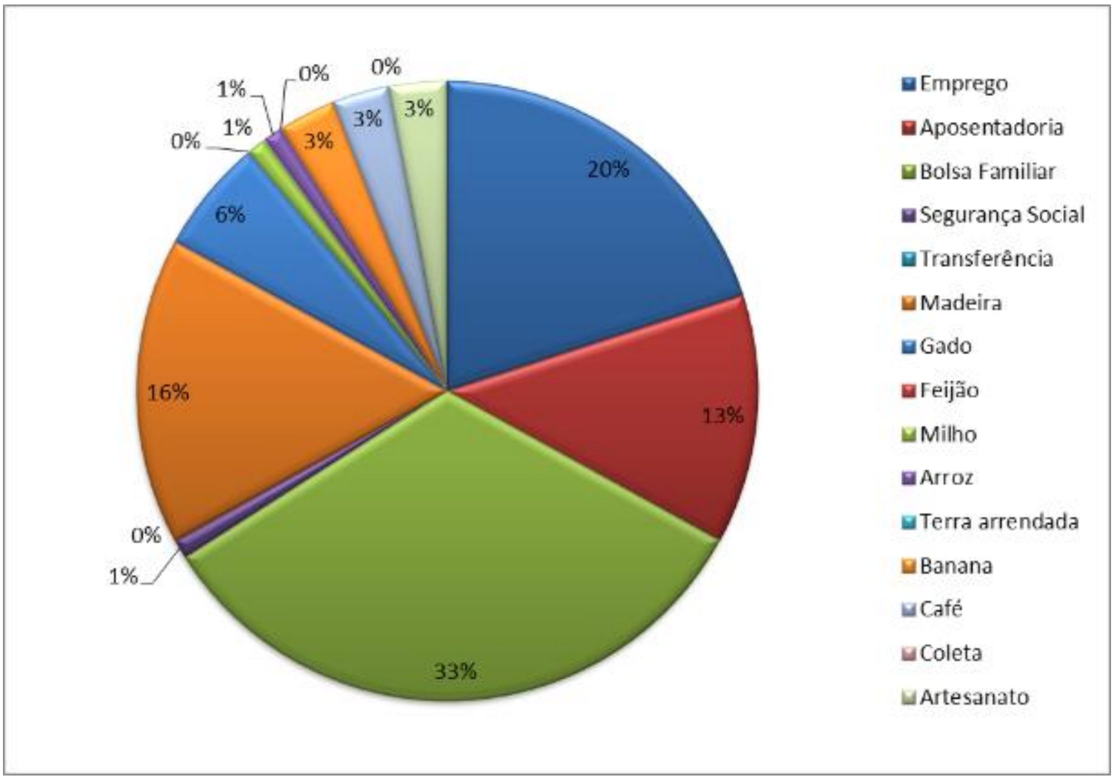
The social structure and the roles played by men and women is quite clear. Men carry out political functions and most significant commercial, while women have domestic duties. They help men in the fields and actively participate in collection activities, including Brazil nut, which is characterized as commercial. Craft production is carried out mostly by women, while there are few men who produce crafts. Currently in the process of political reorganization of the Surui, women have increased their participation, with a voice and active participation in some decisions, including getting to meetings and trainings, also facilitated by greater access to formal education. However, it can still be considered as quite shy participation of women in political and commercial decisions.

[21] Metareilá 2010.
[22] Metareilá *ibid.*


Traditionally, their way of life has always been based on the use of natural resources in the area, where hunting, fishing and gathering of forest products account for much of the livelihood and food security of the group. More recently the Paiter Suruí began to develop economic productive activities, through contact with loggers and ranchers who live on the outskirts of TISS. The people also began to receive financial aid from the federal government and FUNAI which represents an important contribution to the economy, representing 33% of the income earned by the population. Also the employees (teachers, health workers, sanitation officers, surveillance officers) and pensions, account for 20% and 13%, respectively (Figure 7). The only comparable activity currently in terms of income is logging (16%)[23] . Other alternatives such as coffee and bananas do not reach more than 6% of the total income of a family.

The health services provided to Indians by FUNASA do not meet their real needs and are characterized by users as poor and inefficient, and are not considered suitable for major cultural specificities of the indigenous culture.

Figure 7. Relative importance of different sources of income.



Source: 2010 Metareilá

[23] There are indications that the amount of wood harvested is greater than that presented by the report. What this means is that the income from this activity means more than 16% in relative importance

Culturally some shamanic practices stand out, such as traditional festivals of healing and magical objects considered by the natives. Currently, with the inclusion of evangelical churches in the villages and the Indians converting to this religion, there is much prejudice and demonization of shamanic practices, and these practices are falling into disuse today.

Current land use and property rights and traditional law, land conflicts and disputes.

Indigenous peoples have the exclusive right to use the natural resources of public goods with special use, legally defined as "Indigenous land", aiming at their physical and cultural reproduction, as is envisaged in the Constitution. The land ownership of 247,845 hectares of TISS is with the Union, and this makes the demarcation procedure formally recognizing this right[24].

Currently, there are at TISS 3416.6 hectares that has been deforested[25] , of which 2,252.5 are in use (for subsistence agriculture, in areas leased, coffee crops and pastures).

Figure 8. **Current land uses in the TISS.**

The history of land tenure conflicts include disputes over the Surui land use and demarcation of their areas. In the 70s and 80s there were various conflicts with settlers who lived on the outskirts of their territory and invaded and exploited their natural resources. This was relieved with the precise definition of the limits of their land[26], which has become more respected by the colonists. With the final demarcation, there were no relevant land disputes internal or external to the IT.

Still, the PCFS plans to implement a plan to maintain a constant communication channel open between all stakeholders and communities in the area surrounding the project. For resolving possible conflicts that may arise during the implementation of the project, everyone involved will be informed about this open channel for receiving any comments, suggestions or questions (described in more detail in Section 6).

The project does not envisage involuntary relocation of any individual or group. In the case of project activities, these will be implemented according to the TISS ethno-zoning. The Paiter Suruí themselves created the zoning and characterized the areas within the TISS according to their purpose (social, cultural, productive, religious, etc.). And activities provided by the project will be implemented respecting these guidelines. This zoning also identifies the existing villages, respecting the areas of housing and productive use, to ensure that no activity requiring relocation is established in these areas (Figure 9).

[24] The subsoil and mineral resources belong to the Union in accordance with Article IX paragraph 20 of the Brazilian Federal Constitution.
[25] See Supplementary Material 03 for details of the history of use and change of land use in the TISS.
[26] The demarcation of IT was in 1976, and permanent possession in 1561 was declared by the decree of September 29, 1983, and ratified by Decree No. 88867 of October 17, 1983, by President Joao Figueiredo.

Biodiversity Information

The biological inventories for mammals, birds, herpetofauna, fish fauna, fungi and vegetation were made in TISS between 2009 and 2010 in different ecosystems and forest types, and confirmed the high biological diversity present[27] .

Mammals occurring in the TISS were recorded for 48 species belonging to 23 families, especially 10 species of primates[28].According to the Brazilian list[29], nine species listed for the area of TISS are classified as *vulnerable* to extinction at high risk of extinction in the wild in the medium term. Of these nine species, seven are of the order Carnivora (five cats, one canine and one mustelidae), one of the order Cingulata and one of the order Pilosa. These species demonstrate the importance of the area for conservation of the TISS, mainly because it is an area connected to other protected areas. 46 of the 48 species of mammals are listed in a category of the IUCN Red List: three *endangered* species: the cuxiú monkey *(Chiropotes albinasus),* the woolly monkey *(Lagothrix cana)* and otter *(Pteronura brasiliensis)* ; 7 *Near Threatened* species: 3 *Vulnerable* species*,* 29 species of *least concern*, and four species with deficient data, that must be handled with care.

For the birds, although we identified the occurrence of 150 species in 45 families, the inventory was not conclusive, since the species curve had not stabilized. In an inventory on the Axe River in Ji-Parana (downstream of the river that cuts the IT Sete de Setembro) were found more than 400 species of birds, some which are new to science *(Alixii atrogularis)* and another first recorded in Brazil *(Sclerurus albigularis)*[30]. It is expected that a similar number of species occurs in the TISS and subsequent inventories should confirm this hypothesis. Of the 150 recorded species, 14 (or about 10%) are endemic to the Amazon, two of which *(Pyrrhura perlata* and *Lepidothrix nattereri)* are restricted to the Madeira-Tapajós zoogeographical sub-region[31] .

Herpetofauna were recorded for 26 species of amphibians and 41 reptile species, distributed in seven and seventeen families, respectively[32]. All tree species recorded occur in part or in the whole Amazon, some with wider distribution (outside the Amazon). Of the species of open areas, the majority either have a wider distribution on the continent or is connected to the diagonal of open formations in South America, especially in the Midwest region.

There were found 33 species of fish distributed in 14 families[33] . Although we sampled only species of medium size (between 100 and 450mm), the Indigenous Land also has large species that were not captured in the inventory. We identified four kinds of fish that the Suruí do not consume in certain situations.

For the diversity of fungi were identified 91 species in 23 families and 51 genera, of which 31 species were recorded only once during the collection period, which may indicate they are rare species to the region[34]. Some species collected, for example, *Mutinus Geastrum albonigrum caninus* represent the first occurrence in Brazil and is considered rare, and others are new records for the state of Rondonia and the Brazilian Amazon, making these areas of great importance for conserving these species and biodiversity in general. This pattern of occurrence of a few common and many rare species suggests that rare species have this condition because the populations are sparse or the habitat is rare[35] [36]

For woody plant species was sampled a total of 431 specimens, distributed in 40 families, of these, 11 families stood out with greater occurrence[37]. It has been found in this survey that the Burseraceae family was the most representative with a total of 51 species representing 19% of households inventoried, then the family Moraceae, with 14% of 35 specimens and Sapotaceae (13%) with 32 species[38].

[27] ACT, 2010
[28] Bonavigo et al.2010.
[29] Machado et al.2008
[30] Stotz et al.1997.
[31] Stotz et al. 1996.
[32] Valley Junior et al.2010.
[33] Melo et al.2010.
[34] Silva et al 2010.
[35] Lindblad 1998.
[36] Lindblad 2001.
[37] Souza et al.2010.
[38] Souza *ibid.*

Biogeography

The Indigenous Land is located in the Madeira River basin, in the 'Rondônia' interfluve of endemism, which includes the basins of the Madeira and Tapajos Rivers[39] with large numbers of endemic species of restricted distribution. The Madeira-Tapajós interfluve is considered as one of the major biogeographic regions of endemism of birds in South America[40] [41], showing also centers of endemism for other vertebrate groups such as butterflies and plants[42] [43] [44] [45]

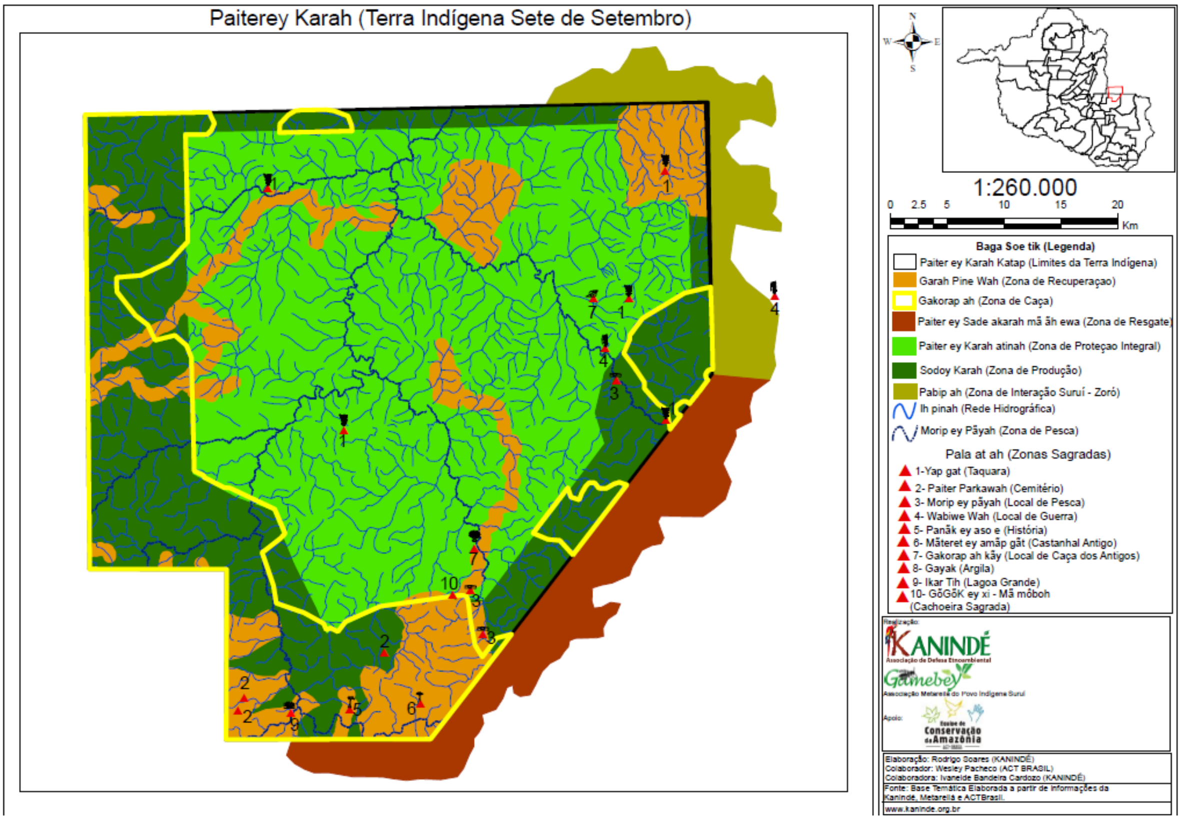
However, the Madeira River basin has only 17.1% of its area covered by protected areas and indigenous territories (with 1.2% overlap between them), a value lower than the average of the Amazon region (25%)[46] .Regions with such large areas of endemism require more comprehensive protection for their species are adequately represented in the system of protected areas[47]. Added to this the fact that the Madeira basin also has the largest area cleared of all the Amazon reaching about 11,400,000 ha[48].

The TISS has many attributes of High Conservation Value *(HCV),* and almost all of TISS is rated extremely important for biodiversity conservation, with the remainder classified as a small area of high importance for conservation[49] .The entire project area is a protected area that had, until then, the important role of containing the deforestation, being connected to other Indigenous Lands forming the Tupi-Monde corridor along with the IT Zoro, Roosevelt and Lourdes. The long-term persistence of biological diversity is best served with a set of protected areas for sustainable use and protection, which should be large enough to support a community of species and ecological processes at landscape scale[50] [51].

Critical and fundamental areas for the communities
According to the ethnozoning[52] (Figure 09) eight areas were identified that are sacred for cultural expression and/or spirituality in TISS. They can be divided into cemeteries, inhabited by local spirits, sites of local wars or areas for strict conservation. These sacred sites are extremely important to ensure the preservation of Suruí ethnic culture.

[39] Da Silva et al 2005.
[40] Haffer 1974.
[41] Cracraft 1985.
[42] Muller 1973.
[43] Brown 1977.
[44] Prance 1973.
[45] Haffer and Prance 2002.
[46] Trancoso et al 2010.
[47] Rodrigues and Gaston 2001.
[48] Trancoso et al 2010
[49] MMA 1999.
[50] Peres 2005.
[51] IUCN 2010.
[52] Kanindé et al.2010.

Figure 9. Ethnozoning IT Sete de Setember.



Although to a lesser degree than before the contact with the white man, the Paiter Suruí still use the natural resources of the territory for cultural, spiritual, material, medicinal and food products. According to the study of the socioeconomics of Paiter Suruí[53] and ethnobiological inventories it is possible to get an idea of their close relationship with its territory.

1.11 Compliance with Laws, statutes and other regulatory frameworks

National and international laws and regulations applicable to REDD +

The PCFS is in compliance with all Brazilian national legal framework, in particular but not exclusively limited to:

i) Principles and rules established by the **Federal Constitution,** in particular, the caput of Article 225, paragraphs I, III and single paragraph, as it demonstrates compliance with the duty of the Surui People towards environmental protection and contribution to the preservation and restoration of essential ecological processes;
ii) The commitments of the Brazilian state within the **United Nations Framework Convention on Climate Change (UNFCCC), ratified by Legislative Decree No. 1 of February 3, 1994;**
iii) **Federal Law No. 12,187, 2009** (establishing the National Policy on Climate Change) and the **Federal Decree 7390, 2010** (which regulates the National Policy on Climate Change) as well as all laws related to the mentioned legal instruments;
iv) **Federal Law No. 11,284, 2006** (which regulates the management of public forests for sustainable production and establishes the Forest Service), and the legislation related to it;
v) **Federal Law 6938, 1981,** regarding the National Environmental Policy and related legislation;
vi) **Law No. 4. 771 of 1965** establishing the Forestry Code;
vii)**The Provisional Measure No. 2186-16, 2001,** in particular with regard to genetic resources and traditional knowledge protection;

[53] Metareilá 2010.

With regard specifically to laws and regulations relating to REDD+, currently there is no established national or international law applicable to the PCFS. Still, there are some processes in place and PCFS analyzed all possible scenarios that would result in future REDD+ regulations.

Current UNFCCC negotiations indicate the implementation of REDD+ in phases *(phased approach),* within which, demonstration activities and pilot projects have their role recognized[54]. The PCFS is a pilot initiative and will help build capacity for the National System of REDD in Brazil and is also intended to serve as an example for the construction of the regulatory framework of the UNFCCC.

The Brazilian government recognizes the role and importance of pilot projects and sub-national REDD+ initiatives. This position has been presented at meetings organized by the Ministry of the Environment and the Forest Service for the establishment of a National System of REDD+. In 2009 a publication of the SFB / MMA highlighted the role of REDD+ projects and sub-national initiatives underway in Brazil, and specifically includes the PCFS[55].

In the policy context, meeting the demands of society, the environment committee of the House of Representatives in 2010 initiated a process of building a bill (PL) for the regulation of REDD in Brazil. The process was led by Congresswoman Rebecca Garcia (rapporteur) and Congressman Luis Carreira (coordinator of the Working Group PL REDD +), being built as a proposed substitute to the PL 5586/2009, authored by Mr Maia Ramos. On the procedural rules of the House, the bill was filed in 2010 and re-submitted by Mrs Rebecca Garcia in 2011, under number 195/2011 PL[56].The proposed PL 195/2011[57] includes fully implementing projects such as the PCFS. It should be noted that the same text of the bill was presented to 195/2011 proceedings in the Senate by Senator Eduardo Braga with the number 212/2011, which reflects the importance that has been given to this matter within the National Legislature.

We can conclude that there is an understanding that, while the regulation of REDD+ activities is not consolidated in Brazil and the UNFCCC, national programs and sub-national projects should be encouraged and implemented, provided principles, criteria and safeguards are in place and already are available and advanced levels of discussion. In this respect, we highlight the process of construction of "Socio-Environmental Principles and Criteria " for developing and implementing programs and projects of REDD in the Brazilian Amazon, an initiative of civil society organizations, which went through a process of 150 days of public consultations and 559 comments received from more than 180 people representing various sectors of Brazilian society[58] .

Besides participating in the construction of these principles and adopting environmental and social safeguards to be cited, the PCFS adopts protocols and methodologies already accepted and recognized internationally in the voluntary carbon market, which is why it is undergoing validation under the independent standards: Climate Community and Biodiversity (CCB) [59] and Verified Carbon Standards (VCS)[60].

The PCFS is being developed in full compliance with Brazilian environmental legislation and seeks primarily to integrate national policies related to climate change, helping to meet the goals and objectives (i) reduction of greenhouse gas emissions set out in National Policy Change climate[61], and (ii) to reduce deforestation under the National Plan for Prevention and Control of Deforestation in the Amazon[62]. Nevertheless, all the risks and implications related to further regulation of REDD in Brazil and the UNFCCC are being considered, so that the project will adapt to and integrate future scenarios that may be established for REDD+.

[54] UNFCCC 2011.
[55] SFB 2009.
[56] More information about the construction process and review of the Draft Law on REDD + can be found at: http://www.idesam.org.br/programas/mudancas/politicas_lei5586.php
[57] Can be found at http://www2.camara.gov.br/
[58] More information can be found at: www.reddsocioambiental.org.br.
[59] The *Climate, Community and Biodiversity Standards* (CCBS) has been the most widely used certification standard internationally for forest carbon projects in both the regulated and voluntary markets.In addition to verifying the potential impacts of climate-related projects, analyzes the impacts and benefits to be generated for communities and biodiversity. Further information: http://www.climate-standards.org/
[60] The *Verified Carbon Standards* (VCS) has increased focus on the specific calculations related to carbon and methodological issues.Available at: http://www.vcs.org/
[61] Law No - 12187 of December 29, 2009. Available at: http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2009/Lei/L12187.htm
[62] Brazil, PPCDAM 2004.

Laws and regulations relevant to the labor laws of the country

The Brazilian labor system complies, among others, with the rules defined by Decree-Law No. 5452, 1st May 1943 , approving the Consolidation of Labor Laws (CLT).This is the main legislative standard for the Brazilian labor law and establishing the rules governing the relationships of individual and collective work.

In the case of PCFS, the hiring of the Suruí people will be prioritized to carry out the functions envisaged by the project. In initial stages, hiring will be carried out by contracts directly between FUNBIO (manager of the Fund Suruí) and those hired, according to the form appropriate for the function (CLT, temporary contract, consulting, etc.), in accordance with Brazilian law. Where appropriate, the hiring process will be done by the Metareilá Association or other associations of the Paiter Suruí people. In both cases, those contracted to work will be informed of their rights at the time of hiring.

Approval from the appropriate authorities, including the established formal and/or traditional authorities customarily required by the communities

The PCFS has been widely discussed with the Federal Government, with FUNAI and the Ministry of Environment (MMA) that support the implementation of the project. FUNAI and the Attorney General's Office, who were consulted by PCFS, formally presented opinions that support the continuity of the PCFS (see supplementary material number 09). The Ministry of Environment (MMA) was also consulted and, although encouraging the implementation of PCFS, said it has no authority to endorse or jurisdiction over REDD projects in Brazil (see supplementary material number 11).

At the state level, the project has the support and approval from the State of Rondonia where the majority of the Suruí population is located and represents almost the entire area of the project in the TISS (see supplementary material number 08). Informal dialogues were initiated with the Government of the State of Mato Grosso, indicating approval for the continuation of the project.

In the case of traditional authorities and indigenous communities, as a project led by their own Indigenous Association of the Paiter-Surui people (Metareilá Association), obtaining a formal approval through a process of consulting the people evolved in a natural way, which resulted in the adoption and signing of a commitment made by the four clans of the Paiter Suruí people[63], considered to mark the start date of the project.

Free, prior and informed consent of all actors involved in the project or who will have their rights affected by the PCFS

The PCFS will be fully implemented within the limits of TISS. Thus, shows no overlap with any other public or private property.

The participation and commitment of the Paiter Suruí in the project was agreed through a process of "free, prior and informed consent," prepared jointly by ACT-Brasil and the Metareilá Association[64].The process involved several meetings and workshops to explain the project objectives, the proposed construction of participatory baseline, the Investment Plan, etc. The risks were reported and discussed beforehand, clear and transparent dialogue between indigenous communities and project participants who decided to go ahead with the PCFS by signing a memorandum of understanding.

The consent document attests that the Paiter Suruí had access to all necessary information on payments for environmental services, especially on carbon credits, allowing them to take an informed position on the conduct of this process, evaluating the risks and benefits that implementing sustainable development actions can pose to their way of life.

Illegal activities that may affect the benefits to climate, biodiversity and community generated by the project

[63] Metareilá 2009.
[64] Brazil ACT 2010.

There are several interpretations based on different legal instruments, regarding the legality of some of the activities undertaken by the Surui in the TISS. The Federal Constitution guarantees the right to indigenous lands traditionally occupied, embodied in the exclusive use of the riches of the soil, rivers and lakes in that area (paragraph 2, Article 231). The best legal doctrine considers that the enjoyment of the riches of their territory is guaranteed to indigenous peoples, including commercial use (unless prohibited by law), as long as it does not jeopardize their social and environmental sustainability. That is, the conduct of activities in indigenous land can not put at risk the future of the people, and the natural environment that ensures their physical and cultural reproduction. The legal instruments that may support such actions and meet the inalienability and unavailability are automatically void. In this context, the practice of leasing Indian lands is prohibited, as explicitly stated in the Indian Statute.

When considering other legislation, such as the Forestry Code, Article 3 (g), areas to maintain the environment necessary for the life of the Indians are considered Permanent Protection Areas (APP). And yet, Article 3-A, amended by Provisional Measure 2.166/67 of 24/08/2001 states that the exploitation of forest resources on Indian lands can only be carried out by indigenous communities under a sustainable forest management regime to meet their livelihoods. Based on this interpretation, we can conclude that the extraction and sale of wood from IT are illegal because they are not made through sustainable forest management.

Historically, the TISS has suffered invasion of external actors to exploit their natural resources, hunters and loggers, and causing other impacts such as fire. Moreover, the Indigenous were enticed to join outside actors to develop schemes such as sharecropping and leasing of land for pastures, and cutting and selling of timber in partnership with loggers in the region.

The cooperation agreement signed between the Surui clans is a crucial milestone which ensures that these illegal activities will no longer be developed in the territory. The PCFS will reverse this scenario by installing surveillance bases in border areas of TISS, the use of new monitoring technologies, the adoption of a surveillance system with Surui environmental agents, a fire brigade, construction of firebreaks, among others. It will also foster the development of new activities for sustainable land use that will replace more destructive production arrangements commonly developed in indigenous territory.

1.12 Ownership and Other Programs

1.12.1 Proof of title

The Surui People, according to their legal status of Indigenous People under the Brazilian Federal Legislation, have the legal and sole "natural" right of use of their lands according to article 20, XI, article 225, I, III, and article 231 of Federal Brazilian Constitution. The Surui People and consequently the Surui Project, as defined for the project documentation, bears the boundaries of the Project defined and recognized by the Decree number 88.867 dated of 18th October 1983 that was published by the competent legal Brazilian authority, which grants, the rights of use by the Surui People of such territory.

The Surui Project is in accordance with the national and international legal regime of Brazilian Indigenous rights and duties on the land use, environment protection, labor, sustainable management of forests and greenhouse gas mitigation, and meets more than one of the requirements as enunciated in Chapter 3.12 - Ownership and Other Programs; 3.12.1 – Proof of Title – VCS Standard and VCS Program Definitions (Right of Use and Proof of Title - Standard Version 3):

> 1) A right of use arising or granted under statute, regulation or decree by a competent authority.
> As it has been observed, the right of use of the Surui territory was established according to the Federal Brazilian Constitution "Magna Carta", and recognized by means of the Decree number 88.867 dated of 18th October 1983. The Decree was issued by the Brazilian competent authority and assures to the Surui People together with the Federal Legal Framework established by the Brazilian Federal Constitution the "right of use" and "Proof of Title".

Thus, we conclude that the Surui Project is in compliance with the requirement number 1) of 3.12.1 – Proof of Title VCS Standard Document.

> 2) A right of use arising under law.

The same argument, which was enunciated under requirement number 1) should be considered and applied to analyze the requirement number 2) The right of use of the Surui territory was established according to the Federal Brazilian Constitution "Magna Carta", and recognized by the Decree number 88.867 dated of 18th October 1983.The Surui Project is granted the right of use that arises from to the Brazilian Federal Law.

Thus we conclude that the Surui Project is in compliance with the requirement number 2) of 3.12.1 – Proof of Title VCS Standard Document.

In conclusion, the Surui People have the "right of use" expressed in the unconditional, undisputed and unencumbered ability to claim that the relevant project will generate or cause GHG emission reduction or removal.

The Surui People, represented by the Associação Metareilá do Povo Indígena Suruí (Metareilá), regarding GHG emission reduction or removal, have documentary evidence establishing conclusively the project proponent's right of use in respect of such reduction or removal, which grants them "Proof of Title".

1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable.

1.12.3 Participation under other GHG Programs

As mentioned earlier, currently there is no national or international REDD+ regulatory regime applicable to the PCFS. The PCFS analyzed all possible scenarios that would result in future REDD+ regulations and the project is being developed in order to integrate and comply with possible future regulatory regimes.

1.12.4 Other Forms of Environmental Credit

Not applicable.

1.12.5 GHG Projects Rejected by Other Programs

Not applicable.

1.13 Additional Information Relevant to the Project

Eligibility Criteria
Not applicable.

Leakage Management
No increases in greenhouse gas emissions are expected outside the boundaries of the project area (leakage), since the main agents of deforestation in the reference region (the Suruí themselves) will be involved in numerous preventive activities, as described in section 3.3 of this document.

Rather, it is expected that the implementation of the activities of PCFS contribute to the increase in carbon stocks across the reference region, considering the increases in carbon stocks in forests that have suffered selective logging. This expected increase in carbon stocks (carbon stock enhancement) in other areas of TISS is part of the plan of activities of the PCFS and will be developed later (Phase 2 of the PCFS) for quantification and possible generation of credits from REDD, when the project proponents obtain a specific methodology and agreements for its implementation.

Commercially Sensitive Information
Not applicable.

Further Information
Among the most striking features of this project is the role of the Paiter Suruí people to search for partners and alternatives to create the activities for the construction of this project and implementation of REDD+. The Paiter Surui people, led by Chief Almir Surui Narayamoga, joined forces since 2007 to reverse the loss of cultural identity and the strong trend of degradation and forest conversion to agricultural uses in the TISS.

One point to note is that this initiative is also to a great effort to unite these people toward obtaining financial and technical resources to achieve their goals.

The Paiter Suruí people themselves identified the process of deforestation and loss of their traditional culture and have sought alternatives to contain it. Thus, their 50-year plan for the territory is a demand prior to conception of PCFS, but which starting in 2009 began to incorporate the proposed use of REDD+ as part of its strategy. Through the PCFS, proponents predict obtaining financial resources for the transformation of existing sources of income, through the adoption of sustainable productive activities.

2 APPLICATION OF THE METHODOLOGY

2.1 Title and Reference of Methodology

The methodology used in the project is the Avoided Unplanned Deforestation- (AUD) - VCS VM0015

2.2 Applicability of Methodology

The Suruí Forest Carbon Project fits the conditions of applicability of the methodology established by the AUD, which has no geographical restrictions and is applicable globally under the following conditions:

a) Baseline activities include unplanned agricultural and grazing activities, considered unplanned deforestation according to the most recent VCS AFOLU guidelines.

b) Project activities can be classified as “Protection without logging, fuel wood collection or charcoal production,” one of the eligible categories defined in the description of the scope of the methodology (see table 1 and figure 2).

c) The project area includes different types of forest including old-growth forests, and degraded forests, meeting the definition of “forest”. [65]

d) At project commencement, the project area includes only land qualifying as “forest” for a minimum of 10 years prior to the project start date.

e) The project area does not include forested wetlands (such as bottomland forests, floodplain forests, mangrove forests).

Thus, the project complies with the specifications of the chosen methodology and use the four specified spatial domains: the reference region, the project area, leakage belt, and leakage management area, the latter three sub-regions of the reference region

The baseline of the PCFS is configured as "degraded and still degrading," and the project scenario is the "Protection without logging, fuel wood collection or charcoal production." The PCFS falls in category E (Table 1 VCS Methodology - VM0015).

For this category, an ex ante assessment of carbon stocks is required at the inception of the project for degraded forests. The PCFS conducted a survey of biomass in the field with credible methodology, as detailed in Supplementary Material 02.

2.3 Project Boundary

According to the methodology the boundaries of following areas of the project were established, as shown in Figure 10:

Reference Region: It is defined as the area of the TISS (Figure 10), a spatial unit legally recognized by the federal government covering 247,845 ha. The TISS was chosen because it best represents the conditions related to land use and change, with the following characteristics:

- **Agents and drivers of deforestation**:

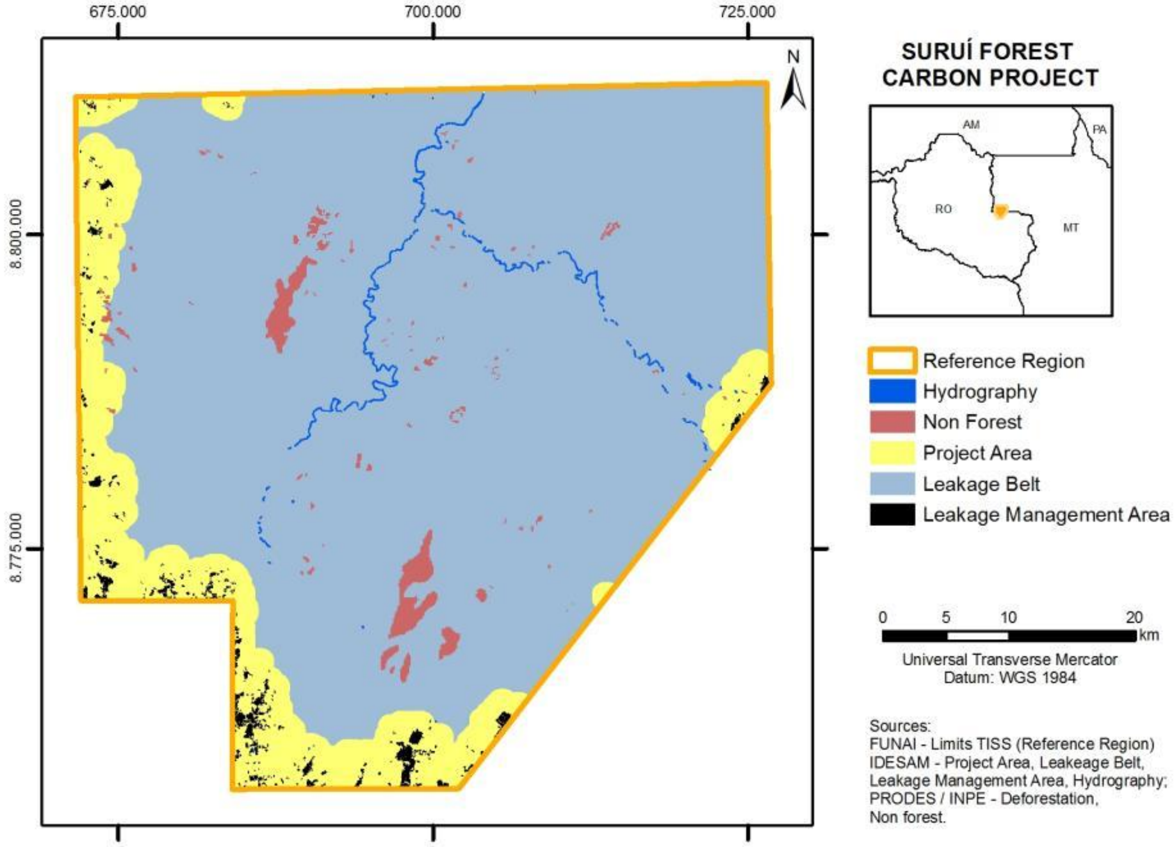
[65] According to the Brazilian government, the forest is a minimum area of 1 hectare of land with crown cover of more than 30% and with trees with the potential to reach a minimum height of 5 meters at maturity stage on the site.

- Historical rate of deforestation: 157.3 ha / year (0.07% pa)
- Paiter-Surui indigenous people, inhabiting 25 villages or towns, totalling 1,231 individuals in 2009. An indigenous people who traditionally performs subsistence agriculture, being enticed by logging companies and farmers to adhere to land use activities aimed at production for the market that increase the rate of deforestation.

- **Socioeconomic and cultural conditions**:
  - The Paiter Suruí belong to four clans, which determine the management of its territory. The legal status and land tenure is just one in the whole territory, and land use policies and enforcement are the same for the RR and the whole project area.
  - Government policies: few or inadequate government policies that cater to indigenous people Suruí. Since policies are unique to the indigenous people, the same policy is applied to the entire territory.
- **Landscape configuration and ecological conditions**
  - For the configuration of the landscape, the project area has the same (100%) forest class (in degraded Ombrophyllous Forest) as the rest of the reference region.
  - A total of 96% of the pixels of the project area (elevation between 171-473m) is within the range of elevation of the rest of the reference region (147-439m).
  - For the annual rainfall, considering the small area of reference in relation to the scale of the data on annual rainfall, it is assumed that 100% of the project area has the same annual precipitation as the rest of the reference region, which is 2000-2200mm.

Project area: it is defined as the forest extension that would be deforested in the baseline scenario of the project based on the spatial model of deforestation, expanded by a 1 km buffer allocation due to the uncertainty in the allocation of deforestation of this model, considering the methodology VM0015 can include other areas that are not projected to be cleared but are or may be threatened. This is where the project proponents intend to prevent deforestation that would occur in the baseline. This area totals 31,994.2 hectares (13% of TISS) of Degraded Ombrophyllous Forest.

Figure 10. Location of the project area, leakage belt, leakage management area and reference region for the Suruí Forest Carbon Project.



Leakage Belt: Area that is at risk of deforestation, surrounding the project area and within the TISS. According to specifications of VM0015 a mobility analysis was applied (option II, step 1.1.3) to define the leakage belt for the project. The leakage belt for the project should include areas which could be deforested by the Paiter Suruí (Figure 10). No evidence exists to indicate production and land-use activities of the Paiter Suruí outside of the TISS. Since their territory is relatively large for their population and has been recognized and demarcated by the Brazilian Government, it is extremely unlikely that the Paiter will move outside of the TISS seeking new areas for farming and logging, in the process exposing themselves to government sanctions for illegal practices in areas outside of their territory. In addition, the areas around the TISS are fully occupied by activities such as livestock and coffee. Forest fragments are insufficient to justify logging or deforestation for the establishment of pastures or crops. Although some Indigenous do emigrate from TISS, there is no record of any of them having acquired or worked land outside the TISS. Although it would be possible to consider the leakage belt only as the area likely to be cleared, it was decided to consider the entire forest area of the Reference region, except for the project area, as the Leakage Belt. Thus, the Leakage Belt has a total area of 208,038.9 hectares.

Leakage Management Area: Area cleared within the TISS by 2009, and classified as deforested since 2000/2001. This area covers 3,416.6 hectares and includes the production areas in pastures and agricultural areas, secondary and regenerating areas of the villages, where activities will be implemented to prevent the spread of deforestation for new areas of forest within the project scenario, according to the Ethnozoning and 50-Year Life Plan for territorial management by the Paiter Suruí people.

Surrounding area: Region beyond the TISS (surrounding area) where there may be impact of the project. Comprises the municipalities adjacent to the TISS.

GHG sources, sinks and reservoirs in the baseline scenario

This project only considers above ground and below ground biomass pools (Table 5). Instead of using an estimate of the literature, we chose to conduct a forest inventory in the TISS to estimate the aboveground biomass due to selective logging of the TISS which could have significant effects on the carbon stocks. We used a root-shoot ratio to estimate the below-ground biomass. The sources of greenhouse gases considered by the PCFS are detailed in Table 6.

Table 5. Carbon pools included or excluded within the boundary of the proposed AUD project activity (Table 3 Methodology VM0015)

Carbon pools	Included / TBD [1] / Excluded	Justification / Explanation of choice
Above-ground	Tree: Included	Carbon stock change in this pool is always significant
	Non-Tree: Included	Included within the definition of "vegetation in equilibrium" adopted by the project
Below Ground	Included	Equivalent to 26% of the emissions expected under the baseline scenario
Dead wood	Excluded	
Wood products	Included	Insignificatn. Significance test applied in 3.4
Litter	N	Not to be Measured According to VCS Program Update of May 24 th, 2010
Soil organic carbon	Excluded	Recommended When forests are converted to cropland. Not to be Measured in conversions to pasture grasses and perennial crop According to VCS Program Update of May 24 th, 2010.

Table 6. Sources and GHG included or excluded within the boundary of the proposed AUD project activity (Table 4 Methodology VM0015).

Sources	Gas	Included / TBD[1] [66] / Excluded	Justification / Explanation of choice
Biomass burning	CO_2	Excluded	Accounted for as changes in carbon stocks
	CH_4	Excluded	Not a significant source (<5%), according to the revised document LULUCF IPCC GL 1996.
	N_2O	Excluded	Considered insignificant under the VCS Program updates on May 24, 2010
Livestock Emissions	CO_2	Excluded	Not a significant source
	CH_4	Excluded	Not applicable to the project
	N_2O	Excluded	Not applicable to the project

2.4 Baseline Scenario

Analysis of historical land-use and land-cover change (Step 2 VM0015).

Collection of appropriate data sources (2.1 VM0015)
This sub-step used eight Landsat 5 TM satellite images between 2001 and 2009 to define the project's LU/LC classes (Table 7).

Table 7. Data used for historical LU/LC change analysis (Table 5 Methodology VM0015)

Vector (Satellite or airplane)	Sensor	Resolution		Coverage	Acquisition date	Scene or point identifier	
		Spatial	Spectral	(km^2)	(MM/DD/YY)	Orbit	Point
Landsat 5 - Land Remote Sensing Satellite 5	TM	30m	0.45 – 2.35 µm	34,225	8/12/2001	230	068
Landsat 5 - Land Remote Sensing Satellite 5	TM	30m	0.45 – 2.35 µm	34,225	8/18/2003	230	068
Landsat 5 - Land Remote Sensing Satellite 5	TM	30m	0.45 – 2.35 µm	34,225	9/5/2004	230	068
Landsat 5 - Land Remote Sensing Satellite 5	TM	30m	0.45 – 2.35 µm	34,225	5/8/2005	230	068
Landsat 5 - Land Remote Sensing Satellite 5	TM	30m	0.45 – 2.35 µm	34,225	6/26/2006	230	068
Landsat 5 - Land Remote Sensing Satellite 5	TM	30m	0.45 – 2.35 µm	34,225	6/26/2007	230	068
Landsat 5 - Land Remote Sensing Satellite 5	TM	30m	0.45 – 2.35 µm	34,225	7/30/2008	230	068
Landsat 5 - Land Remote Sensing Satellite 5	TM	30m	0.45 – 2.35 µm	34,225	9/3/2009	230	068

Definition of classes of land-use and land-cover *(2.2 VM0015)* [67]

For each image displayed in Table 7 a mask was applied based on non-forest vegetation (Savannah) of the Amazon Cartographic Base[68] (scale 1:100,000). In each LANDSAT image was used Supervised Maximum Likelihood Classifier of the ENVI 4.8 software, with the option to classify 100% of the pixels.

[66] Available at: http://cdm.unfccc.int/EB/031/eb31_repan16.pdf

[67] All the necessary requirements of the methodology VM0015 are presented in detail in the supplementary material 03: 2.4.1 Pre-processing steps; Interpretation and Classification 2.4.2, and 2.4.3.Post processing.
[68] Ministry of the Environment 2010.

For the training of the Maximum Likelihood classifier we used 105 control points taken during the field visits and for recognition of the IT forest biomass inventories. The classification was validated using the 337 control points collected from the visual interpretation of high resolution imagery. The classes used for validation were: forest, secondary vegetation, bare soil or pasture, burned areas and water.

After classification, the classified pixels were grouped into three classes:

1 -) Ombrophyllous Forest in Degradation **(240,028 ha)** includes vegetation types of tropical rain forest with logging. This class includes all areas classified as forest in 2009 and that did not change class between 2000 and 2008 (Figure 11). It is known that since 1983 there is selective logging in the TISS. The field surveys, reports of the natives, satellite images and an overflight indicate that almost the entire area has been logged, although it was not possible to specify exactly what proportion of the area. All pixels classified as secondary vegetation in altitude range of 344-478 meters were considered to belong to this class. It is know that RS results biased on classification at hilltops and steep areas. Therefore, we opted to consider such pixels to belong to this class based on the fact that PRODES deforestation data for the TISS on this altitude range was zero.

2 -) Anthropic Vegetation in Equilibrium **(3,416.6 ha):** This class combines classes of bare soil or pasture, secondary vegetation below 344 meters of altitude (originating from pasture and agriculture) and recent burned areas, which have been classified as a class distinct from non-forest. This vegetation also includes the productive areas.

3 -) Non-forest **(4,073 ha):** this class includes the non-forest vegetation (Savannah) of the IBGE map (scale 1:100,000). It also includes water, or hydrography, obtained from the classification with the method of maximum likelihood.

For the purposes of accounting for carbon stocks, non-forest areas were excluded from the land-use classes used for calculation of changes in carbon stocks. They are also excluded in the projection of deforestation in the baseline.

Table 8 below shows the list of all the land uses and land cover at the project start date within the reference region. It is worth mentioning that item 6.1 of Part 2 of VM0015 indicates that if a forest class has predictably growing carbon stocks (i.e. the class is a logged or a secondary forest) and the class is located both in the project area and leakage belt, two different classes must be defined (VM0015 p. 37).

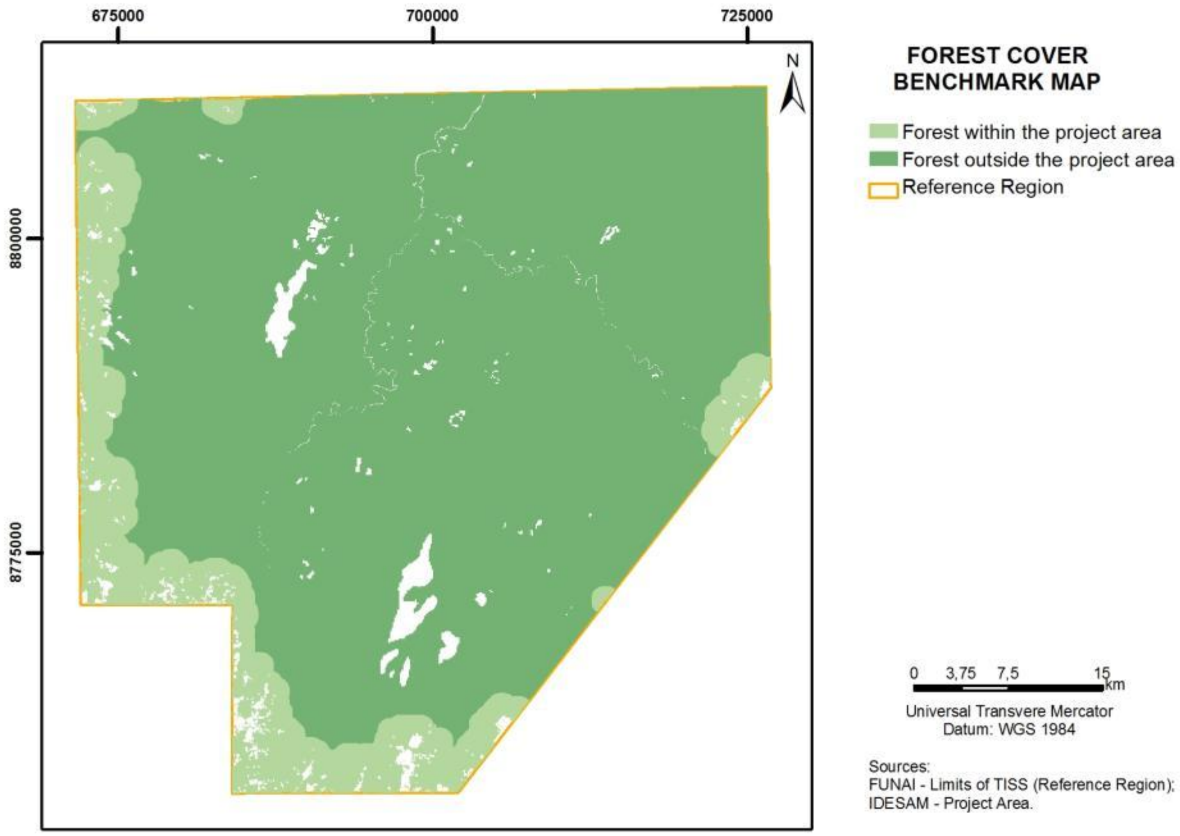
Table 8. List of all land use and land cover classes existing at the project start date within the reference region. (Table 6 Methodology VM0015)

Class Identifier		Trend in Carbon Stock [1]	Presence in [2]	Baseline activity [3]			Description
ID $_{cl}$	Name			LG	FW	CP	(Including unambiguous criteria for boundary definition)
1	Degraded Ombrophyllous Forest	Decreasing	PA	Yes	No	No	Forest being logged within the project area
2	Degraded Ombrophyllous Forest	Decreasing	LK	Yes	No	No	Forest being logged within the leakage belt
3	Anthropic Vegetation in Equilibirum	Constant	LM	No	No	No	Mosaic of vegetation that includes pastures, annual and perennial crops, and secondary vegetation.

1. Note if "decreasing", "constant", "Increasing"
2. RR = Reference region, LK = Leakage belt, LM = Leakage Management Areas, PA = Project area
3. LG = Logging, FW = Fuel-wood collection; CP = Charcoal Production (yes / no)
4. Each class Shall have a unique identifier (ID $_{cl}$).The Methodology icl Sometimes uses the notation (= 1, 2, 3, Icl) to Indicate "initial" (pre-deforestation) classes, Which are all forest classes, and fcl (= 1, 2, 3, ... FCL) to Indicate final "(post-deforestation) classes. In this table all classes ("initial" and "final") shall be listed.

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

Figure 11. Forest Cover Benchmark Map.



The Project presents two categories os land use and land use change, as showned in table below.

Table 9. Definition of land use and land use change categories **(Table 7b Methodology VM0015)**

ID_{ct}	Name	Trend in Carbon stock1	Presence in 2	Activity in the baseline case 3			Name	Trend in Carbon stock	Presence in	Activity in the project case		
				LG	FW	CP				LG	FW	CP
I1/F1	Degraded Ombrophyllous Forest	Decreasing	PA	Yes	No	No	Anthropic Vegetation in equilibrium	Constant	LM	No	No	No
I2/F1	Degraded Ombrophyllous Forest	Decreasing	LK	Yes	No	No	Anthropic Vegetation in equilibrium	Constant	LM	No	No	No

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

Annual deforestation rates were derived from an assessment of land cover and land use changes based on the images listed in Table 7. These rates correspond to the conversion of Degraded Ombrophyllous Forest to Anthropic Vegetation in Equilibrium.

Maps of consecutive years (e.g., 2004/2005) were compared using map algebra in GIS. The deforestation rate was calculated by subtracting the differences in area (in hectares) between vegetation classes for the years considered. A felled forest or deforestation were not considered to return primary forests during the analyzed period (2001-2009). In order to isolate the changes in any given year, a mask of previous years' deforestation was applied to the analysis. For example, when the changes between the years 2004/2005 were analyzed, a mask of the deforestation that occurred between 2001 and 2004 was applied to the 2005 map; as a result, only the changes between 2004 and 2005 were identified in that analysis.

The analysis of historical land use between 2001 and 2009 showed that 1,415.8 hectares were deforested in the Surui territory during that period, totaling 3,416.6 hectares of deforestation accumulated in Anthropic Vegetation (Table 10, Figures 12 and 13).

Figure 12. History of Deforestation in the Surui Territory between 2001-2009.

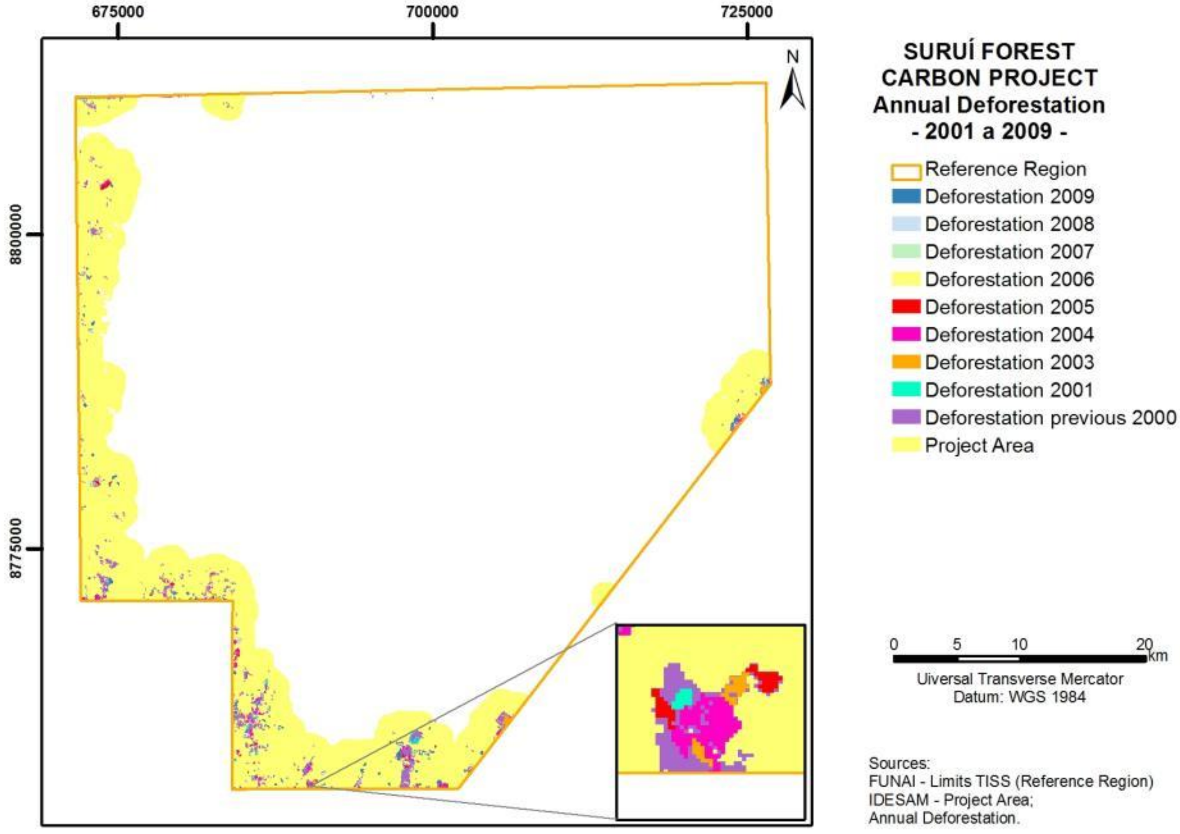


Table 10. Land-use and land-cover change matrix in Reference Region between 2001 and 2009 (Hectares) ***Table 7.a. Methodology VM0015***

		Initial LU / LC class			
	ID cl	*Degraded Ombrophyllous Forest in PA*	*Degraded Ombrophyllous Forest LK*	*Anthropic Vegetation*	*Final Area*
Final LU / LC Class	*Degraded Ombrophyllous forest in PA*	31,994.2	0	0	31,994.2
	Degraded Ombrophyllous Forest LK	0	208,038.9	0	208,038.9
	AnthropicVegetation PA	0	1,415.8	2000.8	3,416.6

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

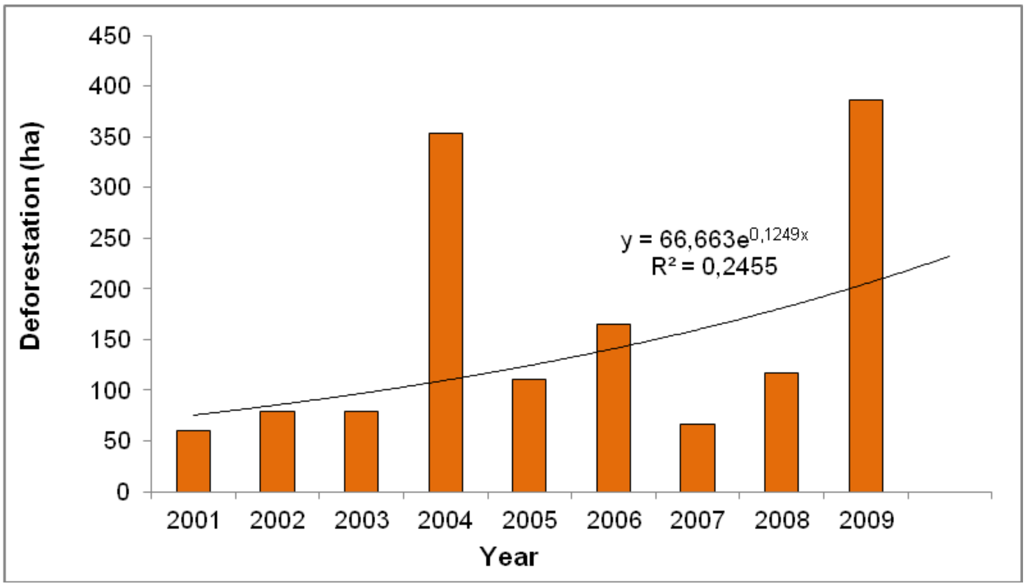
Identification of Agents of Deforestation (3.1 VM0015)

Following the fieldwork (including group meetings and individual questionnaires) and the analysis of socioeconomic data collected by the Metareilá Association, the Suruí people themselves were identified as the sole agents of deforestation. They control their territory and have strategically located new villages to prevent the theft of wood while upholding agreements with timber companies for selective logging in their territory since the mid-1980s. Although that logging did not result in direct deforestation, it has allowed cash income to enter the Surui economy. Since 2000, the Surui have invested part of the timber revenues in productive activities that result in deforestation. Legally, indigenous people posses the real usufruct or right of the land, and as the income from timber has been reduced, the Surui have searched for new sources of cash inflows for their economy. As a result, they have made agreements with ranchers and farmers in the surrounding region that bring in capital and outside labor for the establishment of temporary pastures, crops, and perennial systems--productive activities that are either managed directly by the Surui or by external agents on leased land in the Surui territory[69] These agreements were initiated in the last 10 years and are gradually increasing. Thus, deforestation is a result of the socio-economic impacts of the logging, as the income obtained from timber agreements is invested in productive activities that cause deforestation. At times, though infrequent, these lease arrangements have been made with relatives of white women who have married into the Surui community, adding another dimension to the complex relationship between the Surui and external actors.

The population of the Surui has grown since initial contact in 1969, when there was a massive amount of deaths due to disease. Between 2000 and 2009, the birth rate was 4.3% per year, ranging between 3.2% and 5.1% (for details see Appendix 4).[70]

The analysis of land use and land use change found a total deforestation of 3,416 hectares through 2009. The average annual deforestation between 2001 and 2009 was 157.4 hectares, with a clearly increasing trend through that period (Figure 13). From 2001-2004, the average deforestation rate was 142.9 hectares per year, while from 2005-2009 the average deforestation rate was 168.9 hectares per year. The total deforestation in the period 2005-2009 was 844.4 hectares.

Figure 13. Annual Deforestation in the Surui Territory between 2001 and september 2009.



* Average of the annual rate derived from images from 2001 and 2003.

Identification of deforestation drivers (3.2 VM0015)

This analysis has identified three drivers impacting the amount of deforestation in the reference region.

1) Cash income from external actors: economic drivers are present in 80% of the causes that explain deforestation around the world[71]. In this case, the main driver of deforestation is the dependence on externally-sourced, cash income in the Surui economy. This need for cash income justifies the Surui's agreements with loggers, settlers, and small farmers from outside the community. Although these groups do not inhabit the reference region (i.e., the Surui territory) they develop activities that impact forest cover in the IT with the consent of the Surui. For instance, it is estimated that over 70% of the territory has already suffered from selective logging[72]. The pressure for logging currently comes from three centers located less

[69] Idesam 2010
[70] FUNASA 2010
[71] Geist and Lambin, 2002
[72] Supplementary Material 2 - Carbon Inventory in TISS

than 50 km from the Surui territory boundaries: Cacoal (63,000 m^3/year), Ji Parana (64,000 m^3/year) and Espigão D'Oeste (184,000 m^3/year), totaling 311,000 m^3 of wood extracted by 61 timber companies per year.[73] This does not include the demand of 6 timber companies operating in Rondolândia (MT) in the far northwest of the Surui territory. Beyond pressures from logging companies, public agencies that should be combating illegal deforestation are involved in illegal logging arrangements that permeate all of these logging centers in the Amazon[74]. Although not "direct agents" of deforestation in the Surui territory, timber companies act as drivers by generating revenue for the Suruí. The Surui have used this timber revenue to finance the establishment of agriculture fields, pastures, and coffee plantations, in addition to facilitating the acquisition of property and an array of goods.

There is also external pressure for the establishment of pastures and agricultural plantations, driven by ranchers and farmers from outside the Surui territory. Mainly, the Suruí have leased these actors land or established sharecropping agreements. Many of these people were settlers or persons living in various kinds of officially-sanctioned settlements. These two groups of actors are creating a demand for opening the forest areas in the TISS, and the Surui are increasingly adhering to these activities. Often, the Suruí also undertake their own activities, investing the proceeds from timber or other sources in agriculture and/or ranching to ensure cash income in their economy.

The difference between revenues (i.e., from timber, livestock, agriculture, government assistance, employment, non-timber forest products, and handicrafts) and annual expenses (i.e., food, energy, transportation, healthcare, leisure, etc.) is captured in an annual financial statement of the Suruí households[75], which in turn tends to impact the amount of deforestation occurring in the Surui territory. If there is a net financial surplus, some of it is invested in clearing the forest for the expansion of agricultural activities and livestock. If there is a lack of surplus, there is an increase in sharecropping and tenancy agreements, which in turn increases deforestation. Thus, in this scenario, future deforestation trends are increasing as the Suruí elect to pursue agricultural activities and ranching as a viable means to obtaining income. All income sustainably generated by the project activities will serve to reduce reliance on the deforestation-driving sources of income, namely logging, sharecropping systems, and tenancy.

2) Population growth: although the birth rate appears to be decreasing, the population of the Surui is still growing. FUNASA data through 2009 was used to determine birth and death rates (Table 11). Holding migration rates proportionally constant, population growth was extrapolated for 30 years. Whereas in 2009 the Suruí population consisted of 1,142 individuals[76], it is estimated to consist of 2,504 individuals in 2038. (See Appendix 4).

Table 11. Historical Demographic Data (FUNASA,04/06/2010)

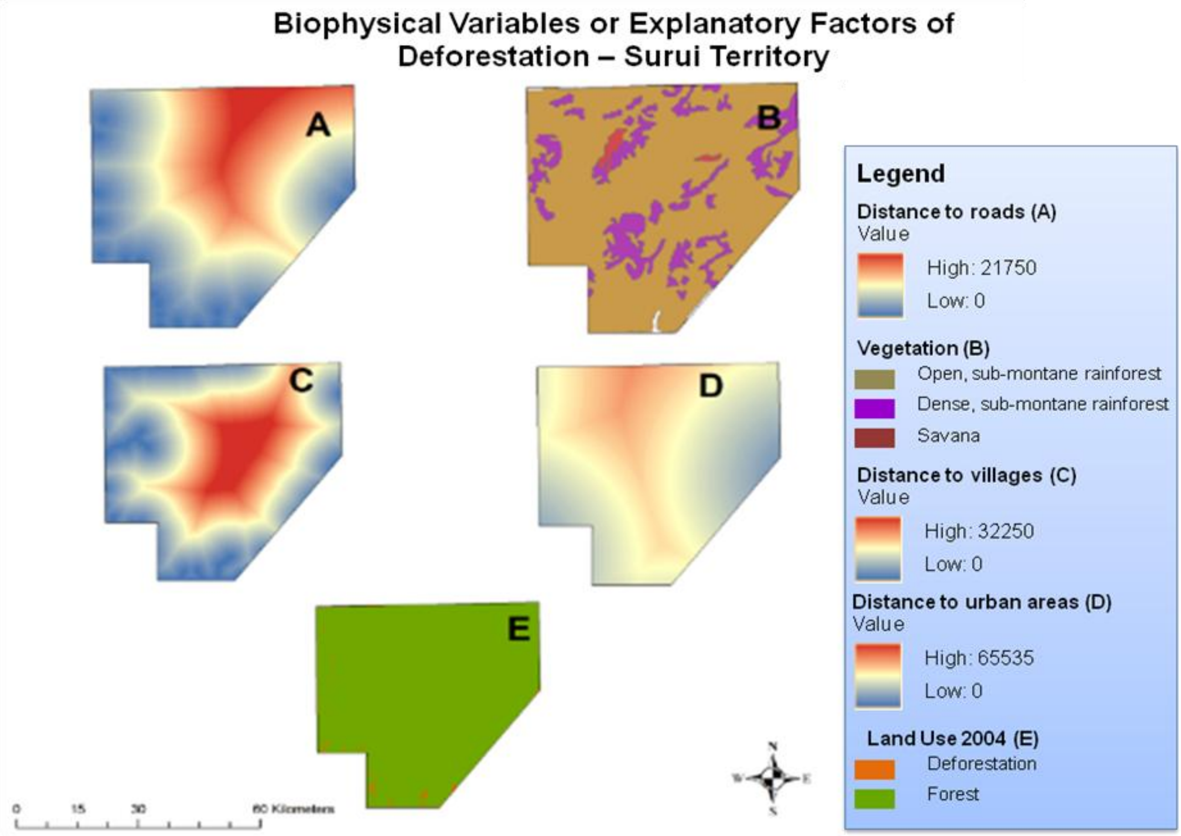
Date	Births	Deaths	Total Population	Birth Rate	Mortality Rate
2000	31	0	794	0.039	0
2001	43	5	836	0.051	0.006
2002	39	2	874	0.045	0.002
2003	41	2	910	0.045	0.002
2004	48	2	956	0.050	0.002
2005	36	2	988	0.036	0.002
2006	44	2	1029	0.043	0.002
2007	49	1	1076	0.046	0.001
2008	43	7	1117	0.038	0.006
2009	37	1	1149	0.032	0.001
			Mean	**0.043**	**0.0027**

[73] Patel et. al 2010
[74] In 2005, at the peak of logging in the region, the Federal Police broke up a gang that was active in several municipalities of Rondônia, such as Cacoal and Ji-Parana, with the support of logging companies, lawyers, IBAMA and State Highway Patrol, who worked in the forgery of Authorizations to Transport of Forest Products - ATPF; tampering ATPF's true, the creation of shell companies for the sole purpose of acquiring ATPF's; misrepresentation server as the registration data of inventory control and inspections carried out in the timber; receipt of bribes by civil servants, particularly the federal tax agency, inserting bogus claims of wood in Sismadi, providing ATPF thereof; use ATPF's fake or adulterated by chemical washing, corruption servers IBAMA by brokers and loggers; practice administrative law, use of third parties as "oranges" to open up ghost companies, some with home addresses and even in cemeteries, fraud audits, approval of irregular entries of companies, and release shipments of illegal timber, as well as countless other practices criminal. "URL: http://www.estacaovida.org.br/site/noticias/especial_gravacoes_telefonicas_comprovam_corrupcao_no_ibama_e_fema_diz_juiz.icv.
[75] Metareilá 2010.
[76] The Surui population census in 2009 result in 1,231 individuals, although only 1,142 individuals is active in the Suruí Territory according to Metareilá data survey in 2009.

3) Increased labor available: the Suruí population increased from about 250 people in mid-1970 to 1200 people in 2009. Currently, nearly half of the population is under 15 years of age. The current labor force available consists of about 534 individuals. It is estimated that in 2038, 949 individuals will be available to provide labor for land use activities and land use changes, representing a force capable of greater damage than today's. That figure already excludes the proportion of the Surui who have salaried payment and who do not contribute to land use activities. Under the project, this available labor will be absorbed by the alternative income-generating activities.

Five drivers showed a positive correlation with the location of deforestation observed in the Surui territory in the period from 2001 to 2009 (Figure 14). These variables were tested, in pairs, to verify the association or spatial dependence, using the Cramer indices (V) and the Joint Information Uncertainty (JIU)[77].

Figure 14. Maps of Biophysical Variables to Explain the Distribution of Deforestation in the TISS.



The variables that best explain the spatial distribution of deforestation were determined to be:

1) Distance to the village: Land use changes that occurred within the Surui territory took place around the villages inhabited by the Surui families or communities. Thus, the distance to the villages is an explanatory variable of deforestation.

2) Distance to prior deforestation: The accessibility of forest areas is influenced by their proximity to areas that have already been cleared for pasture or cropland[78].

3) Distance to roads: Forests that are near roads are generally more accessible and are more susceptible to deforestation for agricultural and livestock systems. Several authors suggest that proximity to roads increases the likelihood of deforestation[79]. This variable's impact in the reference region was confirmed in the field. The spatial layer considered primary roads and secondary roads together, including roads built by

[77] Bonham-Carter 1994.
[78] Rudel and Roper 1997.
[79] Ferreira 2001, Nepstad et al.2001, Souza et al. 2004 and Ferreira et al. 2005

loggers in the Surui territory. Roads facilitate the progression of deforestation in the Surui territory and, thus, are considered an enabling factor of deforestation.

4) Distance to urban areas: Distance to the cities is an extremely important factor to consider when spatially modeling deforestation. Areas are often deforested for productive activities, and the products of these activities are transported to the nearest urban markets. The variable distance to urban patches (*proxy*) appropriately defines the transportation cost of a productive activity. The spatial layer included urban areas obtained from a 1:100,000 scale map[80].

5) Types of vegetation: As vegetation is associated with the geography of the Surui territory, and vegetation types occurring in flat areas (i.e., the sub-class open lower montane ombrophyllous forest) were considered most susceptible to deforestation, given the ease of access.

Identification of underlying causes of deforestation (3.3 VM0015)

Historically, official policies concerning indigenous people in Brazil have been characterized by protection and government assistance, though it is gradually moving toward a new model anchored by technical assistance programs, indigenous NGOs and major regional economic development projects[81]. In 1982, as part of the old model, the president of FUNAI encouraged logging in the Surui territory from 1986 onwards, on the grounds that FUNAI would not otherwise have the financial resources to meet the needs of the Suruí Indigenous Community[82]. Indeed, this pressure for logging is still present[83]. A lack of sustainable alternatives to logging for generating income coupled with public policies for rural credit and incentives for destructive activities such as farming greatly contribute to this pressure be present in the current and baseline scenarios.

Generous subsidies for ranching companies from the Superintendency of Development for the Amazon (SUDAM) attracted capital to the Amazon region in the 1960s, greatly impacting forest cover.[84] For example, Gleba Corumbiara (a huge block of land) in the south of Rondonia was auctioned at the end of the 1960s. The military government spent more demarcating the boundaries of the land than the land earned when it was sold, and buyers earned more by selling the timber on their lots than they paid for the land[85]. This policy model prevailed throughout the Amazon and was responsible for the rapid advance of deforestation as well as the displacement and extinction of several indigenous groups. Subsidies for rural credit lines were higher in the Amazon than in other Brazilian regions, and these subsidies increased dramatically between 1974 and 1981[86]. Even today, such subsidies play an important role in providing and attracting capital to deforestation activities[87]. INCRA has also encouraged inappropriate land uses, considering at that time was that deforestation was an improvement on the land. Forests in poor and fertile soils alike have been deforested as a result of official settlement projects or other settlement activities, as migrants can obtain certain property rights to the land that they occupy by cutting down forest and planting their own crops. The rapid establishment of pastures that has been observed in Rondônia appears to be the result of a combination of institutional and political factors as well as the low quality of land in most official settlement areas. In places accessible by road, this combination has contributed to an increase in the amount of areas cleared for pastures. The remnants of forests in the landscape surrounding the reference region (i.e., the Surui territory) are only in areas that are not accessible by roads or in indigenous lands and conservation areas.

With the rising price of land, the exhaustion of already-cleared areas available for expanding production, and the opportunity to engage in leasing or sharecropping for prices much lower than the cost of acquiring new land, neighboring farmers and ranchers are increasingly pressuring the Suruí to use the land in their territory. Meeting these demands would offer an easy way for the Suruí to increase the cash income to their households, filling in the gap of income lost to the reduction of commercial logging in their territory.

[80] Ministry of the Environment 2010.
[81] Lima and Barroso-Hoffmann 2011
[82] Testimony of Almir Surui Narayamoga the Federal Police on 14/09/2006.
[83] Available at: http://www.ecodebate.com.br/2011/06/16/denuncia-coordenador-do-grupo-de-trabalho-amazonico-e-lider-do-povo-surui-e-ameacado-de-morte/
[84] Mahar 1979, Hecht et al 1986.
[85] Documentary Corumbiara 2009.
[86] Mahar 1989.
[87] Fearnside 2008.

The future trend of these underlying causes of deforestation will tend to remain as before, as government policies still prioritize subsidies for large ranching companies[88]. In addition, "the weakening of FUNAI or legal changes since 1988 have generated a policy gap which has been and should continue to be filled by creative approaches"[89]. This is a gap that needs to be addressed by projects seeking to develop alternative sources of income as well as ongoing training, be these from private companies, NGOs, or donors. This project seeks to promote new economic alternatives for the Suruí to replace sources of income from logging and more destructive productive activities.

Analysis of the chain of events leading to deforestation (3.4 VM0015)

The vast majority of indigenous territories located in the arc of deforestation are surrounded by pastures and other agricultural activities. Currently, global demand for agricultural commodities has increased the opportunity cost of conserving these areas of standing forests in much of the Brazilian Amazon[90]. The set of underlying causes of deforestation described above is a result of all the institutional, political and economic policies that represent the Amazonian context. These causes reflect the historical context and baseline scenario that has existed since the beginning of the colonization of the Amazon region and contact with indigenous peoples. This includes solicitation by loggers and farmers to fill the implementation gap of income-generating activities which would have been best accomplished by FUNAI.

The vegetation cover is directly impacted by observed socioeconomic changes. Suruí households have entered a transitional phase and have begun to change their economic strategies. Moreover, field observations (made through meetings, reports, and socioeconomic surveys) indicate that the changes that have occurred this decade have been attributed to a part of the population, and that the transitional phase will continue to reach more families until the new economic strategies are carried out by all of them.

The Suruí population is subject to three important drivers (i.e., proximal causes) of further socioeconomic changes and/or increased deforestation in the future: the need for cash income, population growth, and a consequent increase in labor available for productive activities. For the biophysical variables that influence the distribution of deforestation--the proximity to villages, proximity to prior deforestation, and proximity to roads and urban areas--contribute to continued deforestation in the Surui territory, facilitated by the sharecropping and tenancy schemes as well as the Surui's own investment in livestock and agriculture made possible by timber revenues. The Suruí have already engaged in economic activities with ranchers and farmers living in the surroundings of the Surui territory. Ranchers lease pastures on indigenous land, and small farmers have sharecropping schemes for planting annual and perennial crops in Surui territory. The trends that have been observed and documented here confirm that as the volume of commercial timber activity within the Surui territory is reduced, the Suruí will increasingly engage with these farming enterprises to maintain their revenues. This process has been underway since mid-2000 and is evidenced by an increase in deforestation after 2005.

Conclusion (3.5 VM0015)

The previous sections have shown that the evidence is conclusive that the Surui are the agents of deforestation in their territory, and the drivers involved and the underlying causes explain the increase in deforested area there. This increase rose from an annual average of 142.9 ha in 2001-2004 to 168.9 ha between 2005-2009. According to reports of the Surui, socio-economic surveys, and field visits, the period of analysis is considered to have been a transition period in which the household income that had been generated by commercial logging has begun to rely instead on other activities. Of these activities, cattle ranching and coffee farming are the most common, reflecting the local market. These trends indicate an increase in deforestation rates in the baseline scenario, since the productive activities that support land use changes to non-forest uses are expected to increase over time. Thus, the expected changes do not reflect the land use in 2009, and it becomes more appropriate to use the modeling option in order to represent the increase in deforestation in the reference region in the baseline scenario.

[88] Greenpeace 2009.
[89] Lima and Barroso-Hoffmann 2002.
[90] Nepstad et al 2006, Laurance 2007

Projection of the quantity of future deforestation (Part 2, Step 4 VM0015)

The reference region is not stratified, as the agents of deforestation have the same potential to act on any part of the full extent of the Surui territory.

Selection of the baseline approach (4.1.1 VM0015)

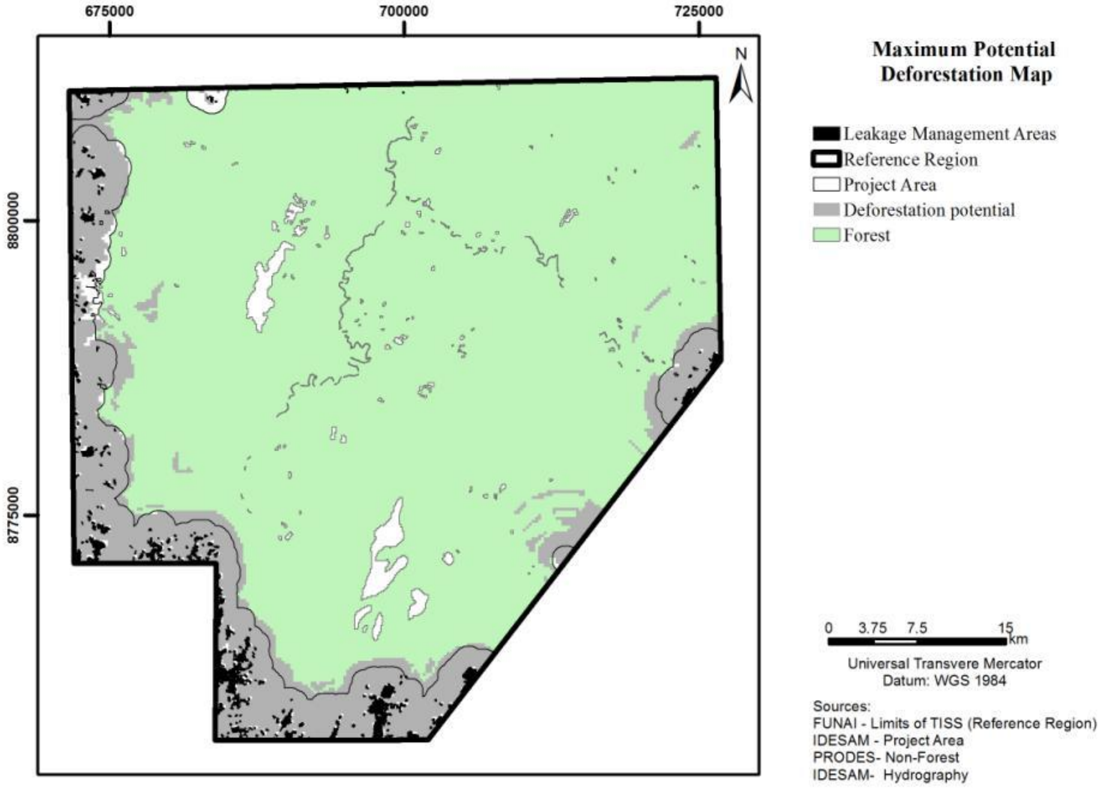
The annual rate of deforestation observed over the period 2001-2009 is increasing (Figure 13, and the analysis of the agents, drivers, and underlying causes of deforestation in the reference region explain this increasing rate. The evidence also suggests that these rates may be higher still in the future, since the Surui economy's transition from timber revenues to income from other activities has begun. Thus, approach "c," the modeling approach, will be used.

Analysis of constraints to further expansion of deforestation (4.1.2 VM0015)

The reference region is exclusively used by the Surui people, who are themselves the sole agents of deforestation. The entire reference region has basically one type of soil (Ultisol) and a small patch of Histosols in the northwest. Thus far, there have been no impediments to the expansion of cattle ranching.

The most influential biophysical drivers of deforestation are the distance to roads, villages, previously deforested areas, and urban areas, as well as the type or sub-class of vegetation. Based on the influence of each of these biophysical variables on the distribution of deforestation from 2000-2009, we built a map indicating the probability of deforestation for 2009. Given these variables, places that have no roads and that are located away from the villages experience limited expansion. The map of maximum potential, or likelihood, of deforestation presents positive values indicating areas that exhibit conditions favorable for conversion to non-forest areas. Non-forested areas, already-deforested areas (as of 2009), and surface waters were removed from this potential area of deforestation (Figure 15). The resulting area of maximum potential is 38,956.25 hectares of forest in 2009. Since the annual historic (2000-2009) observed deforestation is 157.3 hectares, the maximum potential area of deforestation (Figure 15) is 248 times greater than the historical annual rate of deforestation. Therefore, we conclude that there is no limitation to further expansion of deforestation in the reference region.

Figure 15. Maximum potential deforestation map (2009) in the reference region.



Quantitative projection of future deforestation (4.1.3 VM0015)

Projection of the annual areas of baseline in the reference region (4.1.3.1 VM0015)

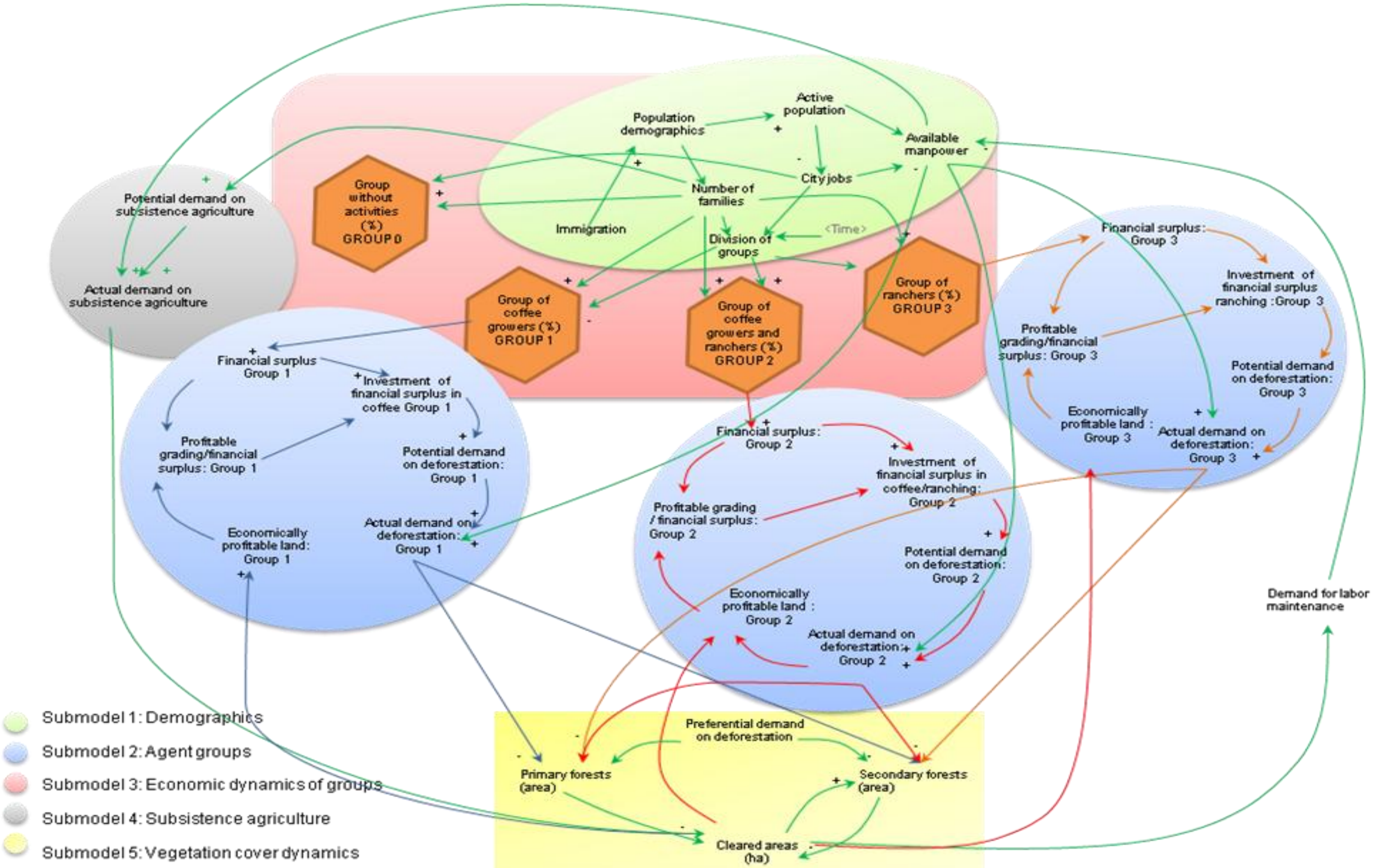
For the projection of deforestation in the baseline scenario, approach "c" of the VM0015 methodology was chosen to build a (non-spatial) system dynamics model. The program used to build the model, Vensim (Ventana Systems, Inc.), is a visual modeling tool that allows the user to develop, document, simulate, and analyze models of dynamic systems. It is designed to make it easier to use and manipulate the system dynamics. It provides a simple way to build simulation models from causal diagrams or flow charts. Within this setting, a model of various interacting components was developed that integrated the population dynamics of the Suruí people as well as the economic dynamics of different groups of agents and their impact on land use changes.

Four different groups of agents have been defined to represent the specific interactions of the Surui people and land use changes in the Surui territory. By separating the trends of these groups, it was possible to represent the various socioeconomic trajectories as they related to deforestation and the reuse of secondary forests, giving an overall picture at the level of the territory.

The socioeconomic data used to define parameters and variables of the model was collected from interviews with 121, or 62%, of the 195 families living in Paiter-Suruí TISS in 2009. Cash income in the Suruí economy currently comes from logging, agricultural activities and livestock (productive activities), government assistance and employment compensation, and--to a lesser extent--the sale of handicrafts. This background was given by the Surui themselves and is supported by field expeditions and workshops, as well as by data from the literature on the region.

We defined five sub-models in order to build the model representing the dynamics of vegetation cover in the Surui territory in the 30 years between 2009 and 2038, as described below and presented in the Causal Diagram (Figure 16):

Figure 16. Causal Diagram



Sub-model 1 - Suruí Demographics: This sub-model reproduces the net population growth and estimates the labor available for activities producing land use changes. All information relating to age, sex, activity and migration was taken from data collected by the Association of Indigenous People Metareilá Suruí[91], which reached 100% of the population.

Birth rates and death rates observed for the period 2000 to 2009 (Table 11) were extrapolated to 30 years (Table 12) using linear trends according to equations (1) and (2), respectively:

$$y = -0{,}0008x + 0{,}0472 \quad (1)$$

$$y = 1E - 05x + 0{,}0024 \quad (2)$$

Migration data was based on information collected in interviews of the Metareilá since 1969, and the immigration rate was found to be positive at 0.026% per annum. This value was considered constant throughout the period in projecting future migration patterns.

Table 12. Linear extrapolation of birth and death rates between 2009 and 2038

YEAR		BIRTH	MORTALITY
1	2003	0.046	0.0024
11	2013	0.038	0.0025
21	2023	0.030	0.0026
31	2033	0.022	0.0027
36	2038	0.018	0.0028

The demographics show a positive rate of population growth decreasing over time. With this projection the Suruí is estimated to reach 2,504 people in 2038.

The available labor was derived from the proportion of active adults (between 15 and 65) of the entire population, excluding those with permanent jobs in nearby towns or in the Surui territory (these adults were considered unavailable for activities producing land use changes). From the population pyramid derived from data collected in 2009, an annual population pyramid through the 30 years considered was produced with three categories: 0-15 years, 15-65 years and > 65 years, accounting for births and deaths in the population.

To calculate the rate of the labor force available for the activities of land use projected by the model, we obtained the ratio of the number of people employed to the number of active people within the sample of people interviewed in 2009 (n = 770). Altogether, there were 39 active jobs for 398 people interviewed, or 9.7%. The model uses the same rate of 9.7%, which includes the calculation of active people who are not available to act as labor in the activities of changing land use. This percentage is taken from the total active labor for land use activities in the simulations.

Table 13 shows the initial and final values for each variable used in this sub-model.

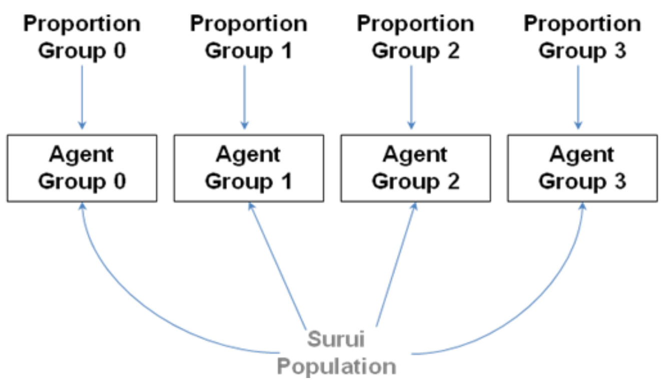
[91] Metareilá 2010.

Table 13. Demographic input values and simulated for 2038.

Description / Class	2009	2038
Suruí Population (individuals)	1142	2504
[0-15 years]	518	705
[15 - 65]	597	1266
[> 65]	27	532
Suruí Households	195	428
Employed Individuals	62	316
Labor available in Surui territory	534	949

Sub-model 2 - Groups of productive agents among the Suruí: In a second sub-model, the households were divided into four different agent groups (Figure 17), distinguished by their productive activities in the Surui territory: "No Productive Activities" (Group 0), "Coffee Growers" (Group 1), "Coffee Growers and Ranchers" (Group 2), and "Ranchers" (Group 3). Each group of agents has different cash income, leading to their own socioeconomic trajectories and different results in land use changes, considering the investment strategy derived from their annual financial balance.

Figure 17. Distribution of the economically-productive Surui population among the agent groups



Sub-model 1 (demographics) takes the household as the basic unit. The number of households is calculated from the total population, assuming a fixed value of 5.85 individuals per household. Based on livelihood information from all Surui households complete socioeconomic data [92], the proportion of households in each agent group was determined. These proportions were fixed to determine the number of households belonging to each group between 2009 and 2038 (Table 14).

Table 14. Characteristics of agent groups in the Surui territory

		Interviews	Number families		
		Families (No.)	%	2009	2038
Group 0	Without Productive Activity/Subsistence	11	9.1	18	39
Group 1	Coffee Growers	53	44	85	187
Group 2	Coffee Growers and Ranchers	48	40	78	170
Group 3	Ranchers	9	7.4	14	31
Total		**121**	**100**	**195**	**428**

[92] The data obtained by Meitarelá, some respondents did not complete the questionnaire, particularly with regard to socioeconomic activities. Thus, of 195 families associated with the use of resources of the territory, only 121 families responded completely and were considered in the calculation of the averages for each group entered in the model.The sample is representative of the population.

Sub-model 3 – Economic dynamics of the productive agent groups: This sub-model models the behavior of the three groups of productive economic agents (Groups 1, 2 and 3). Based on the annual financial flow (Table 15), which equals the difference between household income (i.e., timber, livestock, agriculture, government assistance, employment compensation, non-timber forest products and handicrafts) and annual fixed expenses (i.e., food, energy, transportation, health , leisure, consumer goods, etc.), each group develops different strategies for productive activities. These balances are computed for the three groups and are presented as household averages. The financial surplus of the annual flow sheet per family is invested in consumer goods, real estate and productive activities (coffee or livestock), where the latter is converted into potential demand for opening new areas of production (i.e., through deforestation or the clearing of secondary vegetation) as shown in Figure 18.

To calculate the actual demand for new production areas in any given year, the model considered for that year's iteration the availability of manpower needed to maintain the areas for productive use and to open up new areas. The actual demand is the total new area open to the establishment of production activities as limited by the available labor.

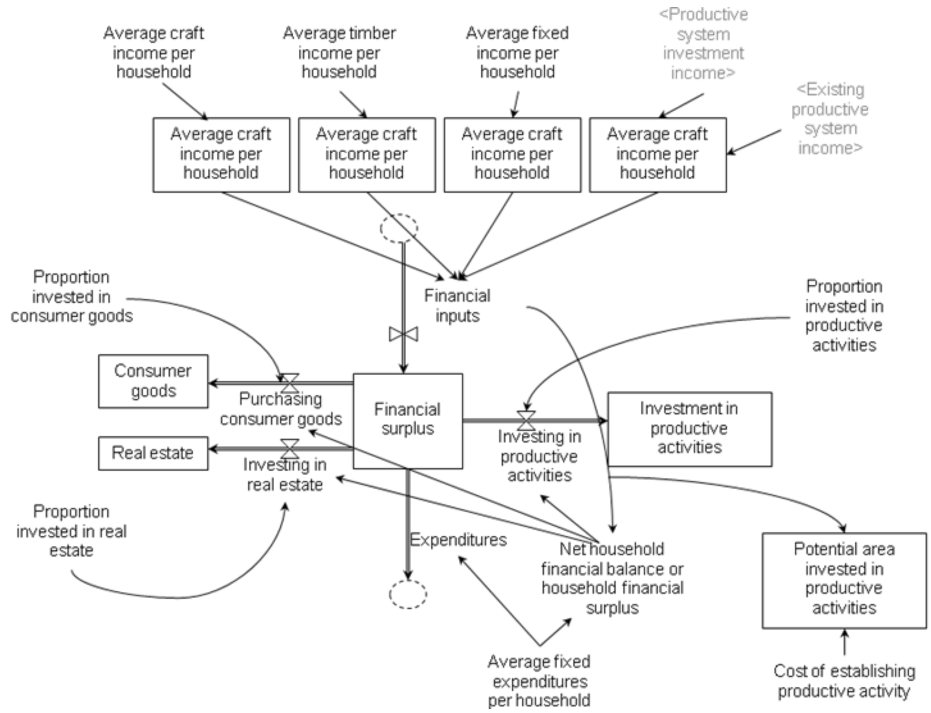
Table 15. Economic data model inputs (2009)

	Number of Households	Fixed Income * (R$/ yr)	Fixed expenses* (R$/ yr)	Timber* (R$/ yr)	Handicrafts* (R$/ yr)	Net revenue own livestock ** (R$/ ha)	Livestock net revenue lease ** (R$/ ha)	Net revenue own coffee ** (R$/ ha)	Net income ** coffee sharecropping (R$/ ha)
Group 0	11	11,663	8,857	4,840	116	-	-	-	-
Group 1	53	6,974	7,026	7,120	148	-	-	294.0	121.6
Group 2	48	6,042	9,060	9,984	344	190.8	60.0	294.0	121.6
Group 3	9	5,006	8,423	7,875	12	190.8	60.0	-	-

* Data from the socioeconomic survey of Metareilá 2010.

** Values obtained by IDESAM to the profitability analysis of the activities Suruí.

Figure 18. Flowchart representing the economic dynamics of the productive agent groups



The average income and expenditures for each group of productive agents determines the annual financial flow for each household. Among the revenues considered are: (i) income from handicrafts, (ii) income from timber, (iii) fixed income (employment compensation, government assistance), and (iv) income from productive activities. The average *fixed costs* include energy costs, food, clothing, transportation, healthcare, education, telephone, entertainment, fuel and vehicle maintenance.

For revenues from productive activities, we used the average values from the profitability study produced based on information collected in the field[93]. This study found the profitability for the Surui of coffee growing and cattle ranching activities, both when is Surui-managed production and when is sharecropping or leasing arrangements with external agents. Annual revenues obtained from each activity account for the production areas available as of the previous iteration of the model in addition to the areas existing in 2009. The crop abandonment and the regeneration of vegetation (secondary forests) are also considered.

Income from logging was considered to follow a downward trend, starting with the price obtained for timber sales in 2009. Based on the four field campaigns since 2009, the overflight, and the inventory of forest biomass, it is possible to say that much of the Surui territory suffered selective logging, and, as a result, there are few trees of commercial value to sustain a continuous logging operation for over ten years[94]. Thus, the model assumes that income from timber decreases from 2009 until 2018, when it becomes zero.

The annual household financial balances of each group are different and drive different investment patterns within this sub-model, with the goal of maintaining a positive balance in subsequent iterations. We used the amount of R$1,500 as the minimum desired of the household financial balance that would be used for consumer goods, real estate and productive activities (see parameters of the investment

[93] Idesam 2010
[94] Idesam 2010

ratios, below). This parameter was chosen conservatively based on the workshops with the Surui. Since only the productive activities directly affect the dynamics of vegetation in the Surui territory, only these are presented and discussed here.

Investment in and profitability of productive areas

It was found that the Suruí engage in two types of arrangements for income generation from productive activities:

(I) ***Surui-managed system,*** in which Surui agents alone invest in production and accumulate all income.

(Ii) ***Sharecropping system,*** which gives the right to use land in the Surui terriotory to an external agent (lessee), who bears the costs of deployment, maintenance and harvesting. The revenues are shared between the tenant and Suruí.

The selection mechanism of the productive arrangement works as follows:

Surui-managed system: when the household financial balance is more than R$1,500, the proportion of the balance *(x)* allocated to establishing the productive area is invested in accordance with the cost of deployment *(y)* of each activity, creating an area of *x / y* hectares that each group can establish in the forested (native or secondary) area.

Sharecropping system: when the net household financial balance is greater than the desired value of R$1,500, the Surui household aims for a constant value of 10% of income for the coffee and cattle, respective to each group's preferred productive activities.[95] When the net household financial balance is below the desired value (R$ 1,500), each group chooses to increase the area for a system of sharecropping or rental to cover the difference between the value obtained and the desired R$1,500. Thus, the group will earn revenue without investing in setting up and maintaining these productive areas. The area designated for the sharecropping matches the amount required to generate enough income to maintain the household financial balance at the desired level.

The proportions were based on data obtained from interviews with the Surui in March and August 2010, and they were presented and validated at workshops with the Suruí conducted by Idesam, ACT and the Metareilá Association.

Investment in productive activities by Surui agent groups

The agent groups develop different productive activities and carry out different strategies for earning a financial return, as described below:

Group 1: only engages in coffee growing activities, facilitated by two types of production arrangements, the "Surui-managed system" and the "sharecropping system."

Group 2: produces both coffee and cattle. With regard to the Surui-managed system, households in Group 2 invest when the household financial balance is higher than desired in the same way as Groups 1 and 3. However, when the net household financial balance is below the desired value, income required to achieve the desired level is distributed between pasture leasing and the sharecropping system in coffee growing areas according to the proportions of these two crops observed in 2009 (79% of the areas in use were pastures while 21% of the areas in use were coffee plantations).

[95] This strategy allows you to generate more revenue without costs was observed in the TISS occur in a portion of family income Suruí still getting the same wood as the most gross of all groups.However, a questionnaire administered by Idesam to 14 Suruí indicated that they tend to adhere to the system of leasing or sharecropping when there is a lack of revenue, although they prefer to conduct their own production systems. Different proportions of the area were tested as they do not have accurate information about this. We tested the following proportions: 50% (I), 25% (II) and 10% (III) of existing areas in use in 2009. We used the constant value of 10% of the initial existing areas, where the response approached more realistic scenarios.

Group 3: only develops livestock as a productive activity, split between the Surui-managed system and the sharecropping system. In the latter system, pasture is leased to a neighboring farmer at an amount per head of cattle per month, and in doing so the household avoids additional costs associated with establishing the pasture and acquiring and maintaining the herd.

In sum, this sub-model generates, at each iteration, the potential area that may be cleared to deploy productive activities (coffee and cattle), based on the annual financial balance of each productive agent group.

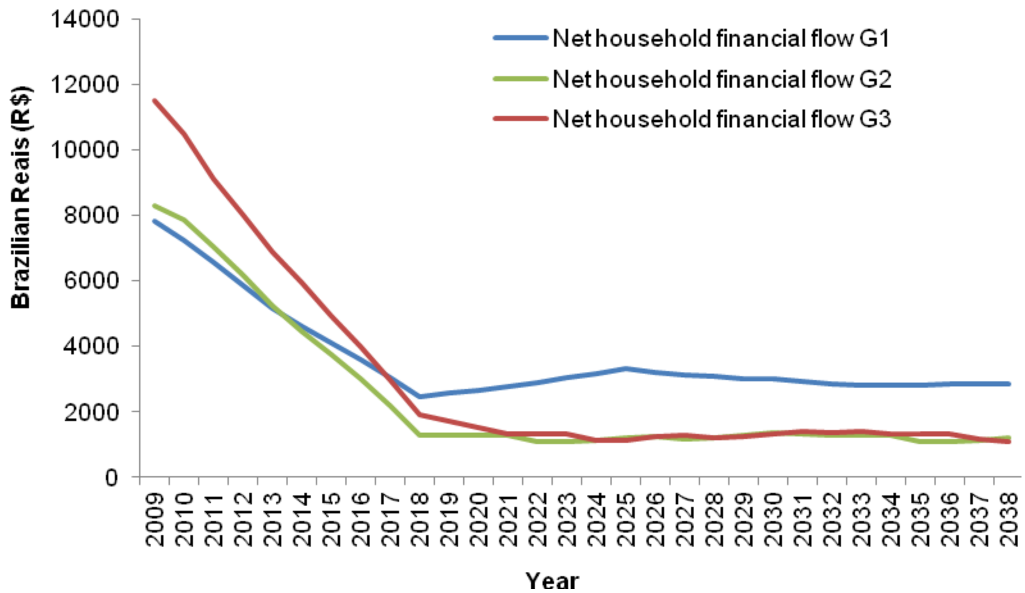
Table 16. Percentage of investments per year for different activities depending on net household financial balance.

Net household financial balance (R)	Percentage spent on consumer goods	Percentage invested in real estate	Percentage invested in productive activities (livestock, coffee*)	Total
>10,000	31.2%	59.2%	9.6% (7.85%, 0.76%)	= 100%
[5000-10000]	46.0%	22%	32% (25.92%, 5.63%)	= 100%
[0-5000]	47.0	6.2%	46.8% (25.7%, 21.1%)	= 100%

* Only Group 2 develops both activities, as denoted in parentheses

For all groups, the household financial balance tends to fall with to the declining timber income, which reaches a value of zero in the year 2019 (Figure 19).

Figure 19. Net financial flow of agent groups (R$)



Sub-model 4 - Subsistence farming: Because subsistence agriculture (facilitated by slash-and-burn practices) is an activity that impacts the forest cover but does not provide cash income, it was considered in a separate model. Sub-model 4 assumes that a constant area per person per year is open to development for subsistence agriculture. Later, the demand for new areas of subsistence agriculture is added to the potential demand for new areas generated by the other activities in sub-model 3. The result is the total area corresponding to the actual demand for productive areas that will enter the sub-model 5, which integrates the socioeconomic and vegetation dynamics of the Surui territory.

In 2009, about 80% of the Surui practiced subsistence agriculture, accounting for an average area of 0.7 ha per household. Every four years a new area of the same size is opened[96]. From this information, the

[96] Metareilá 2010.

model assigns 0.175 ha of deforestation per year for each household to traditional agriculture.This type of agriculture is itinerant (employing fallows); as such, after four years these areas are abandoned and become secondary vegetation. Therefore, we assumed that the same area, 0.175 ha, is abandoned annually even as new areas are opened.

Sub-model 5 - Vegetation dynamics in the Surui territory: the actual demand for new productive areas translates to the conversion of native forests or the reuse of secondary forests, and the area estimated to be affected by this demand is added to the cleared areas in use at each iteration of the model. The landscape of the Surui territory is composed of a mosaic of three land use classes: deforested areas, ombrophyllous forest in degradation, and secondary vegetation. The classes of land use changes are as follows:

- Ombrophyllous forest in degradation > deforested areas;
- Secondary Vegetation> deforested areas;
- Deforested area> Secondary Vegetation.

The actual demand for newly deforested areas used 72% of degraded ombrophyllous forest and 28% of secondary vegetation, according to the analysis of land use change between 2000 and 2009 in LANDSAT 5 images.

This sub-model is presented in two parts. First, it integrates sub-models 1, 3 and 4 to generate actual demand for opening new areas. Second, it distributes demand between degraded ombrophyllous forest and regenerating forests (which are included in “anthropic vegetation in equilibrium”) at each iteration of the model.

Part 01

Actual demand for opening new areas in the Surui territory.

Assumptions and justifications

Within each productive agent group, the potential area that could be cleared to deploy productive activities is multiplied by the number of households in the given group to obtain the total demand of the potential area in a given year (or iteration). To become the actual demand, the available labor (days/person) for that year must be sufficient to perform the identified productive activities in the potential area. The demand for labor is determined differently according to the two types of systems: (i) the “Surui-managed systems” and (ii) the leasing and sharecropping systems, as follows:

(I) **Surui-managed systems*:*** Labor available is discounted by the amount needed for the maintenance of existing productive areas and subsistence agriculture. The resulting available labor will transform (partially or completely) the potential demand into actual demand for area. Table 17 details the required amount of labor (days/person) assumed for each step of activity.

(II) Leasing or sharecropping system: In this system, the Surui are not required to provide the labor for the establishment (i.e., conversion of land) and maintenance of productive activities. External labor (non-indigenous) is considered sufficient to develop the activities of coffee production and ranching under a sharecropping system or lease.

Table 17. Indigenous labor (days/men) for productive activities[97].

Activity (Hectare)	Period System	Activities	Number of Days / Ha Man
Cultivation of coffee	15 years		
Year 0 - Implementation		Deforestation	9.15
		Farm / Cleaning area	16
		Marking / tillage	8
		Planting and replanting	11
		Hand weeding	12
		Chemical weeding	2
		TOTAL	**58.15**
Years[1-15] - Maintenance		Maintenance	21.5
		TOTAL	**21.5**
Livestock	11 years		
Year 0 - Implementation		Deforestation	9.15
		Field preparation	3.5
		Planting	1
		TOTAL	**13.65**
Years[1-11] - Maintenance		Care of the flock	2.16
		Field maintenance	3.5
		TOTAL	**5.66**
Traditional agriculture	4 years		
Year 0 - Implementation		Deforestation	9.15
		Planting	2
		Fields	3.5
		TOTAL	**14.65**
Years [1-4] - Maintenance		Hand weeding	6
		TOTAL	**6**

Part 02

Forest cover dynamics in the territory

The extent of primary forest clearing, or the cutting and re-use of secondary forest (capoeira) is determined by the interaction of net demand for opening new areas and the dynamics of vegetation cover. A total of 28% of the demand for opening new areas was assumed to occur in areas of secondary vegetation and 78% in primary forest areas[98]. This sub-model allows the calculation of areas of forest, deforestation, secondary re-growth, and recently abandoned productive areas.

[97] The labor requirement were obtained based on the total price of labor for one hectare for each activity, divided by 30, which is the daily pay for labor in the rural region.When Suruí respondents were unable to provide the amount of days/men per activity was taken from a table provided by the Cacoal office of the Technical Assistance and Rural Extension Company of Rondônia (EMATER), used to obtain financing from BASA.

[98] Values obtained by analysis of change in land use obtained from the maximum likelihood supervised classification of Landsat satellite images from 2001 to 2009.

At each iteration, the area converted is separated from the areas converted in previous years, so as to follow its evolution through its period of use. After a period explained below, the productive area will be abandoned and added to the area of regeneration (regrowth), and ceases to generate revenue. Coffee (with annual crops until the third year) is productive for 15 years, after which it must be abandoned or restored[99]. A decrease in productivity is assumed from the thirteenth year. For cattle, we used a period of 11 years of production[100]. However, productivity begins to decrease from the sixth year until it reaches midway through the eleventh year, when it is abandoned. The gradual reduction of capacity is important to conservatively model the profitability[101].

The sub-model 5 presents the final model. It was calibrated and validated using data prior to 2009, in accordance with best statistical practice, described below.

Model calibration

To assess the accuracy of the model SimSuruí in predicting changes in land use within the territory, the model has been calibrated within the historical period 2004-2009. The methodology VM0015 does not provide guidance for calibration systemic models, but it requires that the prediction is consistent with good statistical practice, ie, be statistically adjusted. Thus, we adopted the methods generally employed by the systems modeling community, which consists of comparing modeled data and observed data in the same period.

The method chosen was to use a historical sub-period to represent what is expected to occur in the future, from 2009. As reported, the economic changes of the Surui land use have been observed over five years (2005-2009), along with the beginning of the decline in income from timber sales. Thus, it is consistent to use this historic period of change to assess the fit of the model.

The available historical data used were the demographics of FUNASA and land use, obtained from the classes of land use in 2004, produced by classification of Landsat 5 satellite image for this given year (see details in the document classification, supplementary material 3).Thus, the model was adjusted to that historical period, incorporating the above mentioned data so that the comparison was performed.

In the economic dynamics of productive angent groups sub-model (sub-model 3), the same data from the 2009 socioeconomic survey were used for fixed costs, fixed income, income from handicrafts and average yield per hectare of productive activities. For 2004, timber income for each group of producers was obtained was estimated to be 50% higher compared to 2009.Through the questionnaires during the workshops conducted in 2010 Suruí leaders Suruí estimated a decline of approximately 50% in the period 2004-2009. As income was only assessed for the year 2009, this downward trend can be applied. In the model we adopted the opposite assumption, considering that in 2014, Suruí families would get only 50% of income from wood obtained in 2009.

To define the areas in use in 2004 for each activity (livestock, coffee and subsistence agriculture), we applied the same proportions as observed in 2009 compared to the total area deforested in 2004 (Table 18). Modeled and historical data related to the variable "cumulative area of forest cleared" were compared using the method of least squares. The Method of Least Squares is a technique of math optimization that seeks to find the best fit for a set of data trying to minimize the sum of squares *(Payoff)* of the differences between the estimated and observed values. It is the most widely used estimation in econometrics. To obtain the best possible matching or minimum *payoff,* we performed a sensitivity analysis of key parameters of the model using the Monte Carlo method[102] version of Vensim PLE Plus.This method consists of performing a series of simulations, in this case we use 200 simulations, with different possible values in key parameters. These values are selected probabilistically within a chosen range. The range chosen was 80% more or less than original value of the parameter.

[99] Empresa de Assistência Técnica e Extensão Rural de Rondônia.Personal communication.
[100] see Luizão et al.2010
[101] Fearnside 1989
[102] Metropolis 1953.

Table 18. Parameters used in the model for model calibration SimSuruí between 2004 – 2009.

Data	2009	2004
Population	1,142	956
Adults	597	500
Dependent	518	434
Elderly	27	23
Families Group 1	86	72
Families Group 2	77	65
Families Group 3	15	12
Families subsistence agriculture	154	129.1
Income wood Group 1*	7,120.3	10,680
Income wood Group 2*	9,984.4	14,977
Income wood Group 3*	7,875.0	11,813
Areas in use Coffee Group 1 *	2.3	1.26
Areas in use Pasture Group 2 *	16.8	9.40
Areas in use Coffee Group 2*	4.4	2.46
Areas in use Pasture Group 3*	21.6	12.11
Subsistence farming areas *	0.7	0.41
Areas of initial Capoeiras	230	230.3
Initial areas of native forest	240,033	241,748
Deforested initial	3,187	1,498
Areas of non-forest	4,073	4,073
Total area	247,845	247,845

Proportions	2009
Number of individuals	
Adults / total population	0.52
Dependent / total population	0.45
Elderly / total population	0.02
Productive area	
Coffee G1/area cleared	0.06
Coffee G2/area cleared	0.11
G2/areas cleared pastures	0.41
G3/area cleared pastures	0.10
Subsistence agriculture/deforested area	0.04
Groups	
Group total 1/população	0.44
Group 2 / total population	0.40
Group 3 / total population	0.07
Subsistence agriculture / total population	0.79

* Mean values per Suruí family

The *payoff* resulting from the variation of each parameter was evaluated (Table 19). For each parameter, the value equivalent to the minimum *payoff* was determined.

Table 19 - Sensitivity analysis applied to the Monte Carlo model calibration SimSuruí.

Parameters	Original value	Less 80% of the parameter	More 80% of the parameter	Payoff min	Payoff max	Value parameter (Payoff min)
Ratio of investment in productive activities to net family income [families earning R$5,000-10,000] combined with a ratio of investment in productive activities to net family income [families earning more than R$10,000] of 0.094	0.492	0.0984	0.8856	1.02	2.16	0.301
Ratio of investment in productive activities to net family income [families earning R$5000-10,000]	0.492	0.0984	0.8856	4.36	7.86	0.102
Ratio of investment in productive activities to net family income [families earning more than R$10,000]	0.228	0.0456	0.4104	1.11	42.45	0.094
Average Surui coffee profitability (R$ / year)	294	58.8	529.2	3.16	5.3	417.76
Average return on Surui livestock (R$ / year)	190.8	38.16	343.44	3.46	5.39	39.59
Birth rate multiplier	1	0.2	1.8	4.34	4.49	1.79
Mortality rate multiplier	1	0.2	1.8	4.34	4.49	1.79
Timber income multiplier	1	0.2	1.8	0.712	20.16	0.26

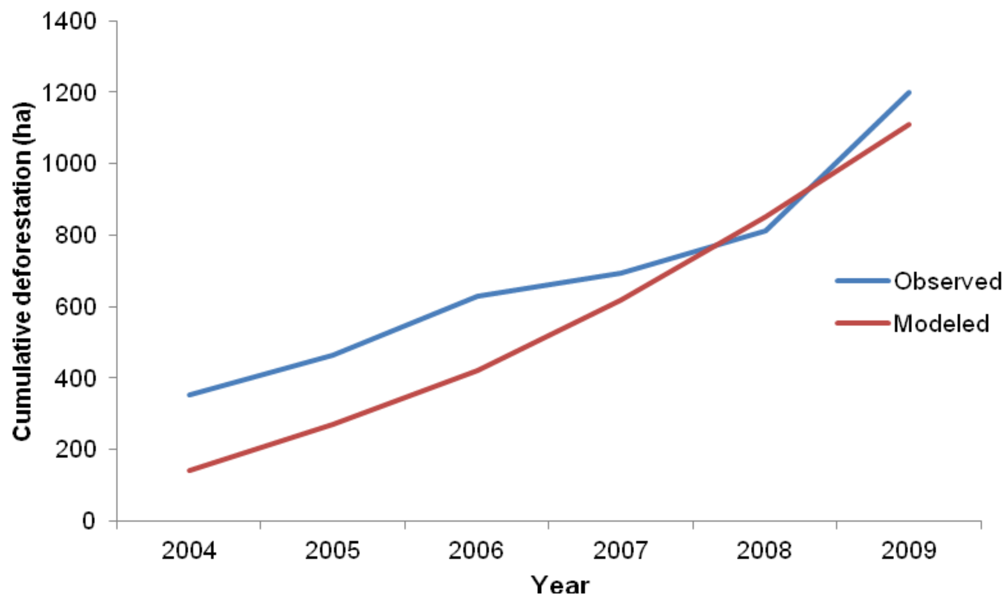
The table 17 shows that the lower minimum payoff value was from *Timber income multiplier* (0.712). However, using 26% of the original value for adjustment neither produced a best fit with the observed deforestation nor represents a valid adjusment, as the timber income data entry is supposed to be understimated instead of superestimated. It has been observed and verified that the best fit of the model simulated to the observed deforestation was achieved changing the parameter *Ratio of investment in* *productive activities to net family income [families earning more than R$10,000]* to 0.094 (or 41%) of the original value, and then, running the sensitivity analysis again to obtain a new payoff min value parameter for *Ratio of investment in productive activities to net family income [families earning R$5,000-10,000]*. Doing that, the minimum payoff of this parameter has changed from 4.36 to 1.02 (lines 2 and 1 of Table 19, respectively).

This approach lead us to the new minimum payoff (value of 0.301) of the original value (0.492), and was used as the new parameter, which gave the most accurated fit for the model. After applying this modification, the similarity between the simulated and observed deforestation regarding the variable "cumulative area of forest cleared" was 93% in 2009 (Table 20, Figure 20).Thus, considering this similarity the SimSuruí model is considered validated. Once validated, the model can be ran for the period 2009-2038.

Table 20. SimSuruí Model validation, comparison of simulated and observed data relating to variable forest area in cumulative hectares deforested.

Year	Simulated	Observed
2004	353.5	141.8
2005	463.9	271.9
2006	628.4	421.9
2007	694.3	618.0
2008	811.6	850.3
2009	1,197.9	1,109.2
Similarity		93%

Figure 20. Cumulative historical deforestation, observed and simulated between 2004 and 2009 in the Surui Territory.



Sensitivity of the baseline scenario (2009-2038)

After selecting the baseline scenario and performing the calibration and validation, we performed a sensitivity analysis using Monte Carlo method. In order to check the influence of key parameters in the variable "cumulative area deforested," eleven parameters were chosen.The analysis parameters were adjusted 50% higher and lower in relation to the value chosen in the baseline, to show the results of their influence on the key variable. The products generated show the uncertainty range of the variable modeled (between 25%, 50%, 75% and 100%).

Monte Carlo simulation, available in the program Vensim PLE Plus is also called the multivariate sensitivity analysis. This option permits automatic analysis, performing thousands of simulations, with some sample parameters.The sample was applied to the normal distribution parameters. The parameters are presented in Table 21.Those that showed most sensitivity were (in order of importance):

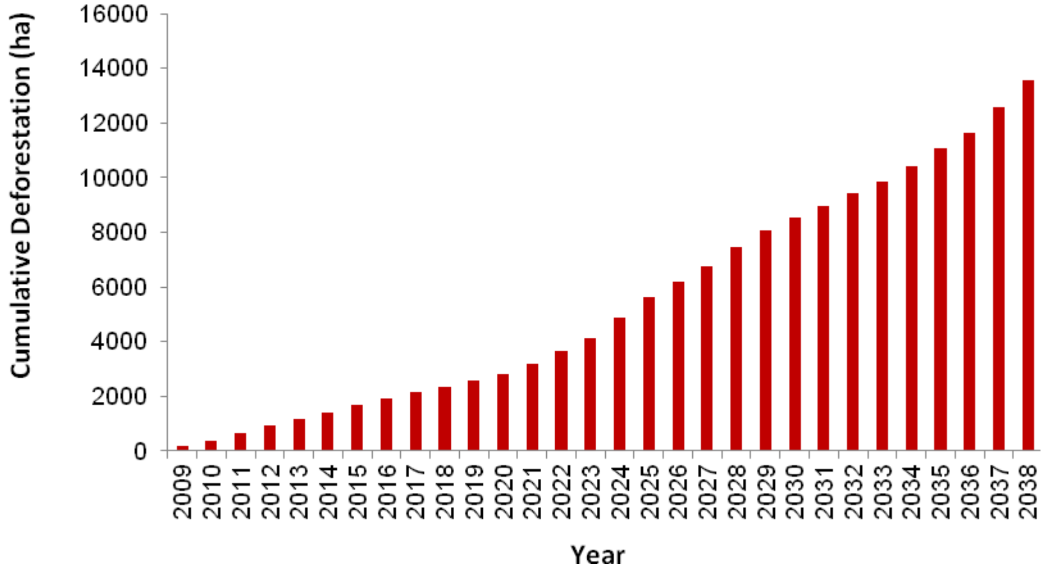
- Average profitability of leasing pasture land (R$/year): sensitivity observed in [11,133.9-21.145,5 hectares] with a difference of 10,012.4 hectares,
- Birth rate coefficient multiplier [10,256.8- 18,154] hectares with a difference of 7,897.2 hectares,
- Average profitability of Surui-managed ranching (R$/year) [10,330.9-15,896.6] hectares with a difference of 5,565.7 hectares,
- Ratio of investment in produtive ativities to net family income [families earning R$0-5000] [12,372.4- 15,101] hectares with a difference of 2,728.6 hectares.

Table 21. Parameters and results Monte Carlo sensitivity analysis applied to the baseline model SimSuruí.

Descrição do Parâmetro	Valor Original	-50%	50%	Sensitivity Variation	Variable Value (min)	Variable Value (max)	Min Value	Max Value
Valor desejado do balanço financeiro liquid o (R$)	1500	750	2250	[750-2250]	12087.2	14770.5	757.08	2249.07
Ratio of investment in produtive ativities to net family income [families earning R$0-5000]	0.468	0.234	0.702	[0.234-0.702]	12372.4	15101	0.701	0.236
Ratio of investment in produtive activities to net family income [families earning R$5000-10,000]	0.301	0.1505	0.4515	[0.301 - 0.4515]	12707.6	13791.2	0.42	0.153
Ratio of investment in productive ativities to net family income [families earning more than R$10,000]	0.0944	0.0472	0.1416	[0.0472 - 0.1416]	13527.2	13735	0.1072	0.1076
Average profitability of Surui-managed coffee production (R$/year)	294	147	441	[147 - 441]	12194	14920.7	438.723	148.383
Average profitability of Surui-managed ranching (R$/year)	190.8	95.4	286.2	[95.4 – 286.2]	10330.9	15896.6	286.082	96.29
Average profitability of leasing pasture land (R$/year)	60	30	90	[30-90]	11133.1	21145.5	89.96	30.28
Average profitability of coffee sharecropping (R$/yr)	121.6	60.8	182.4	[60.8 – 182.4]	13254.8	14366.7	182.32	61.37
Timber income multiplier coefficient	1	0.5	1.5	[0.5 - 1.5]	13174.8	13887.1	0.82	1.12
Birth Rate multiplier coefficient	1	0.5	1.5	[0.5 - 1.5]	10256.8	18154	0.504	1.499
Death rate multiplier coefficient	1	0.5	1.5	[0.5 - 1.5]	13272.1	13884	1.499	0.504

The model output shows that between 2009 and 2038, **13,575.3 hectares** of degraded rainforests would be cleared (Figure 21), as well as the reuse of **5,279.3 hectares** of secondary forest within the Indigenous Suruí Territory. Applying an average deforestation between 2009 and 2038, yields a value of **452.5 hectares/year.**

Figure 21. Change in forest cover within the Indigenous Territory Sete de Setembro modeled in the baseline scenario 2009-2038: Cumulative hectares of natural forests cleared.



The rate of forest clearing peaks in 2038, with 1,020 ha (Figure 22), resulting from the Surui families' need to obtain a minimum income to maintain the desired net income. The cumulative total area, if divided by the number of families in each group in the year 2038 (Table 22) reaches only 50.2 hectares per family among ranchers, who accumulate the largest deforested area.

Figure 22. Change in the forest cover within the Surui territory modeled in the baseline scenario 2009-2038: Deforestation in degraded tropical rain forest (*florestas desmatas*) and re-use of areas of secondary growth or clearing of secondary vegetation.

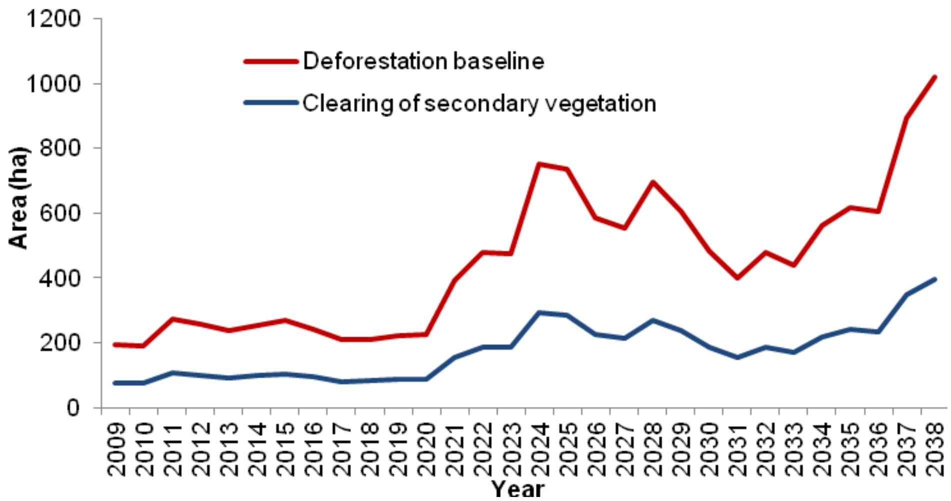


Table 22. Areas in the use of a family of each group in 2009 and 2038.

Groups	2009 [1]		2038 [2]	
	Coffee areas (ha)	Pasture areas (ha)	Coffee areas (ha)	Pasture areas (ha)
Without productive activity	0	0	0	0
Coffee Growers	2.3	0	9.2	0
Coffee Growers and Ranchers	4.4	16.8	7.5	29.6
Ranchers	0	21.6	0	50.2

Sources: [1] Meitarelá socioeconomic survey; [2] Data modeled in the baseline scenario modeling in Vensim.

Projection of the annual areas of baseline deforestation in the project area and leakage belt (VM0015 4.1.3.2)

Baseline deforestation is projected spatially across the reference region in accordance with item 4.2. in Part II of the VM0015.

Summary of step 4.1.3 (VM0015 4.1.3.3)

As all deforestation in the region of reference occurs in the project area, a single summary table is presented below.

Table 23. Annual areas of baseline deforestation in the reference region, project area and leakage belt (VM0015 Methodology Tables 9a, 9b and 9c).

Project year *t*	Stratum *i* of the reference region in the project area 1 $ABSLPA_{i,t}$ ha	Total	
		annual $ABSLPA_t$ ha	cumulative $ABSLPA$ ha
2009	195.0	195.0	195.0
2010	191.2	191.2	386.2
2011	274.1	274.1	660.3
2012	258.0	258.0	918.3
2013	238.7	238.7	1,157.0
2014	255.5	255.5	1,412.5
2015	271.2	271.2	1,683.7
2016	243.3	243.3	1,927.0
2017	210.1	210.1	2,137.1
2018	211.5	211.5	2,348.6
2019	221.3	221.3	2,569.9
2020	225.0	225.0	2,794.9
2021	393.7	393.7	3,188.5
2022	480.8	480.8	3,669.3
2023	475.5	475.5	4,144.8
2024	751.5	751.5	4,896.3
2025	736.0	736.0	5,632.3
2026	584.7	584.7	6,216.9
2027	554.9	554.9	6,771.8
2028	696.8	696.8	7,468.6
2029	606.9	606.9	8,075.5
2030	483.6	483.6	8,559.1
2031	399.9	399.9	8,959.0
2032	477.4	477.4	9,436.3
2033	438.2	438.2	9,874.5
2034	560.8	560.8	10,435.3
2035	618.7	618.7	11,054.0
2036	605.5	605.5	11,659.5
2037	895.2	895.2	12,554.7
2038	1,020.6	1,020.6	13,575.3

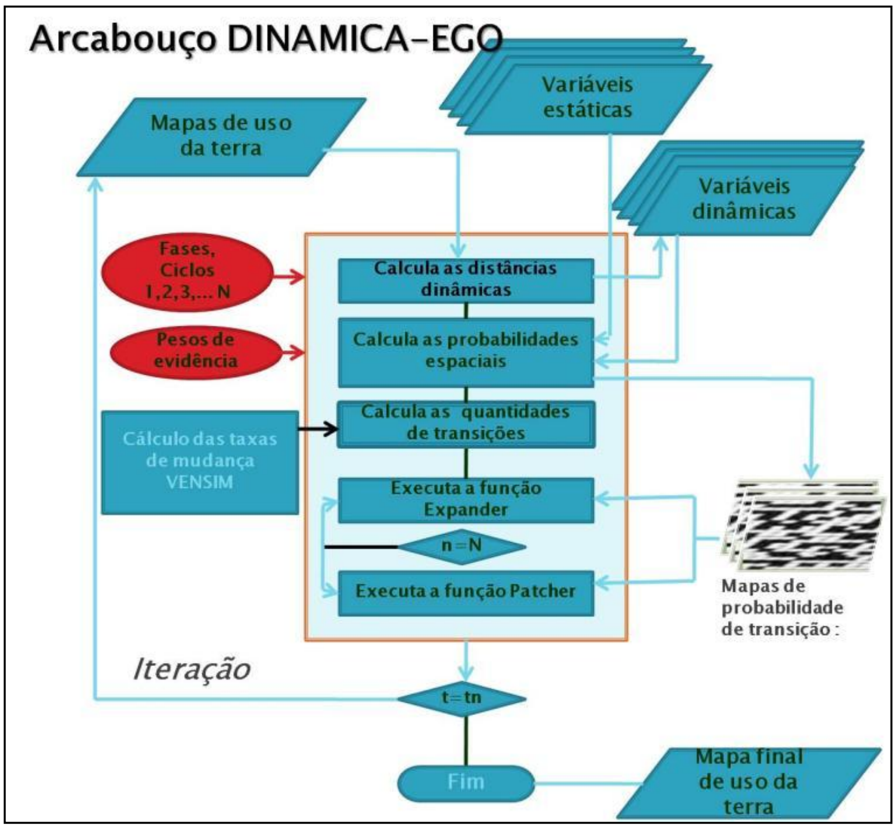
Projection of the location of future deforestation (4.2 VM0015)

To estimate the location of future deforestation, we used the program Dinamica-EGO version 1.6.0, accepted by the methodology VM0015. Dinamica-EGO, which was developed by a team of researchers at the Federal University of Minais Gerais-UFMG[103] allows simulation models to be developed that produce an allocation of deforestation to specific areas of the landscape based on an automated cellular algorithm. The program simulates the spatial patterns of deforestation through the production of a probability map that reflects the combined influence of available cartographic data[104]. Thus, DINAMICA-EGO is a work environment that allows the combination of map algebra and other operators, arranged in different formats, to generate the spatial allocation.

In the model, space is represented by a mosaic of cells of identical size and shape (250m x 250m). In each cell of a cellular automaton transition rules are applied. These rules are defined by the amount of transition between classes of its use *(e.g.* forest -> deforested area) and the map of probability of deforestation.This map comes from integrating the influences of the spatial variables (static and dynamic) considered (Figure 23).

These transition rules determine which cells change, and when, based on the combination of neighboring cells and their prior class (or state) within the spatial arrangement of grid cells in a given iteration.[105] The *expander* and *patcher* functions are specific functions that geographically allocate deforestation according to the calculation of the amount of transitions between classes of land use and probability maps. One function expands the area of deforestation to neighboring cells and the other distributes deforested cells randomly according to a seeding system.

Figure 23. Flowchart of the process type model developed in the dynamic program-EGO.



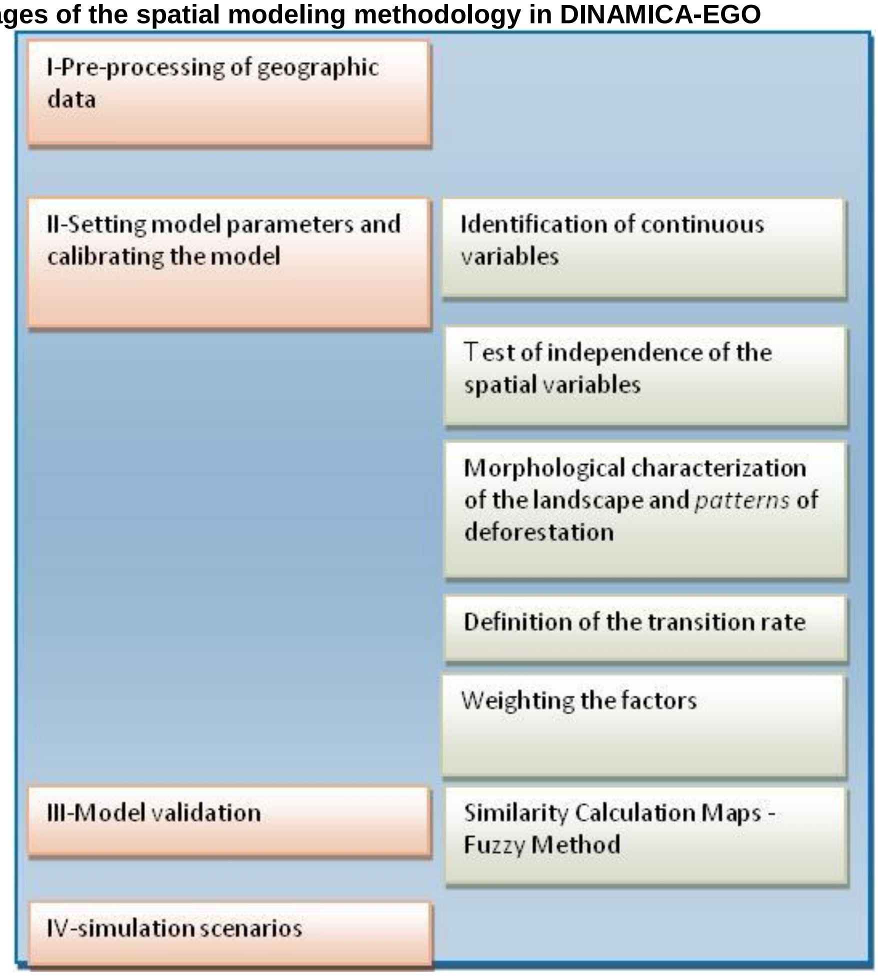
[103] Soares-Filho et al.2002
[104] Soares-Filho et al. 2006
[105] Pedrosa and House 2001

Thus, the model used to project the baseline for the Surui Forest Carbon Project answers two questions related to land use change:

- **Where** does land use changes occur?
- **How** or what is the spatial distribution of the new areas of change?

The spacial modeling of land use changes is performed in four steps (see Figure 24): The first is the pre-processing of spatial data, which include input from landscape or biophysical factors explaining deforestation.The second step is calibration, where model parameters are established from data corresponding to a determined existing period. Calibration includes the test of correlation between the spatial variables, the calculation of the weights of evidence of the variables, the calculation of the transition between classes of land use and spatial characterization of the landscape and land use changes into account.The third step is to evaluate the accuracy of the model (model validation), where a test is performed to determine the similarity between simulated and observed data. Depending on the result obtained, the parameter setting is adjusted in order to increase the accuracy of the spatial model. Once an acceptable level is defined, the fourth step is to simulate scenarios in a defined time horizon – in this case 30 years.

Figure 24. Stages of the spatial modeling methodology in DINAMICA-EGO



Preparation of factor maps (4.2.1 VM0015)

This step used an empirical approach, defining functions to represent the probability of allocation of deforestation from five key spatial variables selected from among nine initial variables. The method used in *Dinamica*-EGO is called *Weight of Evidence,* a Bayesian method. This method requires that the variables used to produce the map of deforestation risk are independent. To verify the correlation between the variables chosen to explain the allocation of deforestation, 9 variables were tested in pairs, using the contents of Cramer (V) and Joint Information Uncertainty (JIU). If the values of V and JIU are above 0.50, this indicates more spatial association than less, and thus one of the variables must be eliminated, or both variables should be combined into a single one in order to avoid bias of the model by redundant information[106]. Combining variables was not required because the value of 0.5 was never exceeded.

The calculation of *weights of evidence for* each variable (or factor) examines their historical influence in relation to the deforestation observed. This influence of the variable is obtained from the amount of pixels representing forest area destroyed during the analysis period (the chosen calibration period was between 2000 and 2004).

Preparation of risk maps for deforestation (4.2.2 VM0015)

After using the function *Weights Ranges***,** the coefficients or weights of evidence relating to the chosen variables are calculated *(coefficients weights of evidence).* For both binary and continuous variables, a calculation is done to indicate whether the range of a continuous variable or any discrete observations are significant in explaining the occurrence or non-occurrence of historical deforestation. Adjustable parameters are available within the program to define classes of a significant variable when continuous. Some variables listed above were excluded from the analysis space because they did not show a significant result in the Bayesian analysis of the occurrence of deforestation. The following variables were discarded: soil type, distance to rivers, slope and relief. The retained variables (evidencing a significant positive or negative influence on the allocation of deforestation) are presented in Table 24.

[106] Bonham-Carter 1994.

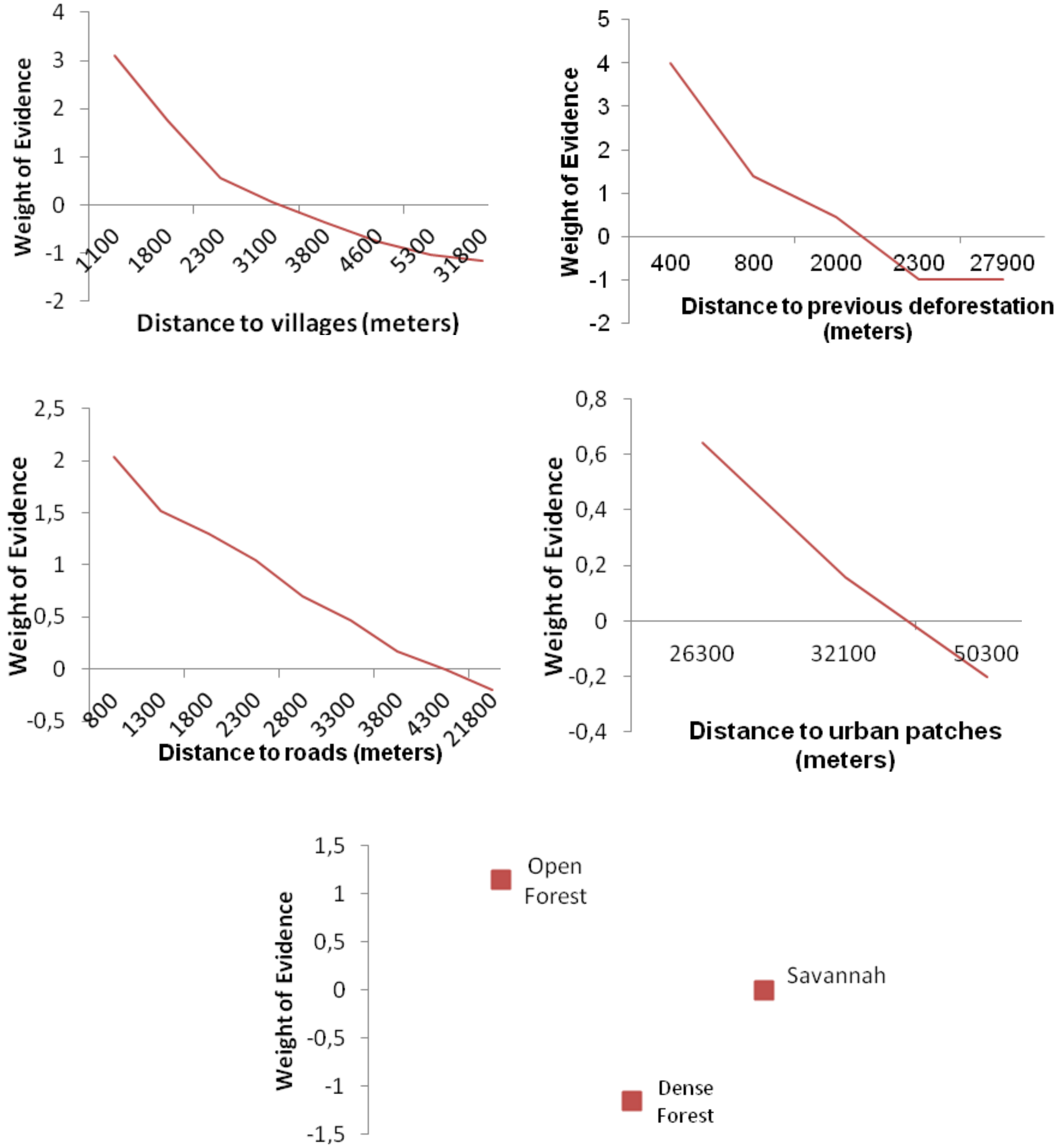
Table 24. List of variables, maps and factor maps (Table 10 Methodology VM0015).

Factor Map		Variable Represented			Meaning of the categories or pixel value		Maps and Other Variables used to create the Factor Map		Algorithm used or Equation	Original Scale of Spatial Data
ID	File Name	Source	UNIT	Description	Range	Meaning	ID	File Name		
1	Distance to villages	ACT / Meitareilá / IDESAM	Meters	Continuous data	[0-32250]	Distance to villages	1	Map of the villages	Euclidean distance from the points of villages	GPS
2	Distance to deforestatio n	Landsat TM and maps for each simulated year-EGO DYNAMICS	Meters	Continuous data	Varies dependin g on the model of iterations		2			900 m2 (30m pixel)
3	Distance to roads	Imazon	Meters	Continuous data	[0-21750]		3	Main roads	Euclidean distance from the lines of stays	
4	Distance to urban areas	IBGE	Meters	Continuous data	[7750-50500]		4	Urban sprawl	Euclidean distance from the polygons of urban spots	1:100.000
5	Types of vegetation	RADAMBRASI L	Categorie s	Major categories of vegetation	1.3	1: Tropical Rain Forest. 2 : Rain Forest open 3: Savanna h	5	Vegetatio n types		1:250.000

All maps in the table above were converted into the resolution of the spatial model of 250X250m. The weights represent the favorability of evidence (probability) of a transition occurring between land use classes (forest-clearing).Positive or negative values can be attributed to this probability depending on the weight of evidence of the influence on the transition considered. Positive values correspond to a change from forest (2) to non-forest (1); conversely, negative values are obtained when the factors negatively influence the transition.

Are shown in Figure 25 the weight of evidence for the six selected variables: distance from roads, vegetation type, distance from the indigenous villages, distance from urban areas, and distance from previous deforestation.

Figure 25. Weights of evidence calculated in DINAMICA-EGO (influences of biophysical variables affecting deforestation).



In this model, the maps of biophysical variables are used to calculate a new probability map that include the changes in some dynamic variables, such as distance to previous deforestation (Figure 26). On this map, each cell has a risk between 0 and 254 of being deforested (Figure 27). This is the result of a multivariate combination of the weights of evidence for each variable chosen[107].

[107] Soares-Filho 2003

Figure 26.Cross tabulation of multitemporal maps to produce maps of probability of transition.

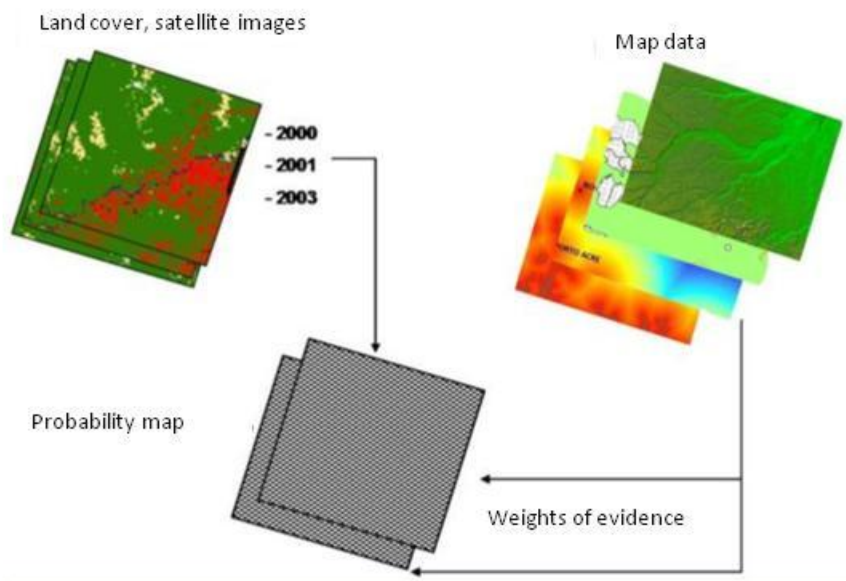
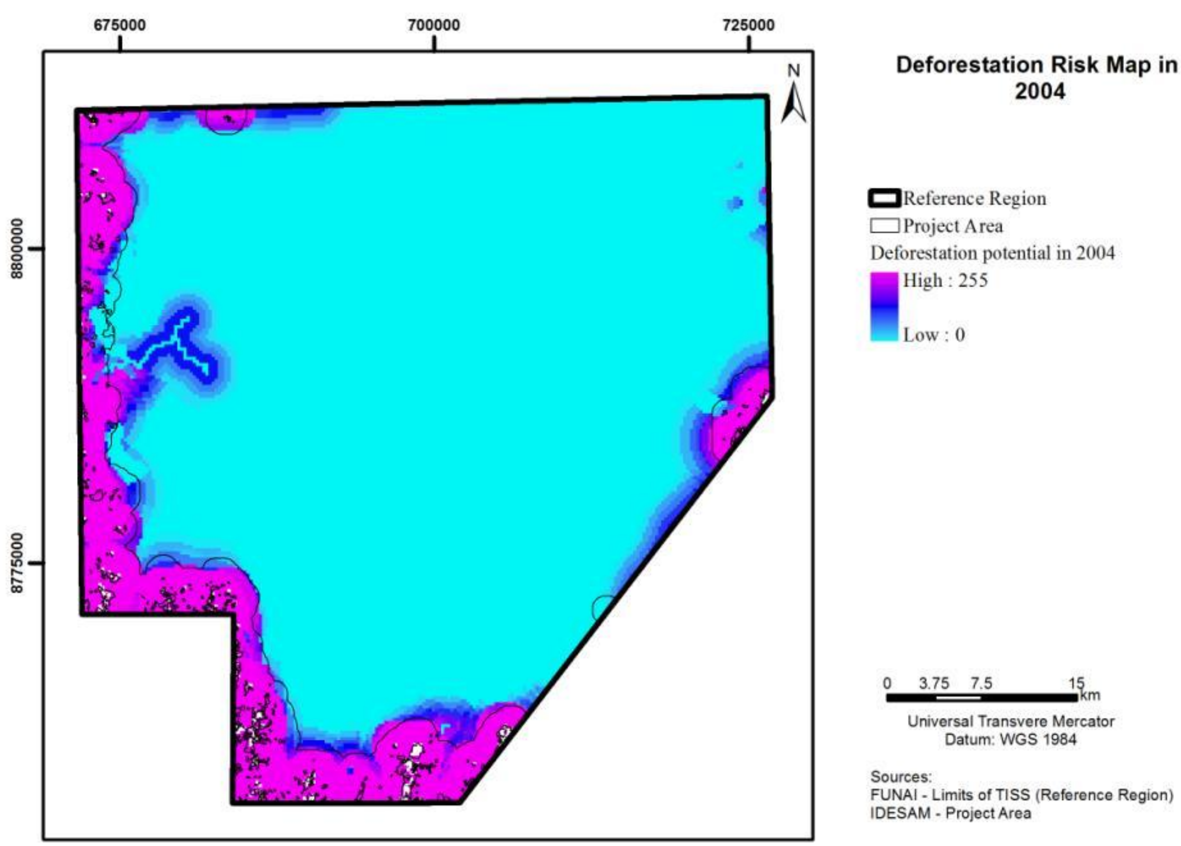


Figure 27. Deforestation risk map, 2004.



Selection of the most accurate deforestation risk map (4.2.3 VM0015)

Calibration and Validation

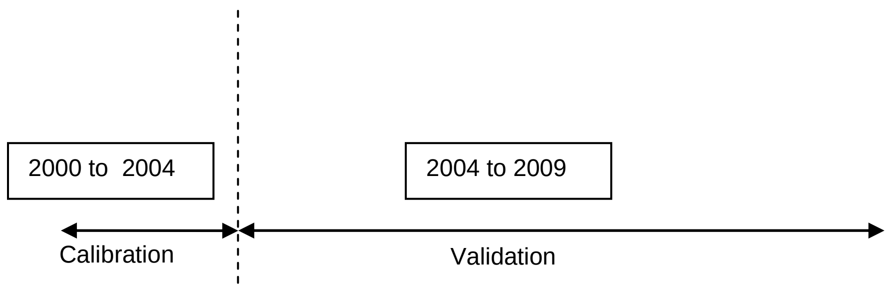
To evaluate the accuracy of deforestation in the model, two points are considered:

(I) the total amount of changes in land use that may differ between two time periods (period of calibration and validation).The calibration of the amount of deforestation has been evaluated in Section 4.1.3.1 VM0015 (p. 61-64), relative to the projection developed in the Vensim program.

(II) the influence of biophysical variables that determine the allocation or spatial distribution of deforestation.

The calibration of item (ii), using the DINAMICA-EGO platform, pertains only to the accuracy of the prediction space, by default the combined influence of biophysical variables using the deforestation probability map. The method chosen was option a) as presented on page 63 of VM0015 and shown in Figure 28, and as contained in the DINAMICA-EGO platform. This option allows parameters to be set regarding the effect of biophysical variables from 2000-2004, and an evaluation of its influence on the expansion of deforestation in the next period [2005-2009].

Figure 28: Areas deforested per year, used to calibrate and validate the spatial allocation.



Validation spatial similarity index - Fuzzy Method

Traditionally, maps have been compared using a contingency table, also known as a confusion matrix, the result of a pixel-by-pixel cross-tabulation of a pair of maps. However, spatial models that reproduce the dynamic patterns of deforestation often try to reproduce patterns covering more than one pixel. Therefore, a comparison is required with the surrounding area, because the maps that do not match exactly pixel by pixel, can still produce similar spatial patterns and thus spatial agreement with a neighboring pixel.To address this issue, several methods were developed for comparison of interaction between neighboring pixels.

For example, Costanza(1989) introduces the multiple resolution fitting procedure that compares a map spatial fit within increasing window sizes. Pontius (2002) presents a method similar to Costanza (1989), but that differentiates errors due to location and quantity. Power et al. (2001) provide a comparison method based on hierarchical fuzzy pattern matching. In turn, Alex Hagen (Risk, 2004) made available a map comparison tool kit that contains several of these methods as well as his own metrics, including fuzzy similarity that takes into account fuzziness of location and category within a cell neighborhood and the Kfuzzy, considered to be equivalent to the Kappa statistic (Hagen, 2003).

DINAMICA-EGO methods consist of a modified version of *fuzzy* similarity that best deals with the comparison of changes (Figure 29). The fuzzy similarity is based on the concept of fuzziness of location, in which a representation of a cell is influenced by the cell itself and, to a lesser extent to the cells in its neighborhood.[108] Not considering fuzziness of category, the fuzziness of location can be represented by

[108] Hagen 2003

the fuzzy neighborhood vector. First a crisp vector is associated to each cell in the map. This vector has as many positions as map categories, assuming 1 for a category = i and 0 for categories others than i. Then the fuzzy neighborhood vector (Vnbhood) for each cell is determined as in equations 3 and 4 below:

$$\mathbf{V}_{nbhood} = \begin{pmatrix} \mu_{nbhood_1} \\ \mu_{nbhood_2} \\ \vdots \\ \mu_{nbhood_C} \end{pmatrix} \quad (3)$$

$$\mu_{nbhood_i} = \left| \mu_{crisp_{i,1}} * m_1, \mu_{crisp_{i,2}} * m_2, \ldots\ldots\ldots\ldots, \mu_{crisp_{i,n}} * m_n \right|_{\mathrm{Max}} \quad (4)$$

where $\mu nbhood_i$ represents the membership for category i within a neighborhood of N cells (usually $N=n^2$); $\mu crisp_{i,j}$ is the membership of category i for neighboring cell j, assuming, as in a crisp vector, 1 for i and 0 for categories other than i ($i \subset C$) and m_j is the distance based membership of neighboring cell j. m represents a distance decay function, for instance, an exponential decay ($m=2^{d/2}$). Although spatially continuous, to facilitate computation this decay function becomes usually truncated outside of the neighborhood window nxn. Which function is most appropriate and also the size of the window depends on the vagueness of the data and the allowed tolerance for spatial error (Hagen, 2003). As we want to assess the model's spatial fit at various resolutions, besides an exponential decay, a constant function equal to 1 inside the neighborhood window and 0 outside of it is also employed. The equations bellow set for the central cell the membership values for each category taking respectively the highest contribution found within a neighborhood window nxn. Next a similarity measure for a pair of maps can be obtained through a cell-by-cell fuzzy set intersection between their fuzzy and crisp vectors using the following equations:

$$S(\mathbf{V}_A, \mathbf{V}_B) = [\left|\mu_{A,1}, \mu_{B,1}\right|_{Min}, \left|\mu_{A,2}, \mu_{B,2}\right|_{Min}, \ldots\ldots\ldots, \left|\mu_{A,i}, \mu_{B,i}\right|_{Min}]_{Max} \quad (5)$$

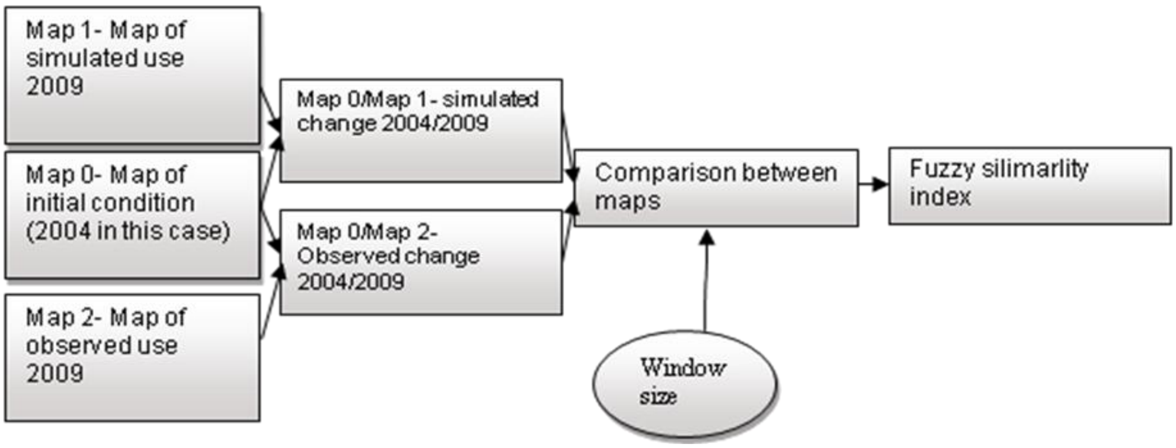
where $\mathbf{V}_A$ and $\mathbf{V}_B$ represent the fuzzy neighborhood vectors for maps A and B and $\mu_{A,i}$ and $\mu_{B,i}$ are their neighborhood memberships for categories $i \subset C$ i. According to Hagen (2003), since the similarity measure $S(\mathbf{V}_A,\mathbf{V}_B)$ tends to overestimate the spatial fit, the two-way similarity is applied instead, so that:

$$S_{twoWay}(A,B) = \left| S(\mathbf{V}nbhood_A, \mathbf{V}crisp_B), S(\mathbf{V}crisp_A, \mathbf{V}nbhood_B) \right|_{Min} \quad (6)$$

The overall similarity of a pair of maps can be calculated by averaging the two similarity values for all map cells. However, this calculation carries an inertial similarity between the two maps due to their unchanged areas. To avoid this problem, we have introduced a modification into the overall two-way similarity method, first using two maps of differences, which bears only 1 for changed and 0 (meaning null) for nonchanged cells. In this way each type of change is analyzed separately using pairwise comparisons involving maps of differences: 1) between an initial condition map and a simulated one and 2) between an initial condition map and a reference one.

This modification helps us solve two matters. First, as we deal only with one type of change at a time, the two-way similarity measure can be applied to the whole map without the constraint[109 110], due to the different number of cells per category. Second, the inherited similitude between the simulated map and its initial can be eliminated from this comparison by simply ignoring the null cells in the overall counting. But, there are two ways do that. One consists of counting only two-way similarity values for nonnull cells in the first map of difference and another by doing the opposite. As a result, we can obtain three measures of overall similarity, the third being the average of the two ways of counting. As a random pattern of maps tend to score higher due to chance depending on the way the nulls are counted, it is advisable to pick the minimum overall similarity value.

Figure 29. Flowchart of the processes for calculating the similarity index of the model developed in DINAMICA-EGO.



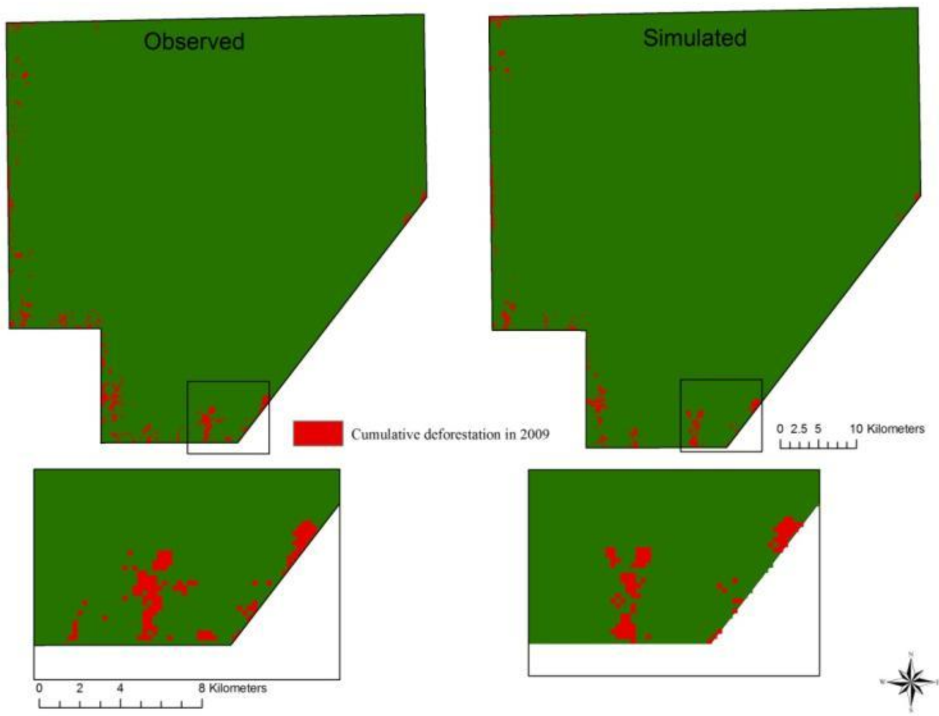
To get to the final value, the simulation of the allocation of deforestation baseline SimSuruí was made several times, using combinations of distribution functions between the *expander* and *patcher,* whose parameters were defined based on actual observations between 2001 and 2004 (mean and variance of deforested annually) to obtain the most appropriate similarity index.Thus, the minimum *fuzzy* similarity index was 53%, using a 5x5 cell window (Figure 30).This index allows the simulation of the baseline scenario with project. Few studies performed with DINAMICA-EGO to design the deforestation in the Amazon reach over 50% accuracy with less than window size 5x5 cells[111]. For example, recent work has reached a similarity index of 54% (window 5x5 cells) to model the deforestation of the municipality of Lábrea in the southern state of Amazonas[112], and 54.7% in a 7x7 cell window to the south of Roraima[113].

Mapping of the locations of future deforestation (4.2.4 VM0015)

DINAMICA-EGO allocates deforestation on a time horizon of 30 years from 2009, based on the probability map defined in the previous step (which evolves at each iteration due to dynamic distance considered), the parameters of the spatial configuration of changed areas (deforestation) defined between 2000 and 2009 and the rate of change that is passed from the model calculations performed in Vensim.

[109] Hagen *op.cit.*
[110] Hagen *op. cit*
[111] Britaldo Soares-Filho, personal communication.
[112] Vitel 2009.
[113] Barni 2009.

Figure 30 Maps of deforestation as observed and simulated in DINAMICA-EGO for the period between 2005 and 2009.



The program, through an automated algorithm, selects the pixels with the highest likelihood of change, according to the number of cells to be deforested, calculated from the rate and area of remaining forest to be cleared. The result is presented in the form of a series of multi-temporal maps (Figure 31 and Figure 32).

Figure 31. Multi-temporal projection of deforestation within the Surui territory.

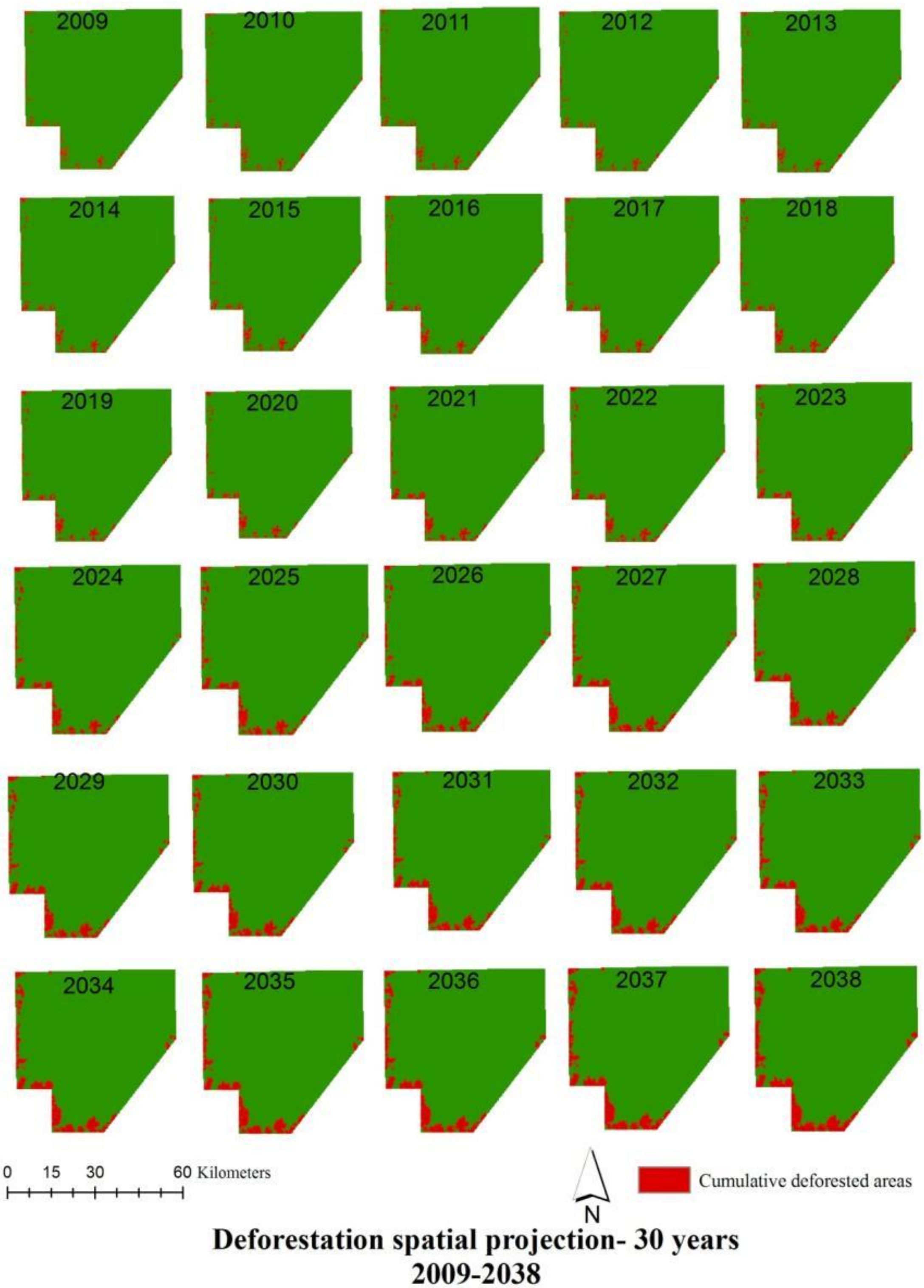
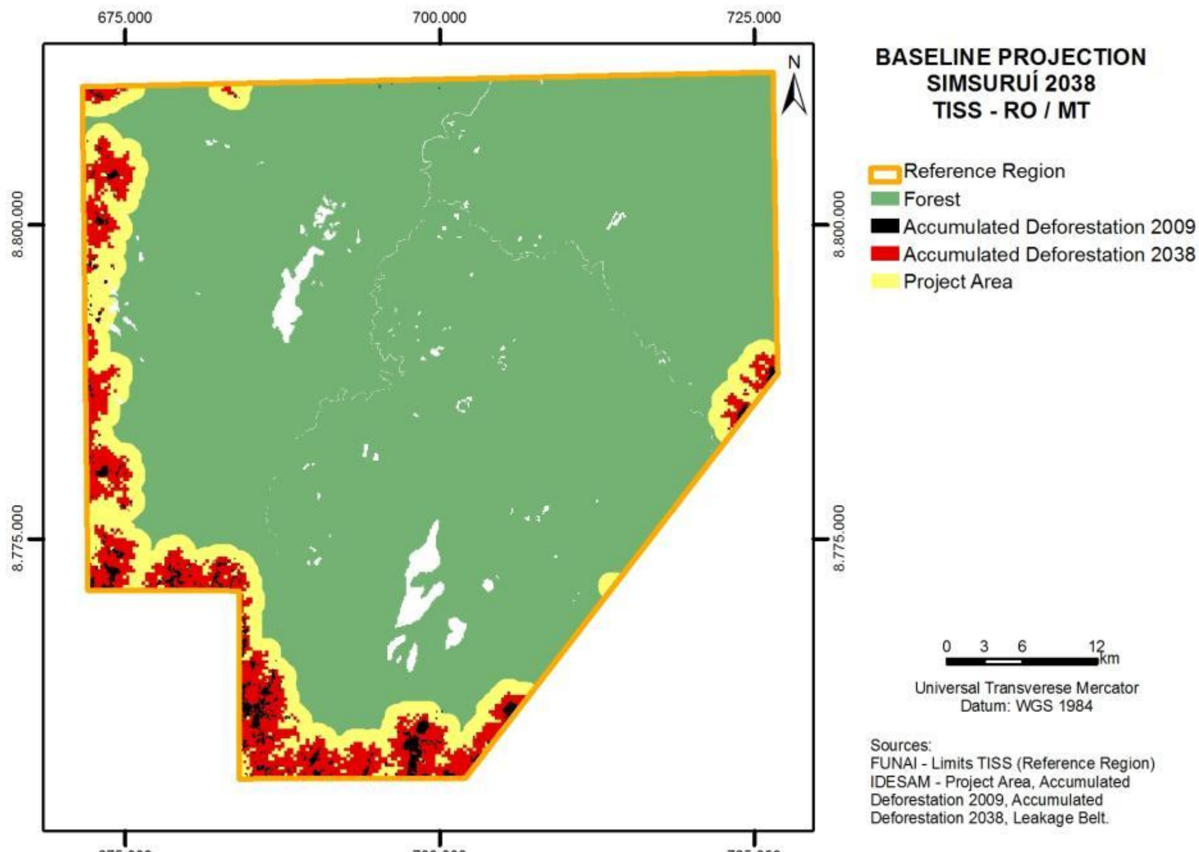


Figure 32: Map of Surui territory land use in 2038, according to the deforestation projection.



2.5 Additionality

The reduction of GHG emissions under the baseline scenario of the PCFS will be achieved by combating the endogenous factors (ie, avoiding that the Suruí Paiter deforest or sell timber illegally, or use these areas for livestock and leases). To do this, will be implemented four major lines of action: Development Forest Protection and Environment, Food Security and Sustainable Production; Institutional Strengthening and Development and Implementation of a financial mechanism (Suruí Fund). For more information about the activities to be conducted to reduce the emissions projected in the baseline scenario, see Table 04.

The project activity is analyzed according to the “Approved VCS Tool VT0001, Version 1.0, ‘Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities.’

Applicability Conditions for this tool apply to this project inasmuch as

a) AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project do not lead to violation of any applicable law even if the law is not enforced;

b) The baseline methodology (VM0015) provides for a stepwise approach justifying the determination of the most plausible baseline scenario in section 4.1.1 (Part 2, Step 4).

Step 1. Identification of alternative land use scenarios to the proposed VCS AFOLU project activity

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

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

Scenario 1: Continuation of the pre-project land use, forest within forest boundaries is maintained as forest without proposed REDD project activities or revenues. This land-use scenario could in theory either come about as a result of:

- Voluntary efforts on the part of the Surui carrying out proposed project activities on the land within the project boundary without being registered as a VCS AFOLU project, and without revenue from the sale of GHG credits, or

- A dramatic shift in enforcement of legal requirements and/or government support for protection of Surui forests.

The former would require a drastic change in the behavior of Paiter Suruí, who would assume full costs for forest conservation and protection of the TI Sete de Setembro by themselves, without regard to an improvement in governance and performance of public agencies and without additional sources of income (such as revenue from carbon credits) directly tied to forest conservation.

The latter set of circumstances would imply a significant increase and improvement in the performance of government institutions such as FUNAI, FUNASA, SESA, the Environmental Police, Ministry of Justice, etc., to ensure the protection and conservation of the environment in indigenous lands, linked to social improvement, economic and cultural rights of indigenous peoples. The resulting scenario would be the maintenance and conservation of forest cover, the existence of alternative and sustainable sources of income for communities and adequate provision of basic services such as health, education, among others.

Scenario 2: Deforestation for the expansion of pastures and crops, as has been occurring outside the project boundaries (baseline scenario). This scenario is described in detail in section 2.4 of this document. In summary, the baseline scenario entails an increase in deforestation within the project area, driven by agriculture and livestock activities that represent today the most viable sources of income as an alternative to the timber sales which have provided an important source of income to the Surui in recent years. This scenario is projected to result in the loss of 13,575 hectares of forest in the 2009-2038 period.

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

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

Scenario 2 (deforestation for the expansion of pastures and crops) potentially does not comply with all mandatory applicable legislation and regulations. It is worth noting that there are several interpretations of the laws applicable to land use in Indigenous Territories. There is no clear consensus on the legality or illegality of the practice of activities such as livestock and agriculture in IT, when practiced by the indigenous inhabitants of their IT. [114] **FUNAI itself has on at least one occasion recognized the**

[114] ISA. Brasil: Titularidade Indígena sobre Créditos de Carbono Gerados por Atividades Florestais em Terras Indígenas, 2009 e Baker&McKenzie. REDD – Reduced Emissions from Deforestation and Degradation – Suruí Carbon Project, 2009.

legality of "partnerships" with non-indigenous farmers for agricultural activities within indigenous territories.[115]

However it is clear that any applicable mandatory legal or regulatory requirements to prevent deforestation are systematically not enforced and non-compliance with those requirements is widespread in Rondônia and on indigenous lands like the Surui. Due to massive deforestation occurred in the State of Rondônia in the last 20 years there is hardly any more forest areas outside of indigenous lands or protected areas. The total accumulated deforestation in Rondônia has already destroyed about 38.6% of the original forest cover of the State.[116] It is estimated that less than 5% of illegal logging and deforestation in Rondônia have been subject to government control and legal enforcement.[117] This situation has generated strong pressure to implement logging, grazing and agriculture on indigenous lands such as the TI Sete de Setembro.

Decree 7056 of 20/12/2009, which established the regulatory structure of the National Indigenous Foundation (FUNAI), states that the institution must, on behalf of the Union, provide for protection and promotion of the rights of indigenous peoples, promote polices for the sustainable development of indigenous peoples, implement programs for monitoring, surveillance and conflict prevention. However, such actions are not systematically implemented and applied in Indigenous Sete de Setembro (TISS), as well as other Indian lands in the region. There are indications that during the 80's, the Paiter Suruí were encouraged to remove wood from inside their territory, on the grounds that otherwise FUNAI did not have the financial resources to meet the demands of the indigenous community[118] According to the testimony of the Suruí in 2006, "The recruiters (timber and the FUNAI) and working illegally in some cases with the connivance of the Indigenous who were enticed by extracting from the TISS approximately 250 truckloads of wood per day, coming from various corners of the area, with no action being taken to prevent this.[119]" This scenario is also identified in other indigenous areas, which face similar situations in terms of pressure on natural resources and poor socioeconomic status of their populations.[120] The neighboring indigenous territories and Zoró and Cinta Larga, for example, have historically suffered from invasions and rampant exploitation of natural resources, despite the legislation aim to protect and preserve the lands and traditional indigenous ways of life.[121]

Sub-step 1c. Selection of the baseline scenario:

As described in detail in section 2.4 of this document, following Steps 2-4 of VM0015.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

This REDD project may result in the generation of small financial benefits from the forest conserved within the project boundaries for the Surui other than VCS related income – primarily as a result of Brazil nut harvest – so the alternatives land uses scenarios were compared based on the investment comparison analysis (Option II).

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[115] FUNAI. PARECER N. 36 /PGF/PG/FUNAI/05. INTERESSADO: ASSOCIAÇÃO WAYMNARÉ E COMUNIDADE PARESI, IRANTXE E NAMBIKWARA ASSUNTO: LAVOURA MECANIZADA E CONTRATO DE FORNECIMENTO DE INSUMOS E EQUIPAMENTOS AGRÍCOLAS

[116] IMAZON. Fatos Florestais 2010.

[117] GTA. O Fim da Floresta? A devastação das Unidades de Conservação e Terras Indígenas no Estado de Rondônia. Junho, 2008.

[118] Depoimento Almir Narayamoga Suruí a Polícia Federal em 14/09/2006.

[119] Carta Aberta do Povo Paiter Suruí. Cacoal, 04 de Agosto de 2006

[120] O Estadão do Norte. Invasões tem conivência da FUNAI, garante o Cimi. Porto Velho, 2003.

[121] http://pib.socioambiental.org/files/file/PIB_verbetes/cinta_larga/diamantes_e_os_conflitos.pdf

Sub-step 2b. – Option II. Apply investment comparison analysis
Brazil nut collection is currently practiced by 92% of Surui families. Income from the sale of 32 tons of Brazil nuts in 2008 totaled approximately R$41,000, or US$24,000, or roughly R$400 (US$235) per producer (harvester) per year (product 2, IIEB).

Financial indicator
NPV is selected as the financial indicator to compare alternatives to implementing the project because the other indicators (IRR, RRR, cost-benefit ratio) as rates and ratios do not take into account the magnitude of financial benefits that are necessary to maintain Surui families. A financial analysis in 2001 by Embrapa researchers (http://www.sober.org.br/palestra/12/02O097.pdf) concludes that although Brazil nut collection is profitable, with relatively high returns to labor, the activity does not generate sufficient income to maintain a family because of the short seasonal harvest period. Thus the limiting factor for Brazil nut collection is not the rate of return, but limits to the absolute returns possible.

Sub-step 2c. Calculation and comparison of financial indicators
Forest conservation is not financially viable without carbon benefits.
If the Surui loose on average 0.5 hectare of their Brazil nut harvest area for every 1 hectare deforested, without replacement, resulting in the gradual reduction of Brazil nut production in the Surui territory to 50% of its current level, the project would prevent the loss of approximately $160,000 over the 30-year life of the creditation period. Discounted at 15%, the present value of this conservation benefit is approximately $15,000. This analysis is based on the following assumptions:

- Brazil nut gatherers do not simply go further into the forest to collect Brazil nuts as the forest is gradually cleared, so there is a loss of income from Brazil nut collection as forest is cleared.
- Reported revenues from Brazil nut collection are net of the cost of collection.

By contrast, the incentives for forest clearing for agriculture are enormous. At an annual benefit of $111 per hectare (the average of annual profits from owning and leasing out land for ranching and coffee production), the Surui stand to earn nearly $18 million over 30 years ($1.7 million at a 15% discount rate) on the land that would be cleared in the absence of the project.

The financial model underpinning this analysis is available for review by validator.

Sub-step 2d. Sensitivity analysis
If deforestation projected in the baseline scenario were to gradually wipe out *all* Brazil nut production in the Surui territory, the total loss would be approximately $320,000 and the NPV of this loss (and therefore a benefit of the project) would be about $30,000.

If *all* of the land projected to be deforested under the baseline scenario were used for ranching under a leasing arrangement (the least profitable agricultural land use, generating only $40/hectare/year), the benefits of clearing would be $6.5 million over 30 years ($627,000 when discounted at 15%).

Conclusion of Step 2: The investment analysis clearly indicates that the project activities, without additional revenues from sale of carbon credits, are less attractive than the baseline scenario.

Step 3. Barrier analysis

Sub-step 3a. Identify barriers that would prevent the implementation of the type of proposed project activity
On purely financial or economic terms it is clear – as indicated by the results of Step 2 (Investment Analysis) – that the proposed REDD project activities are not financially attractive as compared with the alternative land-use (baseline) scenario. Scenario 1 (conservation without REDD revenues) might however be hypothesized to come about due to increased legal enforcement and government support.

However, this scenario of strengthened governance and enforcement faces significant barriers, whilst these same barriers do not prevent the implantation of the alternative land-use scenarios.

Institutional barriers are particularly significant for improved governance and enforcement. The political and administrative structures for territorial protection and sustainable development on indigenous lands are less than ideal in Brazil[122,123]. The situation is no different in TISS nor other indigenous territories in the region. The institutions responsible for implementation of indigenous policies do not have adequate human or physical infrastructure to meet their institutional mandates and thereby ensure the welfare of indigenous environmental and socioeconomic[124]. "Despite the status of Protected Areas, [indigenous lands] have been victims of Rondônia chronic lack of planning, investment and state protection."[125] This scenario allows illegal invasions occur on Indian lands without government control, resulting in major impacts on natural resources in these areas.

For 2010 a total of R$1.8M was estimated to be allocated to all the decentralized units of FUNAI in Rondonia (responsible all indigenous lands in the state)[126]. The overall average annual budget for the Surui for the first 5 years of operation is R$1.3M/year, equivalent to fully 72% of FUNAI's entire budget for the state – an amount that this public agency will not be able to dedicate to meeting the Surui's needs. Even beyond the overall budget limitations, FUNAI and other government agencies' capacity to effectively and efficiently deploy its limited budget is also severely constrained. In a review conducted in 2008, FUNAI only spent 8.84% of its budget for the promotion of Indigenous Lands in Ethnodevelopment; FUNASA (Fundação Nacional de Saúde) only executed 27.92% of its budget for surveillance, food security and nutrition of Indigenous Peoples; and the Ministry of Agrarian Development, had not disbursed any of its budget of R$ 4.24 million for Technical Assistance and Rural Extension in Indigenous Lands[127].

Scenario 1 (conservation without project revenues) is also constrained due to *barriers relating to social conditions and land-use practices* as described in Sections 1.10 and 2.4 of this document, *inter alia*:

i) Demographic pressure on the land (e.g. increased demand on land due to population growth), with the Surui population projected to at least double in the next 30 years (Table 11, this document);

ii) Social conflict among interest groups in the region where the project takes place, with some community members benefiting disproportionately from income derived from timber and sharecropping agreements with neighboring farmers;

iii) Widespread illegal practices (e.g. illegal grazing, non-timber product extraction and tree felling)

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

The baseline scenario is not affected by any of the barriers identified for the scenario with PCFS. Rather, the existence of these barriers (lack of institutional governance capacity, social conditions) drives and encourages activities that lead to deforestation and forest degradation in the project area. In the absence of the activities planned for the project, the economic activities performed by Paiter Suruí tend to migrate from illegal logging to increasing investment in open pastures and areas for coffee production.

[122] Comunicação Pessoal. Termo de Declarações que presta Almir Narayamoga Suruí ao Serviço Público Federal
[123] Ata da 217a. Reunião da 6a. Câmara de Coordenação e Revisão. 24/08/2001
[124] Instituto Socioambiental (ISA). Desmatamento em Rondônia avança sobre áreas protegidas. 14/07/2005.
[125] GTA. O Fim da Floresta? A devastação das Unidades de Conservação e Terras Indígenas no Estado de Rondônia. Junho, 2008.
[126] http://www.funai.gov.br/ultimas/noticias/1_semestre_2010/abril/un2010_06.html
[127] Ricardo Verdum. Orçamento Indigenista da União no PPA 2008-2011.

Step 4. Common practice analysis

Efforts to conserve indigenous lands and support rural development do exist throughout the Amazon, however there is no comparable mechanism for mobilizing comprehensive funding linked to commitments to conserve standing forest. As indicated in Substep 3.a. the level of funding mobilized and the scale of project activities to halt deforestation in the Surui territory is dramatically greater than public programs with broadly similar objectives. While the Surui themselves have been able to access funding from private and public donations, none of these sources of finance have reached the scale needed to revert pressures for deforestation. Perhaps more significantly the essential distinction is that these do not in any formal way require that the Surui reduce deforestation (though this may well be an implicit assumption).

Other indigenous groups in the region also provide an important point of comparison providing evidence that the project's proposed combination of activities and commitments to reduce deforestation are not common practice. Indigenous territories located around the TISS, today face intense process of deforestation. The Zoró Indigenous Territory does not have a Management Plan nor Ethno-zoning. The Igarapé Lourdes Indigenous Territory faces intense logging pressure and the indigenous organization has no support for implementation of programs and projects for sustainable development. The other nearby Indigenous Territories (Roosevelt, Aripuanã, Sierra Morena and Aripuanã Park) are also under pressure from loggers with involvement of indigenous peoples.

Summary:

- In the absence of the REDD project activities and associated revenues, the Surui potentially have two alternative land-use scenarios: 1) Forest conservation with costs assumed by the Surui themselves or by a dramatic upsurge in public support or 2) Deforestation for conversion to agriculture and grazing (baseline).

- These alternative scenarios are legal or characterized by weak or nonexistent application of relevant laws and regulations.

- Without carbon revenues, forest conservation and implementation of proposed project activities is not economically attractive as compared to the baseline scenario.

- Improved governance and public funding, on the scale required to execute project activities, is constrained by institutional barriers as well as social conditions. The baseline scenario is unconstrained by these barriers – and is in fact driven by this lack of governance and social pressures.

- The scale and nature of project activities to reduce deforestation are not common practice in the region, and what limited activity is taking place is essentially different inasmuch as it is not linked formally to measurable commitments to reduce deforestation.

2.6 Methodology Deviations

None

3 QUANTIFICATION OF GREENHOUSE GAS REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Definition of the land-use and land-cover change component of the baseline (Step 5 VM0015)

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

The baseline projections obtained with the Simsurui model indicate that there would be a clearing of about 13,575.3 ha during the duration of the project, between the years 2009 to 2038, as shown in Table 25.

Table 25. Annual areas deforested per forest class *icl* within the project area in the baseline case (baseline activity data per forest class) (Table 11 Methodology VM0015)

Area deforested per forest class *icl* within the project area		Total baseline deforestation in the project area	
IDicl> **Name >**	Icl1 Degraded Ombrophyllous Forest (PA)	***ABSLPA$_t$*** **annual**	***ABSLPA*** **cumulative**
Project year *t*	**ha**	**ha**	**ha**
2009	195.0	195.0	195.0
2010	191.2	191.2	386.2
2011	274.1	274.1	660.3
2012	258.0	258.0	918.3
2013	238.7	238.7	1,157.0
2014	255.5	255.5	1,412.5
2015	271.2	271.2	1,683.7
2016	243.3	243.3	1,927.0
2017	210.1	210.1	2,137.1
2018	211.5	211.5	2,348.6
2019	221.3	221.3	2,569.9
2020	225.0	225.0	2,794.9
2021	393.7	393.7	3,188.5
2022	480.8	480.8	3,669.3
2023	475.5	475.5	4,144.8
2024	751.5	751.5	4,896.3
2025	736.0	736.0	5,632.3
2026	584.7	584.7	6,216.9
2027	554.9	554.9	6,771.8
2028	696.8	696.8	7,468.6
2029	606.9	606.9	8,075.5
2030	483.6	483.6	8,559.1
2031	399.9	399.9	8,959.0
2032	477.4	477.4	9,436.3
2033	438.2	438.2	9,874.5
2034	560.8	560.8	10,435.3
2035	618.7	618.7	11,054.0
2036	605.5	605.5	11,659.5
2037	895.2	895.2	12,554.7
2038	1,020.6	1,020.6	13,575.3

Calculation of baseline activity data per post-deforestation forest class (Step 5.2 VM0015)

The method used to define the final post-clearing class (vegetation in equilibrium) was Method 1: **Historical LU/LC-change**. The carbon stock for this class after forest clearing was obtained from a matrix of transition probabilities between categories of land use (Markov Matrix). This matrix estimates the average composition of vegetation (and their carbon stocks) that may replace a forest cleared in the Amazon biome[128].The forest vegetation results in an average equilibrium stock of 47 t CO_2 e/ha.

[128] Fearnside, 1996

Table 26. Annual areas of post-deforestation classes *fcl* within the project area in the baseline case (baseline activity data per non-forest class) (Table 12b Methodology VM0015)

Area established after deforestation per class *fcl* within the project area		Total baseline deforestation in the project area	
ID_{cl}	1		
Name >	Anthropic vegetation in equilibrium	***$ABSLPA_t$*** **annual**	***ABSLPA*** **cumulative**
Project year *t*	**ha**	**ha**	**ha**
2009	195.0	195.0	195.0
2010	191.2	191.2	386.2
2011	274.1	274.1	660.3
2012	258.0	258.0	918.3
2013	238.7	238.7	1,157.0
2014	255.5	255.5	1,412.5
2015	271.2	271.2	1,683.7
2016	243.3	243.3	1,927.0
2017	210.1	210.1	2,137.1
2018	211.5	211.5	2,348.6
2019	221.3	221.3	2,569.9
2020	225.0	225.0	2,794.9
2021	393.7	393.7	3,188.5
2022	480.8	480.8	3,669.3
2023	475.5	475.5	4,144.8
2024	751.5	751.5	4,896.3
2025	736.0	736.0	5,632.3
2026	584.7	584.7	6,216.9
2027	554.9	554.9	6,771.8
2028	696.8	696.8	7,468.6
2029	606.9	606.9	8,075.5
2030	483.6	483.6	8,559.1
2031	399.9	399.9	8,959.0
2032	477.4	477.4	9,436.3
2033	438.2	438.2	9,874.5
2034	560.8	560.8	10,435.3
2035	618.7	618.7	11,054.0
2036	605.5	605.5	11,659.5
2037	895.2	895.2	12,554.7
2038	1,020.6	1,020.6	13,575.3

Table 27. Annual areas of post-deforestation classes *fcl* within the leakage belt in the baseline case (baseline activity data per non-forest class) (Table 12c Methodology VM0015)

Area established after deforestation per class *fcl* within the leakage belt		Total baseline deforestation in the leakage belt	
ID $_{cl}$	*2*		
Name>	Anthropic Vegetation in Equilibrium	*$ABSLLK_t$*	*ABSLLK*
		annual	cumulative
Project year *t*	ha	ha	ha
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2014	0	0	0
2018	0	0	0
2019	0	0	0
2020	0	0	0
2021	0	0	0
2022	0	0	0
2023	0	0	0
2024	0	0	0
2025	0	0	0
2026	0	0	0
2027	0	0	0
2028	0	0	0
2029	0	0	0
2030	0	0	0
2031	0	0	0
2032	0	0	0
2033	0	0	0
2034	0	0	0
2035	0	0	0
2036	0	0	0
2037	0	0	0
2038	0	0	0

Estimation of baseline carbon stock changes and non-CO2 emissions (Step 6 VM0015)

Estimation of baseline carbon stock changes (Step 6.1 VM0015)

Between 2010 and 2011 an inventory of forest biomass was conducted, sampling 22 hectares of Degraded Ombrophyllous Forest in the TISS, in the three forest vegetation types or sub-classes present: Open Ombrophyllous Forest with Lianas (FAC), Open Ombrophyllous Forest with Palmeiras (FAP) and Dense Ombrophyllous Forest (FD). The main results are summarized below. For more detailed information read the supplementary material 02.

We used the stratified systematic sampling method, where each of the three vegetation types sampled corresponded to a stratum. Initially, we created a grid on the TISS map and selected nine quadrants where sampling units would be allocated for the pilot inventory. Criteria for choosing the sampling sites included proximity to extraction roads, vegetation types and the level of difficulty of access to areas. As a first step was nine clusters were sampled in order to determine the optimal number of sample plots to represent the total stock of TISS with a sampling error of less than 10% for a confidence interval (CI) of 95%. This determined the need to sample 13 more clusters in a second stage, resulting in a total of 22 (Figure 34).

Figure 33. Logging roads in TI Sete de Setembro

Figure 34. Distribution of permanent and temporary sampling units in the project area and elsewhere in the reference region.

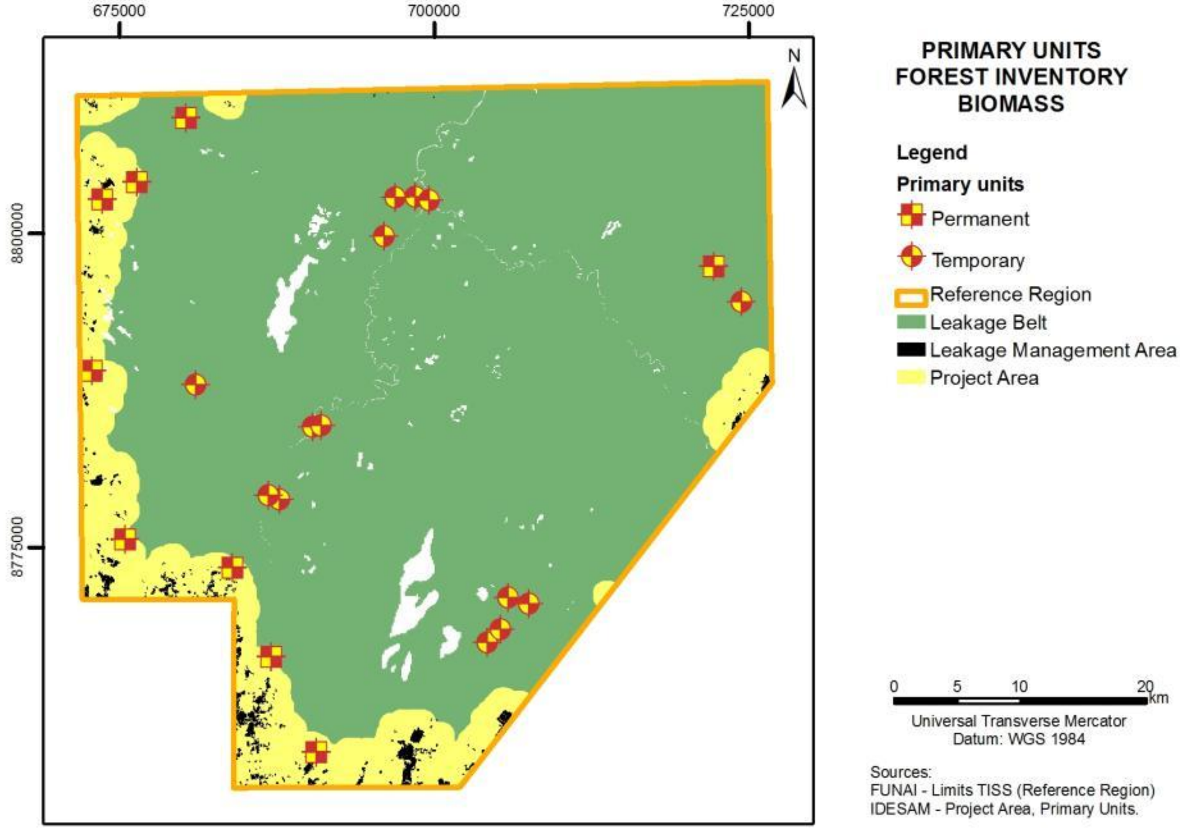
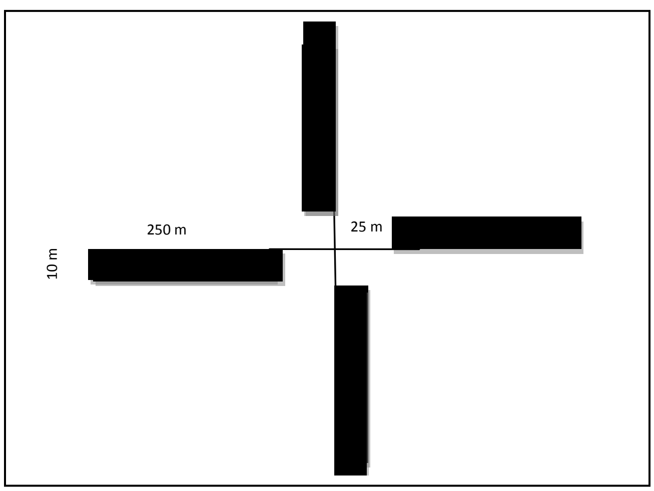


Figure 35. Logging in TI Sete de Setembro

Each cluster consists of four plots arranged in a cross distributed to the North, South, East and West, with dimensions of 10 x 250 meters, beginning 25 meters from the center of the cluster (Figure 36). Nine permanent clusters were installed for permanent monitoring of changes in carbon stocks, and 13 temporary clusters were measured. The clusters were installed at least 300 meters from the main logging road that gave access to the area.

Figure 36. Form of conglomerates installed.



In each plot all individuals of plants - trees, palms and lianas - with a diameter at breast height (DBH) ≥ 10 cm (or circumference at breast height - CBH ≥ 31.4 cm) were measured, and the height of palm trees estimated. The indigenous names of plants were noted for the permanent plots.

Data was registered in spreadsheets and allometric equations were used to obtain the dry weight of plants measured. For tree species equation 7 [129], for open rain forest in southern Amazonia, was used:

[129] Nogueira et al. 2008.

$$PS_{abg} = EXP - 1{,}716 + 2{,}413 * Ln(DAP) \qquad (7)$$

Whereby:
PS_{abg} = estimated dry weight for each individual
DAP = diameter at breast height

To estimate the biomass of palms, we used equation 8[130] , most frequently used in the Amazon, as follows:

$$PS_{abg} = EXP - 6{,}3789 - 0{,}877 * Ln\left(\frac{1}{DAP^2}\right) + 2{,}151 * Ln(H) \qquad (8)$$

Whereby:
PS_{abg} = estimated dry weight for each individual
DAP = diameter at breast height
H = Height

Carbon stock was estimated converting measured dry weight for each individual to carbon, according to equation 9 [131], as follows:

$$C_{abg} = PS_{abg} \times 0{,}485 \qquad (9)$$

whereby:
C_{abg} = Above-ground;
PS_{abg} = estimated dry weight for each individual.

The results indicate sampling error for the entire population of 1.96%. The carbon stock of aboveground biomass was 125.97 tons per hectare.

Due to the low variation of carbon stocks identified between the three vegetation types of TISS, it was decided to use the weighted average. Thus, the stock of carbon above ground for calculations of emission reductions by the project will be 125.97 t C / ha.

For belowground biomass, we used a root / shoot ratio of 34.3% [132] of dry biomass. This is a median value obtained from direct measurements, incorporating other references[133] .

The stock change without the project involves the clearing of rainforest for the establishment of temporary pastures and agricultural crops, as well as the regeneration of secondary vegetation representing various stages of development. The forest carbon stock as measured in the carbon inventory and incorporating belowground biomass, is 169.18 tC / ha (620.3 tCO_2 / ha) [134] .This value was reduced by the amount of carbon in vegetation in equilibrium that would replace the forest, composed of a mosaic of land uses in the Brazilian Amazon, equivalent to 12.82 tC per hectare (47.0 tCO_2 / ha) [135] .The use of this value for landscape carbon stocks in equilibrium is conservative in that it is based on a higher proportion of secondary forests in the deforested area (45%) than the proportion projected for the simulated year 2038 (32%).

[130] Saldarriaga et al. 1988.
[131] Silva 2007.
[132] Silva *op. cit.*
[133] Some values for root / shoot ratio for tropical forests that can be used were obtained indirectly, such as those based in other forest types, *ie* boreal forests, as 21% in Cairns et al. (1997), or even more extensive reviews that suggest a value of 42% as Mokany et al. (2006). Therefore, we used a value obtained through primary data by Silva (2007), weighing about 175 trees (biomass above and below ground), to obtain the value of this ratio of 34.3%.
[134] See Supplementary Material No. 4
[135] Fearnside 1996.

Thus, the project comprises a single class of original forest vegetation, divided into two *strata,* with carbon values for the initial class, Degraded Ombrophyllous Forest (Icl1 and Icl2), of 620.3 tCO_2 -e/ha converted to the final class Anthropic Vegetation at Equilibrim (Fcl1)[136] (47.0 -e/ha $tCO_{2)}$ resulting in an emission factor of 573.3 tCO_2 -e/ha.(Table 31).

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

Carbon stocks were estimated from field measurements of biomass and the inventory of the TISS. This survey was conducted to determine the carbon stocks of existing forest classes in the project area and leakage belt.

Table 28 Average carbon stock per hectare of all LU/LC classes present in the project area, leakage belt and leakage management area (Table 14 Methodology VM0015)

LU / LC class		Average carbon stock per hectare ± 95% CI					
		Cab cl		*Cbb cl*		*Ctot cl*	
		average stock	± 95% CI	*average stock*	± 95% CI	*average stock*	± 95% CI
ID cl	Name	$t\ CO_{2e}\ ha^{-1}$	$t\ CO_{2e}\ ha^{-1}$	$t\ CO_{2e}\ ha^{-1}$	$t\ CO_{2e}\ ha^{-1}$	$t\ CO_{2e}\ ha^{-1}$	$t\ CO_{2e}\ ha^{-1}$
Icl1	Degraded Ombrophyllous Forest (PA)	461.9	14.1	158.4	4.8	620.3	18.9
Icl2	Degraded Ombrophyllous Forest (LK)	461.9	14.1	158.4	4.8	620.3	18.9
Fcl1	Anthropic vegetation in equilibrium					47.0	

Calculation of baseline carbon stock changes (6.1.2 VM0015)

The method used to calculate changes in carbon stocks in the baseline scenario followed method 2 (activity data are available for categories) in step 6.1.2 of Part II of Methodology VM0015. The carbon stock of degraded rainforest was obtained through biomass inventory conducted for the TISS (for further information see above section: Estimation of baseline carbon stock changes) as shown in Table 29 (corresponding to Table 15a of VM0015). The changes in carbon stocks for the post-deforestation land-use class *(anthropic vegetation in equilibrium)* was defined using a classification based on a Markov matrix (for details see Step 5.2 VM0015), as shown in Table 30 (corresponding to Table 15b of VM0015).

[136] See Supplementary Material No 6

Table 29. Changes in carbon stocks in classes pre-deforestation (forests) in the baseline scenario (Table Methodology 15a VM0015)

Project year *t*	Carbon stock changes in initial (pre-deforestation) forest classes in the project area				Total carbon stock change in initial forest classes	
	ID_{icl1}	= Degraded Ombrophyllous Forest (PA)	ID_{icl2}	= Degraded Ombrophyllous Forest (LK)	annual	cumulative
	$ABSLPA_{icl,t}$	$Ctot_{icl,t}$	$ABSLPA_{icl,t}$	$Ctot_{icl,t}$	$DCBSLPAi_t$	$DCBSLPAi$
	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2009	195.0	120,959.6	0.0	0.0	0.0	0.0
2010	191.2	118,590.3	0.0	0.0	0.0	0.0
2011	274.1	170,043.5	0.0	0.0	0.0	0.0
2012	258.0	160,044.5	0.0	0.0	0.0	0.0
2013	238.7	148,056.7	0.0	0.0	0.0	0.0
2014	255.5	158,519.4	0.0	0.0	0.0	0.0
2015	271.2	168,231.2	0.0	0.0	0.0	0.0
2016	243.3	150,925.2	0.0	0.0	0.0	0.0
2017	210.1	130,318.5	0.0	0.0	0.0	0.0
2018	211.5	131,195.1	0.0	0.0	0.0	0.0
2019	221.3	137,257.0	0.0	0.0	0.0	0.0
2020	225.0	139,575.1	0.0	0.0	0.0	0.0
2021	393.7	244,197.3	0.0	0.0	0.0	0.0
2022	480.8	298,233.2	0.0	0.0	0.0	0.0
2023	475.5	294,955.1	0.0	0.0	0.0	0.0
2024	751.5	466,189.6	0.0	0.0	0.0	0.0
2025	736.0	456,540.4	0.0	0.0	0.0	0.0
2026	584.7	362,677.2	0.0	0.0	0.0	0.0
2027	554.9	344,219.7	0.0	0.0	0.0	0.0
2028	696.8	432,221.6	0.0	0.0	0.0	0.0
2029	606.9	376,473.8	0.0	0.0	0.0	0.0
2030	483.6	299,970.9	0.0	0.0	0.0	0.0
2031	399.9	248,070.7	0.0	0.0	0.0	0.0
2032	477.4	296,113.2	0.0	0.0	0.0	0.0
2033	438.2	271,800.2	0.0	0.0	0.0	0.0
2034	560.8	347,906.7	0.0	0.0	0.0	0.0
2035	618.7	383,796.7	0.0	0.0	0.0	0.0
2036	605.5	375,597.9	0.0	0.0	0.0	0.0
2037	895.2	555,309.9	0.0	0.0	0.0	0.0
2038	1,020.6	633,108.4	0.0	0.0	0.0	0.0

Table 30. Baseline carbon stock change in post-deforestation (non-forest) classes (Table 15b Methodology VM0015)

Project year *t*	Baseline carbon stock change in post-deforestation (non-forest) classes ID_{fcl} $ABSLPA_{fcl,t}$ ha	= Anthropic Vegetation in Equilibrium $Ctot_{fcl,t}$ tCO_2-e ha^{-1}	Total carbon stock change in final non-forest classes annual $DCBSLPAf_t$ tCO_2-e	cumulative $DCBSLPAf$ tCO_2-e
2009	195.0	9,169.7	0.0	0.0
2010	191.2	8,990.1	0.0	0.0
2011	274.1	12,890.6	0.0	0.0
2012	258.0	12,132.6	0.0	0.0
2013	238.7	11,223.9	0.0	0.0
2014	255.5	12,017.0	0.0	0.0
2015	271.2	12,753.2	0.0	0.0
2016	243.3	11,441.3	0.0	0.0
2017	210.1	9,879.2	0.0	0.0
2018	211.5	9,945.6	0.0	0.0
2019	221.3	10,405.2	0.0	0.0
2020	225.0	10,580.9	0.0	0.0
2021	393.7	18,512.1	0.0	0.0
2022	480.8	22,608.4	0.0	0.0
2023	475.5	22,359.9	0.0	0.0
2024	751.5	35,340.8	0.0	0.0
2025	736.0	34,609.3	0.0	0.0
2026	584.7	27,493.8	0.0	0.0
2027	554.9	26,094.6	0.0	0.0
2028	696.8	32,765.8	0.0	0.0
2029	606.9	28,539.7	0.0	0.0
2030	483.6	22,740.2	0.0	0.0
2031	399.9	18,805.7	0.0	0.0
2032	477.4	22,447.7	0.0	0.0
2033	438.2	20,604.6	0.0	0.0
2034	560.8	26,374.1	0.0	0.0
2035	618.7	29,094.8	0.0	0.0
2036	605.5	28,473.3	0.0	0.0
2037	895.2	42,096.9	0.0	0.0
2038	1,020.6	47,994.6	0.0	0.0

Table 15c of VM0015 was not included because it refers to a method of Step 6.1.2 of this methodology that was not utilized.

Table 31. Carbon stock change factors per category of LU/LC change (Table 16 Methodology VM0015)

Category from Table 7b		Average *carbon stock* ± 95% CI of the "initial" *class*			Average *carbon stock* ± 90% CI of the final class	Average carbon stock change factor ± 90% CI
		Cab	*Cbb*	*Ctot*	*Ctot*	*ΔCtot*
IDct	*Name*	tCO_2e ha^{-1}	tCO_2e ha^{-1}	tCO_2e ha^{-1}	tCO_2e ha^{-1}	tCO_2e ha^{-1}
Icl1 to fcl1	Degraded Ombrophyllous Forest to anthropic vegetation in equilibrium	461.9	158.4	**620.3**	**47.0**	**573.3**
Icl2 to fcl1	Degraded Ombrophyllous Forest to anthropic vegetation in equilibrium	461.9	158.4	**620.3**	**47.0**	**573.3**

Table 32. Total net baseline carbon stock change in the project area
(Calculated with Method 2: Activity data per category) **(Table 17 Methodology VM0015)**

Project year *t*	Activity data per category x Carbon stock change factor in the project area ID_{ct} = Icl1 to fcl1		Total baseline carbon stock change in the project area	
	$ABSLPA_{ct,t}$ ha	$DCtot_{ct,t}$ tCO_2-e ha^{-1}	annual $DCBSLPA_t$ tCO_2-e	cumulative $DCBSLPA$ tCO_2-e
2009	195.0	573.3	111,789.9	111,789.9
2010	191.2	573.3	109,600.2	221,390.1
2011	274.1	573.3	157,152.8	378,542.9
2012	258.0	573.3	147,911.8	526,454.8
2013	238.7	573.3	136,832.8	663,287.6
2014	255.5	573.3	146,502.4	809,789.9
2015	271.2	573.3	155,477.9	965,267.9
2016	243.3	573.3	139,483.9	1,104,751.8
2017	210.1	573.3	120,439.4	1,225,191.1
2018	211.5	573.3	121,249.5	1,346,440.6
2019	221.3	573.3	126,851.9	1,473,292.5
2020	225.0	573.3	128,994.2	1,602,286.7
2021	393.7	573.3	225,685.2	1,827,971.9
2022	480.8	573.3	275,624.8	2,103,596.7
2023	475.5	573.3	272,595.2	2,376,191.9
2024	751.5	573.3	430,848.8	2,807,040.7
2025	736.0	573.3	421,931.0	3,228,971.7
2026	584.7	573.3	335,183.5	3,564,155.1
2027	554.9	573.3	318,125.1	3,882,280.3
2028	696.8	573.3	399,455.8	4,281,736.0
2029	606.9	573.3	347,934.1	4,629,670.1
2030	483.6	573.3	277,230.8	4,906,900.9
2031	399.9	573.3	229,265.0	5,136,165.9
2032	477.4	573.3	273,665.5	5,409,831.4
2033	438.2	573.3	251,195.6	5,661,027.0
2034	560.8	573.3	321,532.6	5,982,559.6
2035	618.7	573.3	354,701.9	6,337,261.5
2036	605.5	573.3	347,124.6	6,684,386.2
2037	895.2	573.3	513,213.1	7,197,599.2
2038	1,020.6	573.3	585,113.8	**7,782,713.1**

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

Emissions from fires used to clear forests in the baseline are omitted.

Tables 18 and 19 of Step 6.2 of VM0015 were not included because they refer to non-CO2 emissions from burning of forests.

3.2 Project Emissions

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

Tables 20a, 20b, 20c and 20d of Step 7.1.1 of VM0015 do not apply to the project, as planned deforestation and logging activities (and consequent decrease in carbon stocks) are not expected in the project area.

Optional accounting of significant carbon stock increase

As allowed by the methodology, the project proponents include a factor that represents the increase in carbon stocks in the project area, since project area includes degraded forests that in the baseline case would be deforested and due to the project activity these areas will recover and sequester additional carbon. We adopted the lowest value found in the literature in the Amazon, giving the conservative estimate that a logged forest sequesters carbon at a rate of 0.27 tC / ha/year (or 0.99 tCO2/ha/year)[137], resulting in increased carbon storage in the project area of 253,910.5 tCO_2 (Table 33).

Table 33. *Ex ante* estimated carbon stock increase due to planned protection without harvest in the project area (Table Methodology 21.a. VM0015)

Project year	Area of forest classes growing without harvest in the project case x Carbon stock change (increase)		Total carbon stock increase due to growth without harvest	
	ID_{cl}	= 1	annual	cumulative
	$APNiPA_{icl,t}$	$DCtot_{icl,t}$	$DCPNiPA_t$	$DCPNiPA$
t	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2009	194.99	0.99	193.0	193.0
2010	191.17	0.99	378.5	571.6
2011	274.12	0.99	814.1	1,385.7
2012	258.00	0.99	1,021.7	2,407.4
2013	238.68	0.99	1,181.5	3,588.9
2014	255.54	0.99	1,517.9	5,106.8
2015	271.20	0.99	1,879.4	6,986.2
2016	243.30	0.99	1,927.0	8,913.2
2017	210.08	0.99	1,871.8	10,785.0
2018	211.49	0.99	2,093.8	12,878.9
2019	221.27	0.99	2,409.6	15,288.5
2020	225.00	0.99	2,673.1	17,961.5
2021	393.66	0.99	5,066.5	23,028.0
2022	480.77	0.99	6,663.5	29,691.5
2023	475.49	0.99	7,061.0	36,752.6
2024	751.53	0.99	11,904.3	48,656.8
2025	735.97	0.99	12,386.5	61,043.3
2026	584.66	0.99	10,418.7	71,462.0
2027	554.90	0.99	10,437.8	81,899.9
2028	696.77	0.99	13,796.1	95,696.0
2029	606.90	0.99	12,617.5	108,313.5
2030	483.57	0.99	10,532.3	118,845.8
2031	399.91	0.99	9,105.9	127,951.7
2032	477.35	0.99	11,342.0	139,293.7
2033	438.16	0.99	10,844.5	150,138.3
2034	560.85	0.99	14,436.3	164,574.6
2035	618.70	0.99	16,538.1	181,112.7
2036	605.49	0.99	16,784.2	197,896.9
2037	895.19	0.99	25,701.2	223,598.2
2038	1020.61	0.99	30,312.4	253,910.5

[137] Valle et al 2007.

Table 34. Total *ex ante* estimated carbon stock increase due to planned activities in the project area (Table 21.d. Methodology VM0015)

Project year *t*	Total carbon stock increase due to growth without harvest		Total carbon stock increase due to planned logging activities		Total carbon stock increase due to planned fuel-wood and charcoal activities		Total carbon stock increase due to planned activities	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$DCPNiPA_t$	*DCPNiPA*	$DCPLiPA_t$	*DCPLiPA*	$DCPFiPA_t$	*DCPFiPA*	$DCPAiPA_t$	*DCPAiPA*
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	193.0	193.0	0	0	0	0	193.0	193.0
2010	378.5	571.6	0	0	0	0	378.5	571.6
2011	814.1	1,385.7	0	0	0	0	814.1	1,385.7
2012	1,021.7	2,407.4	0	0	0	0	1,021.7	2,407.4
2013	1,181.5	3,588.9	0	0	0	0	1,181.5	3,588.9
2014	1,517.9	5,106.8	0	0	0	0	1,517.9	5,106.8
2015	1,879.4	6,986.2	0	0	0	0	1,879.4	6,986.2
2016	1,927.0	8,913.2	0	0	0	0	1,927.0	8,913.2
2017	1,871.8	10,785.0	0	0	0	0	1,871.8	10,785.0
2018	2,093.8	12,878.9	0	0	0	0	2,093.8	12,878.9
2019	2,409.6	15,288.5	0	0	0	0	2,409.6	15,288.5
2020	2,673.1	17,961.5	0	0	0	0	2,673.1	17,961.5
2021	5,066.5	23,028.0	0	0	0	0	5,066.5	23,028.0
2022	6,663.5	29,691.5	0	0	0	0	6,663.5	29,691.5
2023	7,061.0	36,752.6	0	0	0	0	7,061.0	36,752.6
2024	11,904.3	48,656.8	0	0	0	0	11,904.3	48,656.8
2025	12,386.5	61,043.3	0	0	0	0	12,386.5	61,043.3
2026	10,418.7	71,462.0	0	0	0	0	10,418.7	71,462.0
2027	10,437.8	81,899.9	0	0	0	0	10,437.8	81,899.9
2028	13,796.1	95,696.0	0	0	0	0	13,796.1	95,696.0
2029	12,617.5	108,313.5	0	0	0	0	12,617.5	108,313.5
2030	10,532.3	118,845.8	0	0	0	0	10,532.3	118,845.8
2031	9,105.9	127,951.7	0	0	0	0	9,105.9	127,951.7
2032	11,342.0	139,293.7	0	0	0	0	11,342.0	139,293.7
2033	10,844.5	150,138.3	0	0	0	0	10,844.5	150,138.3
2034	14,436.3	164,574.6	0	0	0	0	14,436.3	164,574.6
2035	16,538.1	181,112.7	0	0	0	0	16,538.1	181,112.7
2036	16,784.2	197,896.9	0	0	0	0	16,784.2	197,896.9
2037	25,701.2	223,598.2	0	0	0	0	25,701.2	223,598.2
2038	30,312.4	253,910.5	0	0	0	0	30,312.4	253,910.5

Tables 21b and 21c of methodology VM0015 were not included because they refer to information obtained *ex post.*

***Ex ante* estimation of carbon stock changes due to unavoidable unplanned deforestation within the project area (Step 7.1.2 VM0015).**

Significant GHG emissions within the project area are not expected under the "project scenario," nevertheless as a conservative approach to *ex ante* estimates, it is assumed only 90% of the total deforestation under the baseline scenario will be avoided.
This factor takes into account any unexpected changes in carbon stocks, potentially generated by expansion of family farming areas, unavoidable unplanned logging or encroachment etc. This value makes a total of 524,360.8 tCO_{2-e} that could be emitted in the project scenario (Table 35).

***Ex ante* estimated net actual carbon stock changes in the project area (Step 7.1.3 VM0015)**

Results are summarized in Table 35 (corresponding to Table 22 of VM0015)

Table 35. *Ex ante* estimated net carbon stock change in the project area under the project scenario (Table 22 Methodology VM0015)

Project year *t*	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities[51]		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$DCPAdPA_t$	*DCPAdPA*	DCPAiPAt	*DCPAiPA*	$DCUDdPA_t$	*DCUDdPA*	$DCPSPA_t$	*DCPSPA*
	tCO_2-e	tCO_2-e	tCO2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	0.0	0.0	193.0	193.0	11,179.0	11,179.0	10,985.9	10,985.9
2010	0.0	0.0	378.5	571.6	10,960.0	22,139.0	10,581.5	21,567.4
2011	0.0	0.0	814.1	1,385.7	15,715.3	37,854.3	14,901.1	36,468.6
2012	0.0	0.0	1,021.7	2,407.4	14,791.2	52,645.5	13,769.5	50,238.1
2013	0.0	0.0	1,181.5	3,588.9	13,683.3	66,328.8	12,501.8	62,739.9
2014	0.0	0.0	1,517.9	5,106.8	14,650.2	80,979.0	13,132.3	75,872.2
2015	0.0	0.0	1,879.4	6,986.2	15,547.8	96,526.8	13,668.4	89,540.5
2016	0.0	0.0	1,927.0	8,913.2	13,948.4	110,475.2	12,021.4	101,562.0
2017	0.0	0.0	1,871.8	10,785.0	12,043.9	122,519.1	10,172.1	111,734.1
2018	0.0	0.0	2,093.8	12,878.9	12,125.0	134,644.1	10,031.1	121,765.2
2019	0.0	0.0	2,409.6	15,288.5	12,685.2	147,329.2	10,275.6	132,040.8
2020	0.0	0.0	2,673.1	17,961.5	12,899.4	160,228.7	10,226.4	142,267.1
2021	0.0	0.0	5,066.5	23,028.0	22,568.5	182,797.2	17,502.1	159,769.2
2022	0.0	0.0	6,663.5	29,691.5	27,562.5	210,359.7	20,898.9	180,668.1
2023	0.0	0.0	7,061.0	36,752.6	27,259.5	237,619.2	20,198.5	200,866.6
2024	0.0	0.0	11,904.3	48,656.8	43,084.9	280,704.1	31,180.6	232,047.2
2025	0.0	0.0	12,386.5	61,043.3	42,193.1	322,897.2	29,806.6	261,853.8
2026	0.0	0.0	10,418.7	71,462.0	33,518.3	356,415.5	23,099.6	284,953.5
2027	0.0	0.0	10,437.8	81,899.9	31,812.5	388,228.0	21,374.7	306,328.2
2028	0.0	0.0	13,796.1	95,696.0	39,945.6	428,173.6	26,149.5	332,477.6
2029	0.0	0.0	12,617.5	108,313.5	34,793.4	462,967.0	22,175.9	354,653.5
2030	0.0	0.0	10,532.3	118,845.8	27,723.1	490,690.1	17,190.8	371,844.3
2031	0.0	0.0	9,105.9	127,951.7	22,926.5	513,616.6	13,820.6	385,664.9
2032	0.0	0.0	11,342.0	139,293.7	27,366.6	540,983.1	16,024.6	401,689.4
2033	0.0	0.0	10,844.5	150,138.3	25,119.6	566,102.7	14,275.0	415,964.4
2034	0.0	0.0	14,436.3	164,574.6	32,153.3	598,256.0	17,716.9	433,681.4
2035	0.0	0.0	16,538.1	181,112.7	35,470.2	633,726.2	18,932.1	452,613.5
2036	0.0	0.0	16,784.2	197,896.9	34,712.5	668,438.6	17,928.2	470,541.7
2037	0.0	0.0	25,701.2	223,598.2	51,321.3	719,759.9	25,620.1	496,161.8
2038	0.0	0.0	30,312.4	253,910.5	58,511.4	778,271.3	28,199.0	524,360.8

***Ex ante* estimation of actual non-CO2 emissions from forest fires**
This step is not applicable to the PCFS, since forest fires have not been included in the baseline scenario. Table 23 of VM0015 methodology was not included because it refers to estimates of non-CO2 emissions from forest fires.

Total *ex ante* estimations for the project area (Step 7.3 VM0015)
As previously described, ex-ante estimates include an an annual increase of 0.99 t CO_2 -e/ha for degraded forests that would have been deforested under the baseline within the project area and an effectiveness of 90% for project activities in avoiding the deforestation that would occur baseline scenario baseline (Table 36).

Table 36. Total *ex ante* estimated actual net carbon stock changes and emissions of non-CO2 gasses in the project area. (Table 24 Methodology VM0015)

Project year *t*	Total *ex ante* carbon stock decrease due to planned activities		Total *ex ante* carbon stock increase due to planned activities		Total *ex ante* carbon stock decrease due to unavoided unplanned deforestation		Total *ex ante* net carbon stock change		Total *ex ante* estimated actual non-CO_2 emissions from forest fires in the project area	
	annual	Cumul.	annual	Cumul.	annual	Cumul.	annual	Cumul.	annual	Cumul.
	$DCPAdPA_t$	DCPAdPA	$DCPAiPA_t$	DCPAiPA	$DCUDdPA_t$	DCUDdPA	$DCPSPA_t$	DCPSPA	$EBBPSPA_t$	EBBPSPA
	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
2009	-	-	193.0	193.0	11,179.0	11,179.0	10,985.9	10,985.9	-	-
2010	-	-	378.5	571.6	10,960.0	22,139.0	10,581.5	21,567.4	-	-
2011	-	-	814.1	1,385.7	15,715.3	37,854.3	14,901.1	36,468.6	-	-
2012	-	-	1,021.7	2,407.4	14,791.2	52,645.5	13,769.5	50,238.1	-	-
2013	-	-	1,181.5	3,588.9	13,683.3	66,328.8	12,501.8	62,739.9	-	-
2014	-	-	1,517.9	5,106.8	14,650.2	80,979.0	13,132.3	75,872.2	-	-
2015	-	-	1,879.4	6,986.2	15,547.8	96,526.8	13,668.4	89,540.5	-	-
2016	-	-	1,927.0	8,913.2	13,948.4	110,475.2	12,021.4	101,562.0	-	-
2017	-	-	1,871.8	10,785.0	12,043.9	122,519.1	10,172.1	111,734.1	-	-
2018	-	-	2,093.8	12,878.9	12,125.0	134,644.1	10,031.1	121,765.2	-	-
2019	-	-	2,409.6	15,288.5	12,685.2	147,329.2	10,275.6	132,040.8	-	-
2020	-	-	2,673.1	17,961.5	12,899.4	160,228.7	10,226.4	142,267.1	-	-
2021	-	-	5,066.5	23,028.0	22,568.5	182,797.2	17,502.1	159,769.2	-	-
2022	-	-	6,663.5	29,691.5	27,562.5	210,359.7	20,898.9	180,668.1	-	-
2023	-	-	7,061.0	36,752.6	27,259.5	237,619.2	20,198.5	200,866.6	-	-
2024	-	-	11,904.3	48,656.8	43,084.9	280,704.1	31,180.6	232,047.2	-	-
2025	-	-	12,386.5	61,043.3	42,193.1	322,897.2	29,806.6	261,853.8	-	-
2026	-	-	10,418.7	71,462.0	33,518.3	356,415.5	23,099.6	284,953.5	-	-
2027	-	-	10,437.8	81,899.9	31,812.5	388,228.0	21,374.7	306,328.2	-	-
2028	-	-	13,796.1	95,696.0	39,945.6	428,173.6	26,149.5	332,477.6	-	-
2029	-	-	12,617.5	108,313.5	34,793.4	462,967.0	22,175.9	354,653.5	-	-
2030	-	-	10,532.3	118,845.8	27,723.1	490,690.1	17,190.8	371,844.3	-	-
2031	-	-	9,105.9	127,951.7	22,926.5	513,616.6	13,820.6	385,664.9	-	-
2032	-	-	11,342.0	139,293.7	27,366.6	540,983.1	16,024.6	401,689.4	-	-
2033	-	-	10,844.5	150,138.3	25,119.6	566,102.7	14,275.0	415,964.4	-	-
2034	-	-	14,436.3	164,574.6	32,153.3	598,256.0	17,716.9	433,681.4	-	-
2035	-	-	16,538.1	181,112.7	35,470.2	633,726.2	18,932.1	452,613.5	-	-
2036	-	-	16,784.2	197,896.9	34,712.5	668,438.6	17,928.2	470,541.7	-	-
2037	-	-	25,701.2	223,598.2	51,321.3	719,759.9	25,620.1	496,161.8	-	-
2038	-	-	30,312.4	253,910.5	58,511.4	778,271.3	28,199.0	524,360.8	-	-

3.3 Leakage

According to methodology VM0015, two sources of leakage are considered and must be addressed:

i. Decrease in carbon stocks and increase in GHG emissions associated with leakage prevention measures;
ii. Decrease in carbon stocks and increase in GHG emissions associated with activity displacement leakage.

Decrease in carbon stocks or increase in emissions due to leakage prevention measures

The project believes that the Paiter-Suruí people, residents within the TISS, represent 100% of the actors directly involved in deforestation activities foreseen by the baseline scenario with PCFS. The leakage belt areas and leakage management PCFS (see Figure 10) are located within the TISS. To avoid leakage due to "activity displacement" of Surui outside of the project area, leakage prevention measures will be taken, primarily focused on income generation and improved quality of life of the Paiter-Surui people, that are described below:

- **Alternative and sustainable sources of income for the Suruí.** The implementation of the project is largely based on the development of new alternative sources of sustainable income to replace those activities that cause deforestation in the baseline, the improvement of production chains of brazil nuts, coffee, bananas, handicrafts, and the creation of new sources of income, such as tourism and the actual jobs created with the implementation and monitoring of the project.

- **Reforestation activities.** The project includes the reforestation of agricultural areas and pastures with native species, increasing the stock of carbon in the leak management areas.

While these activities may generate GHG emissions through fossil fuel consumption, fertilization or increased methane emissions by livestock, it is considered that these emissions are insignificant compared to the emissions from the sources expected in the baseline scenario base. This statement is in accordance with the Methodology VM0015 and VCS 3.0.

In fact, the PCFS is expected to generate a positive balance of emissions in the leakage management area through the promotion of reforestation and agroforestry systems based on principles of agroecology, low consumption of energy and chemical inputs, and increased use of organic fertilizers. Even so, as a conservative measure, these emissions are not accounted for in generating carbon credits for the PCFS.

Decrease in carbon stocks or increase in emissions due to activity shifting

The model SimSuruí, developed to estimate a projection of deforestation in the baseline scenario for the PCFS, involved the analysis of all potential actors and agents of deforestation in the TISS (and thus for the entire PCFS Reference Region). As previously stated, the Paiter-Surui PCFS believes that all of the actors involved in deforestation activities in the TISS are represented, and with the preventive measures outlined above, emissions leakage from activity shifting are not expected.

In any case, the PCFS will monitor external (and internal) agents that could be displaced to the leakage belt. The project includes a monitoring plan and monitoring mechanism to ensure the physical integrity of the entire project area and reference region, and also covering the "leakage belt." To date, two monitoring stations have been installed and the project will install three more stations placed at strategic sites to protect all of the TISS.

Ex ante estimation of leakage (Step 8)

This section does not apply to the PCFS since no form of leakage is expected from the implementation of the activities of the Suruí Forest Carbon Project. For this reason, Tables 25a, 25b, 25c, 26, 27, 28, 29a, 29b, 29c, 30, 31, 32 and 33 of the Methodology VM0015 were not included because they refer to leakage arising from the implementation of Project activities.

3.4 Summary of GHG Emission Reductions and Removals

Ex ante total net anthropogenic GHG emission reductions (Step 9 VM0015)

Significance Assessment (Step 9.1 VM0015)

The sources of GHG emissions considered in the PCFS (above- and below-ground biomass - see Table 16 Methodology VM0015) are significant, as demonstrated by applying the "Tool for Testing Significance of GHG Emissions in A/R CDM Project Activities," where the above-ground biomass accounts for 74.5% of the expected emissions in the baseline scenario and below-ground biomass accounts for the remaining 25.5%. Both sources, therefore, show a significance level >5% and thus will be considered in calculations of reductions in net GHG emissions by project activities.

For the project baseline scenario, the significance level was calculated for potential emission sources as well as activities that may decrease the emissions expected in the baseline scenario; these are, respectively: (i) CH_4 emissions from biomass burning and (ii) decrease in emissions expected in the baseline scenario, by logging without the use of fire (durable goods). Was also calculated the significance of a possible emission source that could lead to a reduction in avoided emissions under the PCFS scenario: (i) emissions from deforestation in leakage management areas.

Below, an analysis of identified emissions sources.

Baseline Scenario

(I) CH4 from burning biomass

To determine the significance of CH4 emitted through the burning of biomass, we used the equation presented in Step 6.2 of the Methodology VM0015:

$$EBBCH4_{icl,t} = EBBCO_2 * \frac{12}{44} * ER_{CH4} * \frac{16}{12} * GWP_{CH4} \quad (10)$$

Whereby:

EBBCO2icl, t = CO2 emissions per hectare from burning of biomass per forest class in year t icl: * CO2e ha^{-1}
EBBCH4icl, t = CH4 emissions per hectare from burning of biomass per forest class in year t icl: * CO2e ha^{-1}

ERCH4 = Emission rate for CH4 (IPCC default value = 0.012).
GWPCH4 = Global Warming Potential for CH4 (IPCC default value = 21 for the first commitment period).

The result of this equation gives the value of 52.53 tCO2e*ha^{-1}. However, a combustion efficiency of 50% is assumed (Step 6.2, VM0015) such that CH4 emissions represent 4.6% of the emissions per hectare. This source has been shown not significant and conservatively will not be counted as an avoided emission in the PCFS.

(ii) Durable Wood Products

We calculated the significance level of potential logging that does not use fire (eg. for the production of durable goods like furniture, etc.) and hence does not produce GHG emissions. To perform the calculations we used the following assumptions:

- Net Emission Factor per hectare: **573.3 tCO2**
- Logging intensity **30m^3/ha**[138]
- Coefficient of volumetric efficiency: **45%**[139]
- Wood density = **0.59 t/m^3** [140]
- Carbon density = **0.485 tC / t biomass**[141]
- Conversion factor for CO_2e = **44/12**[142]
- Permanence factor of CO_2e by the use of wood in durable goods: 30m^3/ha * 45% * 0.59 * 0.45 * 3.666 = **13.14 tCO2e/ha**
- Calculation of the significance level: 13.14 tCO2 / 573.3 tCO2 = 0.023 **(2.3%)**

And, it is assumed that logging would occur at an average intensity of 30m^3/ha, according to known exploitation intensitiesin tropical forests. Of total production, wood represents 45% of the extracted volume. By applying the values for wood density and the carbon content of the biomass, the amount of carbon removed from the forest for the production of durable goods may be estimated.

It is important to point out that the logging intensity values used here are extremely conservative because in a degraded forest as found in TISS, a logging intensity of 30m^3/ha of commercial species is unlikely.

The result of the calculation of significance (2.3%) indicates that this activity will not be counted because it is below the level of significance established by the Methodology VM0015.

PCFS Scenario

(I) Leakage Management Areas

As previously mentioned, it is expected that with project implementation there will be an increase of carbon stocks in areas under leakage management as reforestation and agroforestry activities will be encouraged and promoted by the project proponents.

[138] Putz, 2008
[139] CONAMA, 2009
[140] Nogueira, 2008
[141] Silva, 2007
[142] IPCC, 2006

If a very pessimistic scenario is assumed, whereby carbon stocks in leakage management areas totaling 3,416 ha decreased by 50% (from 47 tCO_2/ha to 23.5 tCO_2/ha) through deforestation caused by the Paiter-Suruí, the total emissions from this loss would represent 4,1% of expected emission reductions in the project scenario (per hectare) and therefore is not considered significant and will not be counted as an potential emission source in the project scenario.

Table 37. ***Ex ante*** **estimated net anthropogenic GHG emission reductions (Δ*REDDt*) and Voluntary Carbon Units (*VCUt*) (Table 34 Methodology VM0015)**

Project year *t*	Baseline carbon stock changes		Baseline GHG emissions		*Ex ante* project carbon stock changes		*Ex ante* project GHG emissions		*Ex ante* leakage carbon stock changes		*Ex ante* leakage GHG emissions		*Ex ante* net anthropogenic GHG emission reductions		*Ex ante* VCUs tradable		*Ex ante* buffer credits	
	annual	cum.	annual	cum.	annual	cum.	annual	cum.	annual	cum.	annual	cum.	annual	cum.	annual	cum.	annual	cum.
	DCBSLPA t	*DCBSLPA*	*EBBBSLPA t*	*EBBBSLPA*	*DCPSPA t*	*DCPSPA*	*EBBPSPA t*	*EBBPSPA*	*DCLK t*	*DCLK*	*ELK t*	*ELK*	*DREDDt*	*DREDD*	*VCU t*	*VCU*	*VBC t*	*VBC*
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	111,789.9	111,789.9	-	-	10,985.9	10,985.9	-	-	0.00	0.00	0.00	0.00	100,804.0	100,804.0	**94,755.7**	**94,755.7**	6,048.2	6,048.2
2010	109,600.2	221,390.1	-	-	10,581.5	21,567.4	-	-	0.00	0.00	0.00	0.00	99,018.7	199,822.7	**93,077.6**	**187,833.3**	5,941.1	11,989.4
2011	157,152.8	378,542.9	-	-	14,901.1	36,468.6	-	-	0.00	0.00	0.00	0.00	142,251.7	342,074.4	**133,716.6**	**321,549.9**	8,535.1	20,524.5
2012	147,911.8	526,454.8	-	-	13,769.5	50,238.1	-	-	0.00	0.00	0.00	0.00	134,142.3	476,216.7	**126,093.8**	**447,643.7**	8,048.5	28,573.0
2013	136,832.8	663,287.6	-	-	12,501.8	62,739.9	-	-	0.00	0.00	0.00	0.00	124,331.0	600,547.7	**116,871.1**	**564,514.8**	7,459.9	36,032.9
2014	146,502.4	809,789.9	-	-	13,132.3	75,872.2	-	-	0.00	0.00	0.00	0.00	133,370.1	733,917.8	**125,367.9**	**689,882.7**	8,002.2	44,035.1
2015	155,477.9	965,267.9	-	-	13,668.4	89,540.5	-	-	0.00	0.00	0.00	0.00	141,809.6	875,727.3	**133,301.0**	**823,183.7**	8,508.6	52,543.6
2016	139,483.9	1,104,751.8	-	-	12,021.4	101,562.0	-	-	0.00	0.00	0.00	0.00	127,462.5	1,003,189.8	**119,814.7**	**942,998.4**	7,647.7	60,191.4
2017	120,439.4	1,225,191.1	-	-	10,172.1	111,734.1	-	-	0.00	0.00	0.00	0.00	110,267.3	1,113,457.1	**103,651.2**	**1,046,649.6**	6,616.0	66,807.4
2018	121,249.5	1,346,440.6	-	-	10,031.1	121,765.2	-	-	0.00	0.00	0.00	0.00	111,218.4	1,224,675.4	**104,545.3**	**1,151,194.9**	6,673.1	73,480.5
2019	126,851.9	1,473,292.5	-	-	10,275.6	132,040.8	-	-	0.00	0.00	0.00	0.00	116,576.3	1,341,251.7	**109,581.7**	**1,260,776.6**	6,994.6	80,475.1
2020	128,994.2	1,602,286.7	-	-	10,226.4	142,267.1	-	-	0.00	0.00	0.00	0.00	118,767.8	1,460,019.6	**111,641.8**	**1,372,418.4**	7,126.1	87,601.2
2021	225,685.2	1,827,971.9	-	-	17,502.1	159,769.2	-	-	0.00	0.00	0.00	0.00	208,183.2	1,668,202.7	**195,692.2**	**1,568,110.6**	12,491.0	100,092.2
2022	275,624.8	2,103,596.7	-	-	20,898.9	180,668.1	-	-	0.00	0.00	0.00	0.00	254,725.9	1,922,928.6	**239,442.3**	**1,807,552.9**	15,283.6	115,375.7
2023	272,595.2	2,376,191.9	-	-	20,198.5	200,866.6	-	-	0.00	0.00	0.00	0.00	252,396.7	2,175,325.2	**237,252.9**	**2,044,805.7**	15,143.8	130,519.5
2024	430,848.8	2,807,040.7	-	-	31,180.6	232,047.2	-	-	0.00	0.00	0.00	0.00	399,668.2	2,574,993.4	**375,688.1**	**2,420,493.8**	23,980.1	154,499.6
2025	421,931.0	3,228,971.7	-	-	29,806.6	261,853.8	-	-	0.00	0.00	0.00	0.00	392,124.4	2,967,117.9	**368,597.0**	**2,789,090.8**	23,527.5	178,027.1
2026	335,183.5	3,564,155.1	-	-	23,099.6	284,953.5	-	-	0.00	0.00	0.00	0.00	312,083.8	3,279,201.7	**293,358.8**	**3,082,449.6**	18,725.0	196,752.1
2027	318,125.1	3,882,280.3	-	-	21,374.7	306,328.2	-	-	0.00	0.00	0.00	0.00	296,750.4	3,575,952.1	**278,945.4**	**3,361,395.0**	17,805.0	214,557.1
2028	399,455.8	4,281,736.0	-	-	26,149.5	332,477.6	-	-	0.00	0.00	0.00	0.00	373,306.3	3,949,258.4	**350,907.9**	**3,712,302.9**	22,398.4	236,955.5
2029	347,934.1	4,629,670.1	-	-	22,175.9	354,653.5	-	-	0.00	0.00	0.00	0.00	325,758.3	4,275,016.7	**306,212.8**	**4,018,515.7**	19,545.5	256,501.0
2030	277,230.8	4,906,900.9	-	-	17,190.8	371,844.3	-	-	0.00	0.00	0.00	0.00	260,040.0	4,535,056.6	**244,437.6**	**4,262,953.2**	15,602.4	272,103.4
2031	229,265.0	5,136,165.9	-	-	13,820.6	385,664.9	-	-	0.00	0.00	0.00	0.00	215,444.4	4,750,501.0	**202,517.8**	**4,465,471.0**	12,926.7	285,030.1
2032	273,665.5	5,409,831.4	-	-	16,024.6	401,689.4	-	-	0.00	0.00	0.00	0.00	257,641.0	5,008,142.0	**242,182.5**	**4,707,653.5**	15,458.5	300,488.5
2033	251,195.6	5,661,027.0	-	-	14,275.0	415,964.4	-	-	0.00	0.00	0.00	0.00	236,920.6	5,245,062.6	**222,705.3**	**4,930,358.8**	14,215.2	314,703.8
2034	321,532.6	5,982,559.6	-	-	17,716.9	433,681.4	-	-	0.00	0.00	0.00	0.00	303,815.7	5,548,878.3	**285,586.7**	**5,215,945.6**	18,228.9	332,932.7
2035	354,701.9	6,337,261.5	-	-	18,932.1	452,613.5	-	-	0.00	0.00	0.00	0.00	335,769.8	5,884,648.1	**315,623.6**	**5,531,569.2**	20,146.2	353,078.9
2036	347,124.6	6,684,386.2	-	-	17,928.2	470,541.7	-	-	0.00	0.00	0.00	0.00	329,196.4	6,213,844.5	**309,444.6**	**5,841,013.8**	19,751.8	372,830.7
2037	513,213.1	7,197,599.2	-	-	25,620.1	496,161.8	-	-	0.00	0.00	0.00	0.00	487,593.0	6,701,437.5	**458,337.4**	**6,299,351.2**	29,255.6	402,086.2
2038	585,113.8	7,782,713.1	-	-	28,199.0	524,360.8	-	-	0.00	0.00	0.00	0.00	556,914.8	7,258,352.3	**523,499.9**	**6,822,851.2**	33,414.9	435,501.1

4 MONITORING

4.1 Data and parameters are available at validation

Data Unit / Parameter:	**Deforestation**
Data unit:	Hectares/year
Description:	The annual area of forest converted to non-forest vegetation.
Source of data:	IDESAM
Value applied:	157.4 ha/year (2001-2009).
Justification of choice of data or description of measurement methods and procedures applied:	Deforestation will be measured using a supervised classification with the maximum likelihood method and the Forest Cover Benchmark Map (2009) to obtain annual increments in classes of non-forest land in the period 2001-2009. Using map algebra with GIS, we compared pairs of maps (e.g. 2001/2002) and calculated differences in area (in hectares) between classes at different years. A mask was applied before the deforestation map analysis to eliminate the transitions that would have occurred (ie., when we analyzed the changes between the years 2004/2005, the deforestation that occurred between 2001 and 2004 was masked to obtain the result for 2005-2004), such that forest that had been cleared could not go back to being a primary forest during the period 2001-2009.
Any comment:	See Supplementary Material 03.

Data Unit / Parameter:	**Carbon stock in aboveground biomass**
Data unit:	Tons C/ha
Description:	Tons of carbon per hectare in aboveground biomass within the forest degradation class in the TISS.
Source of data:	Forest inventory conducted by IDESAM, ACT and Metareilá.
Value applied:	125.97 tC/ha
Justification of choice of data or description of measurement methods and procedures applied:	We randomly selected clusters of permanent and temporary plots, measured the DBH of all trees and palms, and applied allometric equations for trees (Nogueira et. al. 2008) and palms (Saldarriaga et. al. 1988) to obtain the total above-ground biomass.
Any comment:	See Supplementary Material 02.

4.2 Data and parameters monitored

Data Unit / Parameter:	**Deforestation**
Data unit:	Hectares/year
Description:	The annual change in area of forest converted to non-forest vegetation.
Source of data:	Images LANDSAT: http://www.dgi.inpe.br/CDSR/ Calculations made by the IDESAM.
Value applied:	Deforestation will be measured using a supervised classification with the maximum likelihood method to exclude non-forest land use classes and obtain an updated Forest Cover Benchmark Map. The same method described above will be applied.
Justification of choice of data or description of measurement methods and procedures applied:	*Annual*
Any comment:	Mean of 45.25 ha/year (10% rate of deforestation in the baseline)
	Remote Sensing, GIS, ENVI 4.8 software.
	See supplementary material number 06 for QA / QC procedures.
	The same methods described in Supplementary Material 03 will be used plus visual interpretation, to be applied to the entire Reference Region.
	The validation of deforestation will be complemented by observation, verification and *in situ* monitoring.

Data Unit / Parameter:	**Carbon stock change/increase in the Project Area.**
Data unit:	Tons/hectare/year
Description:	Analysis of stem growth and increase of biomass of the sampled individuals
Source of data:	Forest Inventory (re-measurement)
Value applied:	Re-measurement and verification of the CAP increment of trees within the permanent plots
Justification of choice of data or description of measurement methods and procedures applied:	Triennial (every three years).
Any comment:	Initial value: 125.97 tC/ha.
	Measuring tape
	See Supplementary Material 06 for QA / QC procedures.
	Difference between the current CAP and CAP of the last (re) measurement of all individuals of the sample areas to obtain estimates of carbon sequestration or emission.

4.3 Description of Monitoring Plan

TASK 1. Monitoring changes in carbon stocks and GHG emissions for periodic verification.

1. Monitoring actual changes in carbon stocks and GHG emissions in the project area;
2. Monitoring leakage;
3. Ex-post calculation of GHG emission reductions;
4. Monitoring the impacts of natural disturbances and other catastrophic events.

1.Monitoring actual changes in carbon stocks and GHG emissions in the project area.

1.1.Monitor the implementation of the project.

This task will be the responsibility of ACT Brazil, Kanindé, Metareilá and other indigenous associations.

The activities implemented within the project area will be monitored continuously. Financial and technical reports will be submitted for project activities. Of particular importance is the implementation of the surveillance system that will allow continuous monitoring of the territory to halt entry of potential squatters. It involves the construction of three checkpoints in the TISS to control the flow of transport and with the objective of involving the Paiter-Surui in identifying threats of deforestation and forest degradation, mapping areas susceptible to fire, and controlling illegal logging, illegal hunting and fishing, among other activities. Information from the checkpoints will be sent to the executing agency/administrator that is monitoring the site to take appropriate measures for the supervision and control of the TISS, with support from the States of Rondonia and Mato Grosso.

Maps, reports and records will be available to VCS/CCB validators at each validation event. For information on QA / QC, please see the Supplementary Material 06.

1.2. Monitoring change and land use within the project area.

This will be the responsibility of IDESAM and ACT Brazil and will be conducted according to the description of deforestation monitoring outlined above, and will generate the corresponding parameters contained in Appendix V of the Methodology VM0015.

The project will use LANDSAT 5 TM to generate annual deforestation data throughout the Reference Region of the project, using the supervised classification of images with the maximum likelihood method described in the supplementary material 03. This analysis will generate classes of deforestation and forested areas, updated every year, and will be compared with previous years. Deforestation estimates obtained from this analysis will be compared with the deforestation model designed by "SIMSURUI" that was used to established the baseline scenario in the region of interest, and differences between projected and observed values will be presented for every year.

1.3. Forested areas where the carbon stock is increasing.

This is the responsibility of IDESAM, ACT Brazil and Metareilá. The carbon stocks monitoring plan is coordinated by IDESAM for the initial measurement and the first two re-visits or re-measurements. This phase will take place in conjunction with the training of field workers and indigenous associations. After the fourth field check, IDESAM will provide technical assistance for monitoring and benchmark data as well as technical assistance for continued monitoring. After that, it is expected that the Metareilá

Association itself, the proponent institution, will have developed its technical and operational capacity to carry out these activities.

Monitoring will follow the re-measurement of the 36 permanent plots established (arranged in 9 clusters of 1 ha) within the project area, as described above.

Based on the initial measurements of DBH in these plots, the value of total carbon per hectare, will be extrapolated to the whole project area. From this new value of carbon verified *ex-post*, monitoring and presentation of verified data will be used to calculate all relevant and required data contained in Appendix V of the Methodology VM0015.

It will not be necessary to monitor changes in carbon stock of non-CO2 gases from forest fires as this will not change during the project period and it is not expected to be a significant reduction in carbon stocks it is not expected in the project scenario. In the event of significant losses due to forest fires or catastrophic events, these areas will be monitored.

It is expected that the leakage management areas will increase their stock of carbon during the project but, as the area and the stock would be insignificant, these areas are not monitored.

1.4. Monitoring of the impacts of natural disturbances and other catastrophic events.

If there are catastrophic events during the project, these will be evaluated and reported for the project area if they are significant. Monitoring will follow tables 20.e, 20.f, 20.g to report reductions except in case of forest fires, where the tables 18 and 19 of the VM0015 will be used.

2. Monitoring leakage

Following the methodology, the following will be monitored

2.1.Reduction of carbon stocks and GHG emissions due to activity shifting leakage.

This project is not expected to cause any kind of leakage. In any case, deforestation will be monitored annually throughout the Reference Region, including the leakage belt. If some deforestation occurs in the leakage belt during the project period, the loss of carbon stocks will be accounted for using the current values of carbon stock per hectare of the forest class in question, and will be deducted from the non-permanence buffer.

3. Total estimates *ex-post* leakage.

Results are presented in the same way as the *ex ante* estimation of leakage.

4. Anthropogenic GHG reductions *ex post.*

As per the methodology VM0015, the same procedure will be used as to calculate *ex-ant*e emissions, except the *ex post* estimates of changes in carbon stocks and GHG emissions should be used in the case of leakage in the project scenario.

Increases or reductions of GHG associated with preventive measures for leakage will not me monitored since stocks contained in the leakage management area are not significant.

TASK 2 - Revisiting the projected baseline at fixed periods.

1. Update information on agents, drivers and underlying causes of deforestation.

The variables used to project future deforestation from the reference region will be reviewed at 10-year fixed periods.

Information regarding the biophysical variables, agents, vectors, and the underlying causes of deforestation will be updated (Step 3).

2. Adjust the component of use and land-use change of the baseline.

Step 4 of Part 2 of the methodology VM0015 will be repeated to consider the 10-year period in the Reference Region (2010-2018).

Updating the baseline scenario will take place both in the modeling component of the system dynamics (which defines the amount of change) and the spatial component that defines the distribution of deforestation. Key variables that will be used to recalculate the baseline in the second 10-year period of the project are:

- Non-spatial (system dynamics): population, Paiter-Suruí household balance sheets and strategies for investment in productive activities.

- Spatial: road map, distance to urban areas and distance to new sites of deforestation.

To collect this information, field visits will be made where questionnaires and discussions will be held *in situ* that will elucidate new land use dynamics. IDESAM will be responsible for carrying out this part of the monitoring.

3. Adjusting the carbon component of the baseline.

The carbon component of the baseline will be revised according to data monitored in item 1.3 of Task 1 of this monitoring plan.

5 ENVIRONMENTAL IMPACT

There are no anticipated negative environmental impacts from project implementation. Community and Biodiversity impacts – based on CCB Standard Version 3 – are detailed in supplementary sections 8 and 9 of this document.

6 STAKEHOLDER COMMENTS

The need for the development of the PCFS arose from the Paiter-Suruí themselves. The participation of local communities in preparing and designing the project took place through meetings, consultations and processes of prior informed consent, among others.

The PCFS is based on the search for alternative financing for a new management model in TISS. With investments from the Metareilá Association and Kanindé, the first step was to conduct an assessment of the potential of environmental services in the TISS, with focus on developing a Management Plan that could put an end to the extraction and sale of timber. Since then, various activities and discussions were held and outside investments were made for the reforestation project in 2006. Later, in 2007/2008, discussions began about a possible forest carbon project based on REDD+ mechanisms.

The project includes an important process of free, prior and informed consent[143] in the communities of the TISS, informing the Paiter-Suruí of planned activities and potential impacts and consulting with them about their concerns, suggestions and needs.

The process was conducted in three steps during 2009. The first step consisted of meetings and discussions between the Suruí themselves to reach minimum consensus regarding the possibility of development and implementation of PCFS.

The second stage consisted of meetings among indigenous leaders, representatives of local associations and other project partner institutions[144]. This allowed traditional leaders and indigenous organizations and associations to learn about payments for environmental services, especially those from carbon, as well as the methods and activities that make up the construction of the Project Design Document (PDD).

The third stage consisted of field activities with visits and community meetings in the villages, providing information about the project for the different groups in the TISS[145] and discussing the technical concepts related to the PCFS.

Figure 37. General Assembly of the Paiter-Suruí

At the end of this process, a memorandum of understanding was signed between the four clans[146] that indicated the commitment of the Paiter-Suruí indigenous associations to implement the TISS Management Plan, especially regarding aspects of payments for environmental services from the expected sale of carbon credits.

143 Free, prior and informed consent was a process of providing information and discussions among the Suruí with regards to the possibilities of preparing the Forest Carbon Project.
144 Forest Trends, IDESAM, ACT Brasil, Kanindé, FUNBIO, among others
145 Elderly, youth, leaders, parents, teachers, indigenous health workers and other representatives of the community
146 This took place on June 9, 2009 in the community of Lapetanha.

Plan for Ongoing Communication

Beyond the consultation process prior to the start of activities, the Project also plans to implement a plan for ongoing communication and conflict resolution mechanisms, to ensure that those involved directly or indirectly in the project have a chance to express their needs, suggestions and help in resolving potential conflicts.

Thus, the PCFS will implement ongoing communication with the goal of maintaining an open and accessible channel for dialogue between project implementers and beneficiaries that also aims to ensure feedback to the project from relevant comments and suggestions that may arise during the phases of development and implementation of activities.

To accomplish this, "local agents" will be trained to receive comments that arise from the Surui or other actors and share them to project managers. These comments will also be incorporated in regular reports that will be available at the Metareilá headquarters and the associations. Project proponents and partners will also report to the Paiter-Suruí about possible changes due to comments, criticisms and suggestions that emerge, and will communicate to the authorities when there are infractions of the rules and regulations of the project.

In addition, consciousness raising, field inventories, meetings between Surui and other stakeholders, workshops, the status of project activities and other relevant information and activities will be constantly updated and disseminated through reports and technical notes available on the internet at the institutional website and that of implementing partners.

During the CCBA public consultation period, the Project Description (PD) will be available and accessible to local communities and other relevant actors in the project (in Portuguese). To ensure that everyone has access and opportunity to comment on the project, this document will be available on the website of the Metareilá Association of the Suruí Indigenous People. To facilitate access of other groups, there will also be hard copies available and meetings with the villages of the TISS to receive their comments.

Plan to launch the project and resolve of conflicts and non-conformities

To ensure communication with actors involved both directly and indirectly in the project, there is a plan to launch the project and resolve conflicts and non-conformities that may arise with the implementation of project activities.

Local stakeholders will be informed of this open forum to receive and incorporate criticism, comments, questions and resolve conflicts related to the implementation and management of project activities. To understand the operation of this plan, it is necessary to explain the social structure of the Surui that is divided into various representative bodies that aim to prioritize internal needs and create organized and effective ways to report them to the appropriate bodies, as well as provide resolution to potential conflicts and ongoing communication.

First, a representative of the Paiter and a clan Council, composed of three representatives from each clan. Second, is the *Labiwayey* (leaders of the People) composed of two representatives from each zone (there are five zones within the TISS). Above the *Labiwayey* is the *Labiway esagah* (Primary Leader of the People) and the Council of Elders. There are also indigenous organizations and non-indigenous organizations that support and advise on project implementation.

Thus, the process for handling unresolved conflicts and grievances begins with environmental agents in the field who are responsible for receiving such information. All information received will be documented and analyzed with the clan associations and councils to determine appropriate actions to be taken to mitigate possible negative impacts.

In cases where it is not possible to find a solution, information will be transmitted to Metareilá Association (project manager). When actions successfully resolve conflicts that arise, the Project Manager should document how it was done. If conflicts are not resolved, the matter shall be referred to the Labiwayey (Leaders of the People), Labiway esagah (Primary Leader of the People), and finally, if necessary, to the Council of Elders.

Any action or solution applied will be documented and forwarded to the Metareilá Association and the Field Environmental Agents who will file the documents. These will be available for consultation at any time and will serve as a lesson learned if similar cases arise and be used as input for the annual review of the project operational plan.

7 ADDITIONAL CLIMATE CHANGE ADAPTATION INFORMATION FOR CCB

Studies of prediction and climate modeling are performed on large scales, making it difficult to translate them to a micro-region as in the case of T.I. Sete de Setembro. According to the study of the Economics of Climate Change[147], the macro-scale climate scenarios for the Amazon region are as follows:

Climate change:

- Pessimistic Scenario A2: 4-8ºC warmer and 15-20% reduction in rainfall;
- Optimistic Scenario B2: 5.3°C warmer and 5-15% reduction in rainfall;
- Increase of extreme rainfall (e.g. El Niño, extreme rainfall events) in the western Amazon and consecutive dry days in the eastern Amazon;
- Possibility of more intense and frequent droughts after 2050.

Potential impacts:

- Losses of ecosystems and biodiversity in the Amazon and environmental services provided by the forest;
- Lower river levels that affect transport and hydropower generation;
- Increased dryness of the air and more favorable conditions for forest fires;
- Risk of desertification of the Amazon;
- Impacts on human health, migration, trade;
- Effects on movement of atmospheric humidity for southeastern South America

Projections of temperature changes (°C) and precipitation (%) for the Brazilian Amazon are based on literature[148]. Ranges of values include estimates of seven global circulation models (GCM) and four main scenarios[149] from the Special Report on Emissions Scenarios (SRES) (Table 38).

Table 38. Projections of temperature changes (°C) for the Amazon

Estação	2020	2050	2080
		Temperatura °C	
Seca	+0.7 à +1.8	+1.0 à 4.0	+1.8 à +7.5
Cheia	+0.5 à +1.5	+1.0 à +4.0	+1.6 à +6.0
		Precipitação (%)	
Seca	-10 à +4	-20 à +10	-40 à +40
Cheia	-3 à +6	-5 à +10	-10 à +10

Source: Ruosteenoja et al (2003)

[147] Marengo (2009) and Marengo (2007)
[148] Ruosteenoja et al. (2003)
[149] IPCC. Climate Change 2007: Physical Science Basis, pp. 25.

Despite the possible long-term impacts on the TISS that result in net losses of carbon stocks to the atmosphere and local biodiversity, it is expected that even under the worst case scenario, ie., the "emitter" scenario, the TISS will maintain the majority of its forests at the end of this project.

Even under this worst case scenario, the implementation of this project will result in the conservation of huge amounts of carbon that will not be released to the atmosphere, thereby slowing down the expected trend of deforestation in the baseline scenario which would further accelerate global warming and the Amazon desertification process.

Severe droughts in tropical rainforests have caused large emissions of carbon due to the high combustion power of the forest that increases tree mortality and suppresses tree growth. The frequency and severity of droughts in the tropics may increase with extreme episodes of the El Niño Southern Oscillation *(ENSO),* global warming and decreased rainfall due to land use change. Little is known, however, about the spatial and temporal patterns of drought in moist tropical forests and the complex relationships between patterns of drought, fire regimes, mortality and productivity of trees[150].

As shown above, increased local temperature (approximately 0.5-1.8°C) can discourage and/or encumber agricultural production (perhaps only in some crops) by decreasing production or increasing the need for more inputs and labor .

Another likely scenario is a decrease in rainfall (in intensity or frequency) and/or increased occurrence of extreme rainfall events that may affect agricultural practices and food security by compromising both local and commercial production. Another hydrologic implication is a drop in water levels of navigable rivers that are used for fishing and irrigation for agrosilvipastoral activities.

At the crux of these two scenarios, rising temperatures and low rainfall, are vectors that stimulate increased risk of fire and burns. These factors may stimulate the loss of ecosystems and the decline of local species in addition to making subsistence farming and/or family farming unattractive.

Demonstrate that the project activities will support the communities and/or biodiversity to adapt to potential impacts of climate change.

The Suruí Forest Carbon Project will encourage and help the Surui people to develop different organizational skills to improve land management that optimizes the use of the land to adapt to climate change. These activities, aimed at mitigation and adaptation of local climate changes, include:

- Strengthening empowering institutions, people and their organizations;
- Encourage technical agriculture expertise of the next generations;
- Strengthen and enhance the productive chains from family farms through associations and cooperatives;
- Look for sources of biotechnology and genetic improvement for regional adaptation of cultivars that are tolerant to drought and heat;
- Develop plans for land reclamation and reforestation;
- Promoting agroforestry practices (SAFs);
- Disseminate more sustainable agrosilvipastoral practices (e.g. tillage, land zoning);
- Studies of economic viability, sustainable use of extractive activities and existing and potential commercial production;

[150] Nepstad, 2004

- Promote the use of new alternative income sources that are consistent with changes in local climate, primarily increased temperature and decreased rainfall;

8 ADDITIONAL COMMUNITY INFORMATION – FOR CCB

CM1. *Net Positive Community Impacts*

Without project scenario

In the current scenario (without project), the economic plight of the Surui is the main driver of deforestation. Because they have few economic alternatives that provide adequate income for families, indigenous people become involved in activities such as the extraction and sale of illegal timber, land leasing and opening of areas for livestock production and agriculture. Since activities based on sustainable sources of income, such as the extraction of Brazil nuts and other crafts, do not meet the demands of the community due to low market prices and lack of organization of production and technical assistance, the continuation and growth of agricultural activities is expected in the absence of project activities, which also means increasing deforestation and forest degradation. In addition, the low and ineffective supervision and monitoring of the territory allows for constant invasions and the disorderly exploitation of natural resources to continue to occur. In the without project scenario, we expect the continuation and intensification of these activities.

As a consequence of this situation, an increase in conflicts between families and villages of the Surui themselves is expected, caused by an improvement in the socioeconomic situation of certain groups that are associated with these external actors, often at odds with the general consensus of the people Paiter Surui, which weakens them as a group and compromises their traditional ways of life.

In terms of education, there is a gap in teaching at TISS to meet the needs of formal education, a major factor in truancy. There is an insufficient number of schools offering the 2nd segment of elementary school, and no TISS school offers high school and the percentage of Surui who go to college is low (there are 14 students and only 7 have finished). In the absence of the project, the scenario assumes an increase in school dropouts, especially after completing the existing levels offered in TISS schools and leaving to complete their studies in the city. This contributes to the weakening of the Surui people, since most young people leaving to study do not return to the village and settle permanently in the city.

Regarding health, according to the Surui, the services provided by FUNASA do not meet their real needs, are weak and inefficient, and there is no basic sanitation in the villages and water supply and its usage structure are weak. The environment surrounding the villages is very sensitive and is usually a source of re-infection of parasitic diseases[151], which cause diarrhea and fever cases, arising mainly from water contamination.

Culturally there is also a loss of their traditions due to the proximity of settlement projects and urban areas, as well as the influence of religious missions of various denominations and government policies. Without the grassroots cultural activities provided by the project, the loss of traditional knowledge is expected to intensify due to contact with external cultural customs, such as in the case of shamans, who are already greatly reduced in number. There is also the risk of loss of traditional craft techniques and knowledge related to medicinal species. With the loss of traditional crops, an even greater reliance on processed foods is expected and, consequently, the loss of species and traditional production methods.

[151] Kanindé 2010.

PROJECT DESCRIPTION

With Project Scenario

A significant improvement in quality of life of the Surui after project implementation in several areas is expected. The project aims to directly address the two main vectors that drive deforestation in the territory: (i) the lack of economic alternatives for the Surui, which causes them to seek activities that have higher added value (such as coffee and cattle), especially with the decline of timber species of economic value, and (ii) external threats, mainly characterized by illegal invaders to exploit the resources of the TISS.

The project includes the mapping of risks, threats and vulnerabilities in the TISS in order to identify priority areas for action and strengthen the territorial protection. The boundary trails that demarcate the Surui territory will be cleaned and demarcated; the critical points identified will be monitored and frequent surveillance expeditions throughout the territory will be held. Thus, it is expected that instances of unauthorized intrusion and illegal extraction of natural resources on indigenous land will reduce dramatically. Three monitoring stations will also be installed and properly equipped so that the Surui can have better control and power to act in the face of events. A process of cooperation with local authorities for the conservation and protection of indigenous land will also be designed. There will be training and capacity building in these activities, geared to the Surui themselves, that they may be directly involved in the activities provided.

A significant improvement in security and economic condition of the Surui is also expected. One of the main focuses of the project is to implement and foster the development of alternative income sources that are based on sustainable activities to supplement Surui household income and replace the financial income obtained from logging and illegal farming activities. The development of productive chains of products already grown by the Surui, though currently with very low financial returns, is envisioned. Products such as bananas, coffee, Brazil nuts, fish farming, and others, will be encouraged through training and technical assistance, as well as structuring and marketing of local products.

In addition to these activities, the project also seeks to rescue and encourage traditional methods of production, which also has a positive impact in maintaining the local culture of the Surui. Thus, actions will be implemented to improve crop management of the crops already grown by the Surui such as corn, beans and rice, and encourage practices of green manure and weed control, as well as the reproduction seeds of indigenous species which are becoming increasingly rare.

Another line of action of the project is based on strengthening the Surui representative institutions. The goal is to improve the performance of clan-based associations of the Surui People before implementing many of the planned actions. Among the activities planned are the construction and renovation of the workspaces of the clan associations and Associação Metareilá, as well as the acquisition of office equipment and resource allocation for maintenance of the centers, as well as the acquisition of transport vehicles. The hiring and training of human resources will be required for the project is also envisaged in the plan of action.

Impacts on "high conservation value attributes" ***(High Conservation Values - HCV).***

One area of high conservation value areas are forest areas whose value is due to its biodiversity, ecosystem richness, rare species, environmental services and the importance given by the local community to this area of forest and biodiversity. In the case of HCVs related to social issues, we can highlight particularly those that are essential to meet the needs of local communities (e.g. subsistence, health) and those of extreme importance to the traditional cultural identity of local communities (areas of cultural, ecological, economic or religious significance, identified in cooperation with these communities).

HCVs of PFCs were identified by ethnozoning in the TISS, which forms a part of the territorial management planning and shows the Paiter proposal of how to use their land, addressing cultural values and traditional forms of use. The ethnozoning was done through participatory tools for collecting information and other references regarding the region and the Paiter Surui, thus revealing the priority areas for conservation to the Paiter Surui.

Among the areas defined by the Surui, those that most directly affect social issues are:

(I) Cultural Zone, "The Indigenous Land Paiterey Karahi is a place inhabited by our ancestors and where our cultural values and our spiritual relationship with nature were developed and where we seek to preserve this historic relationship"

(Ii) Holy zones - Eight sites considered sacred by the Surui that relate to their cultural and spiritual manifestation

The ethnozoning lists and defines these areas, outlining guidelines for conservation and standards and rules of use for each. The activities of the Surui Forest Carbon Project were designed and will be carried out according to established guidelines and actions allowed in each of these areas, thus significant negative impacts are not expected in these sites.

CM2. Offsite Stakeholder Impacts

From the implementation of PCFS, one of the main results sought is the reduction of deforestation and removal of illegal timber from TISS. Thus, this reduction could cause impacts considered to be negative for the external actors involved in these processes.

Groups which could be impacted by the Project are:

Zoro Indians - Residents of the Zoro Indigenous Territory, which borders the northeastern corner of TISS are known encroach on the Surui land to illegally harvest timber without the consent of the Surui. Thus, from the implementation of monitoring and control activities, these activities will no longer occur, causing economic impacts to this group.

Farmers / Ranchers - These actors developed productive activities in partnership with the Surui, through a system of "sharecropping" and lease. These activities will no longer be developed in the project scenario, thus affecting the income production by these actors.

Timber - The timber extraction activities of TISS have ended since the signing of the Memorandum of Understanding between the clans, and will continue extinct, according to the Surui's 50 Year Life Plan. Thus, for this group, obtaining income from these activities will also be compromised.

Implementation of the Surui Project will cause social and economic impacts to certain groups such as loggers and ranchers. However, this impact will come from the elimination of illegal activities, because these actors can no longer develop the usual activities in partnership with the Surui. Although there will be economic impacts on these groups, the project cannot be held responsible for mitigating these negative impacts. It is understood that the project will serve as an example and stimulus for the development of municipal and state government programs focused on these actors. In this context, the project believes that the elimination of these activities is positive, and thus it is not necessary to design mitigation measures for them.

Nevertheless, the project aims to minimize other potential indirect impacts through the diffusion of knowledge and training about the project, as well as improving governance around the TISS. One of the most significant positive impacts is the creation of a new management and natural resource management model, based on positive incentives to reduce deforestation and promote forest conservation, which can influence the behavior of other actors and replicate this experience in other areas. The project also expects to indirectly generate jobs outside of the Surui land, linked to the productive sector since the commercial farming will be encouraged.

Among the local groups identified who could be affected by the project, are the outside groups whose impacts and mitigation measures were described in previous sections, and the Paiter Surui.

Other potentially affected groups include residents of municipalities neighboring to TISS, for whom possible negative impacts were not identified. Instead, these groups will benefit from the increased environmental control and monitoring of the TI, thus bringing positive impacts to these populations.

CM3. Community Impact Monitoring

The methodology used to define the expected impacts of the Project on the Surui communities, as well as the selection of indicators and building a plan to monitor these indicators is based on the *"Manual for Social Impact Assessment of Land-based Carbon Projects*[152]*."* This methodology aims to use participatory analysis tools for with and without project scenarios, definition of impacts and preparation of a comprehensive plan for monitoring, including indicators, frequency analysis and monitoring, among others. Upon completion of this PDD, this methodology has already been initiated and the Surui had participated in an initial meeting of five days, which generated the with- and without-project scenario analysis and identified the major areas that should be monitored and analyzed. A detailed description of this process is included in Supplementary Material number 13. These themes do not characterize the indicators to be monitored, but they indicate the subjects to which indicators should be linked. A detailed process of identifying the status of TISS in the absence of the project was conducted, the cause and effect relationships and expected impacts, defined by the Indians themselves, so there is a representation of different groups in the TI (women, youth, etc.). The impacts (positive and negative) expected with project implementation in the short and long term, as well as the scenario without the project were analyzed, from these a process will begin to select representative variables to analyze the improvement of these attributes from project implementation.

The methodology will be applied again in its entirety during the year 2012, where the variables/ specific indicators to be monitored are selected and the implementation methodology for the monitoring plan will be defined, which should be completed by December 2012. Thus the thematic areas for monitoring, for which indicators and variables related specifically to each one will be defined, determined at the meeting were:

- Health
- Education
- Food security
- Sanitation / housing structure
- Cultural maintenance and revival
- Institutional strengthening
- Professional training

The monitoring of these variables in order to verify that the project is actually generating positive benefits to communities and allow an assessment regarding possible negative impacts will be done every four years, through workshops with direct participation of the Surui and analysis of indicators from socioeconomic surveys, made directly in the field. As previously mentioned, specific indicators will be identified in future workshops.

The analysis of each indicator will be made by comparing the previous period (beginning of the project) and the subsequent period, yet to be determined; it is possible to determine whether there are improvements or negative in each of these. These results are then analyzed and disseminated by the project proponents to all institutions involved and the project beneficiaries. If there are negative impacts, they should be analyzed in detail to identify the causes and mitigation measures are designed or modification of activities to prevent the worsening of impacts.

The effectiveness of the measures related to maintenance and improvement of HCVs project will be incorporated in the monitoring plan based on guidelines established by ethnozoning, which identified the

[152] Available at: http://www.forest-trends.org/documents/files/doc_2436.pdf

existing TISS HCVs (more details in item CM12). The document presents the current status of the six areas identified as priorities by the Surui for conservation have important character to maintain the lifestyle and traditional culture of the Surui. Thus, specific variables are selected that relate directly to these identified areas, which are included in the monitoring plan for communities and analyzed using the same methodology. These indicators will be assessed through participatory workshops and field verification, together with their own Surui.

9 ADDITIONAL BIODIVERSITY INFORMATION FOR CCB

B1. Net Positive Biodiversity Impacts

Changes in biodiversity as a result of project implementation in the area of the project and throughout its duration.

The project provides positive impacts for biodiversity, especially related to a decrease in poaching by non-Indians who exerted strong hunting and fishing pressure before the project start date. The ethnozoning[153] provides the definition of sacred areas, where hunting is also prohibited for Paiter-Surui, which will reduce hunting pressure on species of mammals and birds in these regions, which now serve as a source to increase populations and areas that can supply the sink where specimens of these species will be hunted only for the subsistence of the Paiter Surui.

Demonstrate that no High Conservation Values identified in G1.8.1-348 will be negatively affected by the project.

With the project, all of TISS, which is considered extremely important for the conservation of several animal groups, will not suffer deforestation and habitat destruction as anticipated in the without project baseline, guaranteeing net positive impacts for biodiversity.

Identify all species that will be used by the project and demonstrate that no known invasive species will be introduced on any area affected by the project and that the population of any invasive species will not increase as a result of project activities

In the implementation of the project, tree species will be used that have traditionally been used by Paiter Surui as well as varieties of indigenous cultivars such as peanuts, Indian hemp and cotton. The project includes the continued use of species introduced in the region: those of subsistence and commercial value, such as rice, beans, maize and cassava, and coffee, banana, and cashews, respectively. The project also seeks to improve the productive chains of some of these agricultural products. Although some agricultural and forest species are not indigenous, such as bananas, coffee and cashews, they are already part of the traditional way of life of the Surui and none of them are considered invasive species in the region.

Describe possible adverse effects of non-native species used by the project on the region's environment, including impacts on native species and disease introduction or facilitation. Project proponents must justify any use of non-native species over native species.

The non-native species are those which have been domesticated and improved, such as corn, rice, beans, coffee, banana and cashew. Of these species, when grown in monoculture, coffee and bananas are more likely to suffer some diseases common to the region, such as some types of fungi and black sigatoka, respectively. The plantings to be made in the implementation of the project will use production arrangements that are more compatible with the traditional indigenous uses, acting as a form of cultural rescue.

[153] Kanindé 2011.

Guarantee that no GMOs will be used to generate GHG emissions reductions or removals.

No GMO will be used in the project.

B2. Offsite Biodiversity Impacts

As the reference area includes the TISS, the expected impacts will be positive due to the supervision and monitoring in the reference area also. It is expected that poaching in the reference area and the sacred areas will end, restricted solely to hunting areas. These factors ensure the conservation of species.

The project will promote the enforcement against hunting and fishing in the reference area, except for hunting areas.

A positive impact outside the project areas is also expected to occur, especially in the reference area. The project implementation actions also include surveillance in areas outside the project area, namely, all of the TISS, which will have three additional checkpoints and a surveillance system for the Surui general population, curbing hunting and fishing by non-indigenous and the removal of timber. The banning of hunting, fishing and extraction of timber and non-timber products in the sacred areas defined in the ethnozoning of the TISS is also considered to be positive..

The only negative impact on biodiversity due to creation of the project would be increased hunting pressure in areas adjacent to TISS. However, the surrounding region does not contain significant areas of forest to house species which are the focus of wildlife hunting, there will be a guaranteed net positive impact if the enforcement and prevention of hunting within the TISS are executed.

B3. Biodiversity Impact Monitoring

To ensure net positive impacts on biodiversity in the project, and monitor the biological diversity that can still be threatened by the project, the following items are included in the proposed plan:

1 - To sensitize community members about the importance of monitoring the use of natural resources and establish rules for sustainable use.
2 - Train community members to operate as biodiversity monitors.
3 - Monitor the species used by the local communities, including the synergetic fauna (mammals, birds and fish) and use of timber and non-timber forest products.
4 - Monitor species of "special interest", those endangered or critically endangered, endemic species and species that cause economic losses to communities (generate conflict).

The awareness of the importance of biological diversity will be accomplished through workshops to present the monitoring plan after the PDD is approved and resources are available.

The monitoring of hunting and fishing is the main point for monitoring biodiversity in the TISS. According to the TISS Ethnozoning[154], there are four (4) hunting areas. To monitor hunting and fishing, the decision was made to selecting four villages that represent the diversity of clans in the TISS and that are in three of the hunting zones (Figure 38) and which include the largest Surui population:

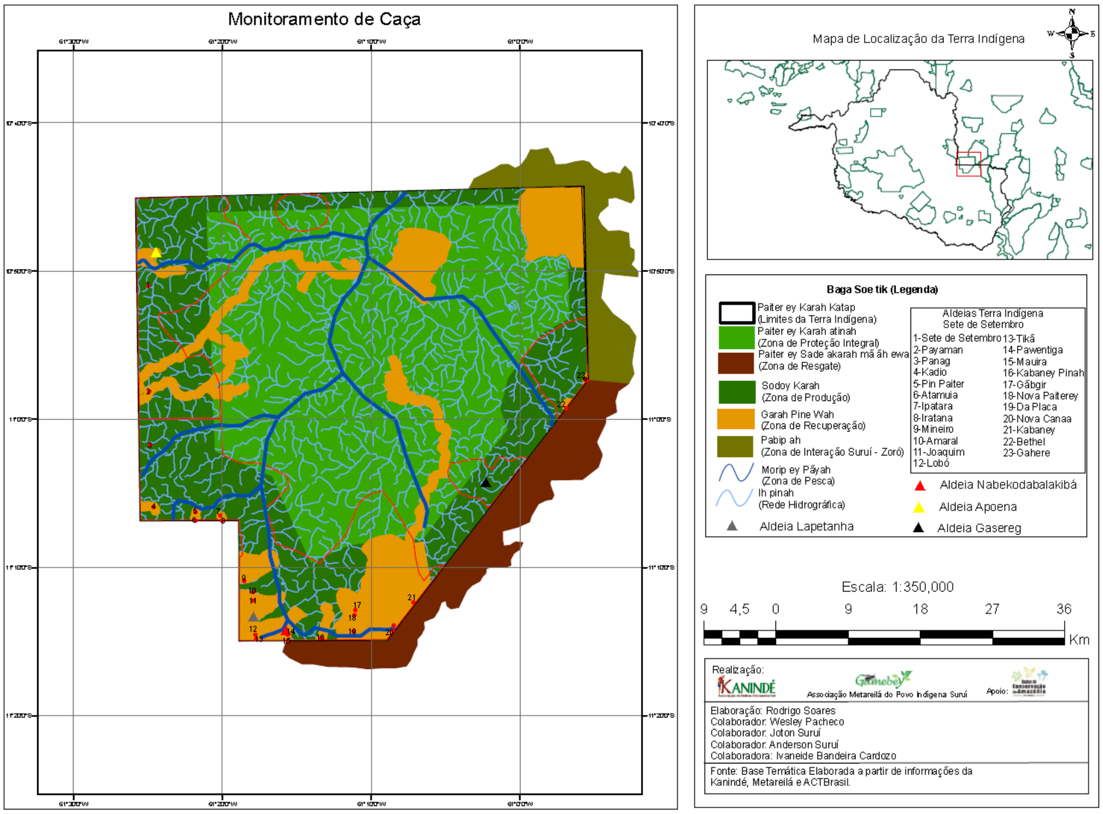
- Lapetanha hunting area - this has two main bases (serving the clans) a Lapetanha village of Gamebey majority and another village Nabekodabalaquibá of Markorey majority;
- Toya Gakorawaque hunting area - the village Apoena Meirelles which belongs to the Kabaney will serve as the base;

[154] Kanindé 2010.

- Gasereg hunting area - Gasereg village, Gabmirey clan.

The monitoring plan for hunting and fishing forsees the selection of indigenous researchers using an appropriate selection criterion. A specific number of indigenous researchers will be allocated according to the number of families in the communities. The team selected will be trained by partners Kanindé and ACT-Brazil, who will also accompany the researchers' assessment, monitoring and archiving of collected data. The variables are presented in Table 39.

Figure 38. Monitoring of Hunting



Data collection of animals hunted and fished: each selected community should have a researcher to fill in questionnaires for the species hunted by the communities. He will interview each family and collect information about the species including: date, species name, quantity, habitat, and purpose. If possible, it is interesting to get the approximate weight and locate the region of hunting or fishing in a cartographic map.

Collecting data from non-timber forest products (seeds, fibers and resins): each selected community must have an indigenous technical person that will fill out questionnaires regarding the species collected. The technical person will interview each family and will collect the following information: name of the species, collected product, quantity, habitat, and purpose.

Table 39. Variables to be monitored by the Project.

Variable	Source	Units	Measurement	Frequency	Proportion	Filing
Land animals hunted by indigenous	Questionnaire	Quantity, species name, location and purpose	Measured	every 7 days	At least 10 houses in four communities that have more than 10 homes or the whole community	Paper and digital database
Fish caught by indigenous	Questionnaire	Quantity, species name, length, location and purpose	Measured	every 7 days	At least 10 houses in four communities that have more than 10 homes or the whole community	Paper and digital database
Biological Inventory (mammals)	Observations, interviews and traces	Occurrence and species richness	Measured, estimated	every 4 years	At least four micro-basins in the TI	Paper and digital database
Biological Inventory (birds)	Observations, interviews and traces	Occurrence and species richness	Measured, estimated	every 4 years	At least four micro-basins in the TI	Paper and digital database
Biological Inventory (reptiles)	Observations, interviews and traces	Occurrence and species richness	Measured, estimated	every 4 years	At least four micro-basins in the TI	Paper and digital database
Biological Inventory (fish)	Observations, interviews and traces	Occurrence and species richness	Measured, estimated	every 4 years	At least four micro-basins in the TI	Paper and digital database
Biological Inventory (woody plants)	Botanical identification	Occurrence and species richness	Measured, estimated	every 4 years	At least four micro-basins in the TI	Paper and digital database
Use of non-timber forest products	Questionnaire	Quantity, species name, location and purpose	Measured	Every 6 months	At least 10 houses in four communities that have more than 10 homes or the whole community	Paper and digital database

Data collected by indigenous researchers, once systematized, will show the species and quantity of each species hunted or fished by the Paiter Surui. This way it will be possible to obtain indicators that will be used to design the subsequent biological inventories for each animal group, with the objective of verifying the population dynamics of the most consumed species and propose proper management in a more secure manner. The monitoring of hunting and fishing might use ODK tools. Hunting and fishing monitoring will be conducted throughout the year, to ensure necessary information about the seasonal activities of hunting and fishing. Workshops will be conducted annually to discuss and validate the data collected by the researchers.

The inclusion of biology students in the region in monitoring and data collection assistance is planned, especially for the species listed in the IUCN Red List.

After the validation of the proposed project under the CCBA standards, project proponents and partners ACT, Kanindé and IDESAM, will compile and publish the full plan for monitoring biodiversity in TISS. The data collected will be published in the form of reports, ensuring transparency and visibility of monitoring activities, as well as awareness of the activities for the indigenous community, the community of Cacoal, the national and international communities and will be available on all of the partners' websites.

GOLD LEVEL BIODIVERSITY [Optional for CCB]

GL3. Exceptional Biodiversity Benefits

1. Vulnerability

Regular occurrence of a globally threatened species (according to the IUCN Red List) at the site:
According to the IUCN Red List, the project brings exceptional benefits for biodiversity. The project area and reference area include three threatened species, 7 near threatened species and three vulnerable species, all mammals. The Project will encourage and facilitate the completion of scientific studies by undergraduate and graduate students for these species, focusing on the goal to better understand the abundance, population size, distribution and land use for these species.

The area of reference and design are also extremely important for sheltering birds endemic to the interfluves with high levels of accumulated deforestation in the Amazon, and rare species of fungi and other with the first occurrence in Brazil and/or the state of Rondônia.

The project area has three vulnerable species, but it is not possible to give precisely the amount of individuals.

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PROJECT DESCRIPTION

11. Glossary

Additionality - Environmental or emissions additionality refers to carbon accounting procedures, where projects should demonstrate real, measurable and long-term results, for the reduction or prevention of carbon emissions that would not occur without the project.

Baseline - The baseline represents the expected conditions (they are related to climate, biodiversity and communities) for a "business as usual" scenario and "without project" scenario (i.e. without the implementation of project activities). Usually we use the term "baseline scenario" or "reference scenario".

Carbon pools - A reservoir of carbon. A system that has the ability to accumulate or release carbon. Carbon pools are measured in terms of mass (e.g. metric tons of carbon).

Carbon Dioxide (CO2) - 3.666 units of CO2 are equal to one unit of carbon (C). CO2 plays an important role in creating and regulating Earth's climate (see Greenhouse Gases - GHG).

Carbon Dioxide Equivalent (CO2e) - It is the universal measure used to indicate the global warming potential of each of the seven greenhouse gases. It is used to assess the impacts of emissions (or avoided emissions) of different greenhouse gases.

Carbon Sink - Any process, activity or mechanism that results in net removal of greenhouse gases from the atmosphere.

Carbon Source - The opposite of a sink. A carbon sink is a net source of carbon to the atmosphere where the flow of carbon to the atmosphere is greater than the absorption of carbon reservoir.

Carbon Stocks - The amount of carbon contained in a sink at a given time.

Climate Change Mitigation - Reducing emissions of greenhouse gases (GHG) emissions to achieve stabilization of the concentration of such gases in the atmosphere, thus preventing global warming.

Crediting period - The time period in which the project will quantify the changes in net reduction of GHG emissions or removals.

Endangered Species - The term "threatened" is used to describe an endangered species, specifically those that fit into the categories of threat defined by the IUCN as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).The IUCN Red List of Threatened Species is currently the most comprehensive global standard on the worldwide distribution and status of threatened species.

Endemic species - species that has its global distribution restricted to a particular site, region or country

Greenhouse Gas (GHG) - Greenhouse gases are gaseous components of the atmosphere that capture the infrared heat and contribute to the greenhouse effect the planet Earth. In addition to carbon dioxide (CO2), the major greenhouse gases include methane (CH4) and nitrous oxide (N2O).

Global Warming Potential (GWP) of three greenhouse gases associated with forest activities are described below. CO2 remains in the atmosphere for approximately 200 to 450 years and its GWP is defined as 1. Methane remains in the atmosphere for 9 to 15 years, and has a GWP of 22 (which has a mean power of global warming 22 times greater than carbon dioxide). Nitrous oxide persists in the atmosphere for about 120 years and has a GWP of 310.

GMO - "Genetically Modified Organism". GMOs are defined as any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology which are capable of transferring or replicating genetic material.

High Conservation Values - HCV - There are six attributes of high conservation value, based on the definition originally developed for FSC certification for forests, but now expanded to be applied in evaluating other ecosystems (http://hcvnetwork.org/).

Intergovernmental Panel on Climate Change (IPCC) - Established in 1988 as a special organ of the United Nations Environment Programme (UNEP) and World Meteorological Organization (WMO) to provide assessment reports for decision makers on the current results of climate change research. The IPCC is responsible for providing technical and scientific grounds for the United Nations Framework Convention on Climate Change (UNFCCC), primarily through the publication of periodic assessment reports (see "Second Assessment Report" and "Third Assessment Report") http://www.ipcc.ch/

Invasive Species - "Invasive species" are defined as exotic species that threaten ecosystems, habitats or species in the project area, as identified in the Global Database of Invasive Species (http://www.issg.org/database) and from local knowledge and scientific literature.

Key Biodiversity Areas - Areas of global significance for biodiversity conservation, that meet criteria based on a system of vulnerability or the fact that they are irreplaceable, defined in terms of threat levels to species or populations: www.iucn.org/dbtw-wpd/edocs/PAG-015.pdf.

Land Use, Land Use Change and Forests (LULUCF) - Part of the Kyoto Protocol for land-use-based activities that have the potential of impacting carbon stocks and emissions.

Leakage - Any increase in GHG emissions occurring outside the project boundaries that result from project activities.

Other local actors - The main groups potentially affected by project activities that are not living within or adjacent to the project site.

Permanence - The longevity of a carbon sink and its stocks, considering the management and natural disturbances that may affect them. A feature of land-use-based carbon projects is the possibility of reversing carbon benefits, whether through the occurrence of natural disturbances (e.g. fire, disease, pests and other unusual weather events), or the lack of concrete guarantees that the original land use activities will not be resumed after the completion of project activities.

Project Area - The area within the carbon project boundary, which is under the control of the project proponent.

Project Duration - The time period within which the project activities will be implemented.

Project Proponents - Organizations and individuals proposing or advocating for a specific carbon "compensation project. Project proponents may be the responsible technician(s), developer(s) and/or investor(s), or other parties working for the project.

Project Start Date - "The project start date" is defined as the beginning of the implementation of the activities that will directly cause the emission reductions or expected removals of greenhouse gases.

REDD+ - Reducing Emissions from Deforestation, forest Degradation, conservation of stocks, sustainable management and enhancement of forest carbon stocks.

Surrounding Area - The area outside the project boundary, where adjacent communities could potentially be affected by the project.

Traditional Rights - Restricting the evaluation of the activities that comply with statutory or under traditional rights. Rights to traditional lands and resources refers to patterns of community use of the land and its resources for long periods, according to the customs, laws, values and traditions of tenure rights of indigenous peoples and traditional communities, including seasonal or cyclical uses, rather than formal legal title of land or resources issued by the State.