# Diagnostic of Key Success Factors for Forest Landscape Restoration

## Municipality of Paragominas

## and

## The State of Pará

A component of the Restoration Opportunities Assessment Methodology (ROAM)

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Support:

WORLD RESOURCES INSTITUTE

Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit

Good Energies
POWER FOR A BETTER WORLD

Execution:

Imazon

CONSERVE BRASIL

Curitiba/Belém
March 2017

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**Editorial Revision**:

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**Translation**

Freetalk Idiomas

D536 Portuguese title: Diagnóstico de fatores chave de sucesso para a restauração da paisagem florestal: município de Paragominas e Estado do Pará: componente da Metodologia de Avaliação de Oportunidades de Restauração (ROAM) / Anita Diederichsen ... [et al]. – Belém, PA: Imazon; Curitiba: Conserve Brasil, 2017.

112 p. : il. color.

ISBN 978-85-86212-91-8

1. Forest - Regeneration. 2. State of Pará Pará - Reforestation. 3. Paragominas - Pará. 4. Environmental protection – Public policies. 5. Restoration Opportunity Assessment Methodology (ROAM). I. Diederichsen, Anita. II. Gatti, Gustavo. III. Nunes, Sâmia. IV. Pinto, Andréia. V. Amazon Institute of People and the Environment. VI. Conserve Brasil.

333.75153098115



Trav. Dom Romualdo de Seixas Nº. 1.698,
Edifício Zion Business, 11º andar • Bairro Umarizal - CEP: 66.055-200
Belém - Pará - Brasil
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**DATA SHEET**

Conserve Brasil was commissioned by Imazon to carry out this work, which is the product of the analysis of bibliographical references, personal interviews and the "Diagnostic for the presence of key success factors for restoration" workshop, held in Paragominas on 7 June 2016. It incorporates the use of Restoration Opportunity Assessment Methodology (ROAM) (IUCN & WRI, 2014) and the Restoration Diagnostic tool, a method for developing forest landscape restoration strategies by rapidly assessing the status of key success factors, V1.0 (Hanson et al., 2015).

For the successful completion of this work, Conserve Brasil relied upon the services of Imazon researcher Sâmia Nunes, as its focal and technical contact at Imazon.

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## ABOUT IMAZON

Imazon is a research institute whose mission is to promote sustainable development in the Amazon thorough studies, support for the formulation of public policies, broad dissemination of information, and professional training. The institute is a non-profit association licensed by the Brazilian Ministry of Justice as a Civil Society Public Interest Organization (Oscip).

Imazon, founded in 1990, has its headquarters in Belém, Pará. During 22 years, it has published over 400 scientific and technical papers. Of these works, 163 correspond to articles published in international scientific journals or feature as book chapters. In addition, 43 books, 17 brochures and more than 175 technical reports and strategic documents for public policies have also been published.

***Website:*** ***www.imazon.org.br***

## ABOUT CONSERVE BRASIL

Conserve Brasil is a company whose objective is to provide consulting services in environmental and sustainability projects, projects for the conservation and restoration of native forests, management of parks, reserves and other conservation units. Since its inception, the core object of the company has been oriented towards conservationist themes.

Conserve Brasil holds vast experience in nature conservation in Brazil and abroad. This is largely due to its professional staff who combine over 30 years of experience dedicated to the conservationist cause.

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## ACKNOWLEDGEMENTS

The Germany Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMU), World Resources Institute (WRI) and the Good Energies Foundation (GEF) for financial support.

The interview respondents and workshop participants who helped generate the information for this publication.

The partners of WRI Brasil who assisted in the construction of this work: Mariana Oliveira, Aurélio Padovezi and Rachel Biderman.

## List of acronyms and abbreviations

| | |
|---|---|
| APP | Area of Permanent Preservation |
| AFS | Agroforestry System |
| BNDES | The National Bank for Economic and Social Development |
| CAR | Rural Environmental Registry |
| Cirad | Agricultural Research for Development (from the French: *Centre de Coopération Internationale en Recherche Agronomique pour le Développement*) |
| Deter | Real Time System for Detection of Deforestation |
| Embrapa | The Brazilian Agricultural Research Corporation |
| Esalq | The Luiz de Queiroz College of Agriculture |
| Fapesp | The São Paulo Research Foundation |
| FLR | Forest Landscape Restoration |
| Ibam | The Brazilian Institute of Municipal Administration |
| Ibama | The Brazilian Institute of Environment and Renewable Natural Resources |
| ICMS | The tax on goods and services levied in Brazil |
| Ideflor | The Institute of Forest Development and Biodiversity of the State of Pará |
| Imazon | Institute of Man and Environment of Amazonia |
| Inpe | The National Institute for Space Research |
| Iterpa | Land Institute of the State of Pará |
| IUCN | International Union for Conservation of Nature |
| LERF | Laboratory of Ecology and Forest Restoration |
| LR | Legal Reserve |
| MMA | Brazilian Ministry of the Environment |
| NDC | Nationally Determined Contributions |
| Planaveg | The National Plan for Native Vegetation Recovery |
| PMABB | Brazilian Biomes Environmental Monitoring Program |
| PMV | Green Municipalities Program |
| PRA | Environmental Regularization Program |
| Prada | Recovery Project for Degraded or Altered Areas |
| Prodes | Project to Monitor Deforestation in the Legal Amazon by Satellite |
| Pronaf | National Program to Strengthen Family Agriculture |
| RAS | The Sustainable Amazon Network |
| Renasem | National Seed and Seedling Registry |
| ROAM | Restoration Opportunities Assessment Methodology |
| SAD | Deforestation Alerts System |
| Sedeme | State Secretariat for Economic Development, Mining and Energy, Pará |
| Semagri | Municipal Secretary of Agriculture, Industry and Commerce |

| | |
|---|---|
| Semas | Secretariat of Environment and Sustainability, Pará |
| Sicar | National System of Rural Environmental Registration |
| Sigam | Integrated Environmental Management System |
| TNC | The Nature Conservancy |
| UFPA | The Federal University of Pará |
| Ufra | The Federal Rural University of Amazonia |
| Unesp | São Paulo State University |
| Usaid | United States Agency for International Development |
| USP | University of São Paulo |
| WRI | World Resources Institute |

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## EXECUTIVE SUMMARY

The Bonn Challenge, launched in 2011 in response to the economic, social and environmental challenges facing the world, established the goal to restore 150 million hectares by 2020, subsequently validated and expanded to 350 million hectares of restoration by 2030. The chosen strategy was Forest Landscape Restoration (FLR). As part of its contribution to the global climate agenda, Brazil announced its goal to restore and reforest 12 million hectares of native vegetation over a 20-year period, through the National Policy for the Recovery of Native Vegetation (Proveg, in Portuguese) and the National Plan for the Recovery of Native Vegetation (Planaveg, in Portuguese), whose base strategy is also FLR.

In this context of a global effort to reduce greenhouse gas emissions, in 2012 the World Resources Institute (WRI Brasil) and the International Union for Conservation of Nature (IUCN) created the "Inspire, Support, and Mobilize Forest and Landscape Restoration" project, in partnership with Imazon. One of the objectives of this project was the application of Restoration Opportunity Assessment Methodology (ROAM) to collect key data for forest landscape restoration that can guide decision-makers, specialists and those who implement restorative actions.

In Brazil, the project utilized one of the ROAM components, the diagnostic of key success factors for forest restoration, which was carried out in depth for the municipality of Paragominas and in a more simplified manner for the State of Pará. One of the opportunities present in the state is "Pará 2030", a plan that aims to improve the state's social and economic development indicators and it is expected that Paragominas, a municipality that participates in the state Green Municipalities Program (PMV), is one of the areas in Pará where the work demonstrated in this plan will be developed.

This report presents diagnostics carried out in Paragominas and Pará, and suggests strategies to promote restoration through the elaboration of the theory of change, developed by considering the absent factors.

### *Diagnostic of key success factors for restoration in Paragominas*

Of the 31 key success factors evaluated by the project in Paragominas, eight were in place (present), nineteen partly in place (only some aspects are present) and four were not in place (absent). These positive results are largely due to the implementation of the municipality's public environmental policies. They indicate that the implementation of actions for forest landscape restoration in the municipality is partially in progress and needs to be strengthened. The Uraim River catchment, responsible for 80% of the population's water supply in Paragominas (approximately 85 thousand inhabitants), was prioritized as the area for the initiation of actions for forest landscape restoration. This catchment has eight thousand hectares of deforested riparian APP, representing 50% of the total area of the catchment's riparian APP.

In contrast, the marked absence of four key success factors for forest landscape restoration in the municipality leads to the conclusion that: i) there are competing demands (e.g. food, fuel) for restoration by degraded or converted forest areas; ii)

there is a lack of value chains for the products and services of restored areas; iii) there is no transfer of restoration "know-how" among specialists or rural extension; and iv) the incentives and financial resources for restoration do not outweigh those of other activities that run counter to restoration.

To propose strategies that promote forest restoration, these four absent factors were analyzed to generate an initial conceptual model based on the methodology proposed by the Open Standards for the Practice of Conservation (CMP, 2013). From this, four strategies were prioritized in line with the National Plan for the Recovery of Native Vegetation (Planaveg), namely:

1. Intensify the sustainability of agriculture and livestock
2. Promote the forest market
3. Develop financial mechanisms for forest restoration
4. Provide technical assistance and forestry extension

For forest restoration to succeed in Paragominas, it must be incorporated and/or strengthened in the existing public policies. For this, it is fundamental to establish a municipal goal for restoration so that implementation of the other strategies may be developed in a shared context that is agreed among the actors. This theme is expected to become one of the priorities on the environmental agenda and restoration will be better understood not only as a legal obligation, but as an opportunity for the municipality of Paragominas.

### *Diagnostic of key success factors for restoration in the State of Pará*

Of the 31 key success factors for forest landscape restoration evaluated for Pará, eight are absent. This result was expected since the greater the scope, the greater the chances of absent factors. Like Paragominas, Pará has a robust environmental policy, but it lacks a state restoration goal. This goal could be associated with the target for zero net deforestation by incorporating the theme of forest landscape restoration into the Green Municipalities Program agenda and other state programs. It is also essential to create a State Climate Policy in the state, to strengthen the establishment of the restoration goal and the relationship between restoration and climate change policies; and the implementation of a regeneration monitoring system capable of generating information about the progress of the forest restoration in Pará, as a basic tool to support decision making.

Implementation of the recommendations for both Paragominas and Pará support the National Policy for the Recovery of Native Vegetation (Proveg) and are strongly related to other existing public policies, such as the Native Vegetation Protection Law (Law 12.651/012), the ABC Plan and the process of agrarian land regularization.

# 1 Introduction

In response to the severe economic, social and environmental crisis facing the world, leaders from different countries met in Germany in 2011 and launched the Bonn Challenge, setting a target of 150 million hectares to be restored by 2020. Driven by the Global Partnership on Forest Landscape Restoration (FLR), the Bonn Challenge brought together various levels of government, businesses, communities and individuals, that not only validated the goal, but extended it to 350 million hectares to be restored by 2030. This goal was endorsed in the New York Declaration on Forests as part of the outcome of the United Nations Climate Summit in 2014.

The macro approach to the agreement goes beyond planting trees and/or only restoring forests. The strategy is one of Forest Landscape Restoration (FLR) which intends to generate a greater positive impact on the issues of combating climate change, water security, maintaining biodiversity and restoring degraded areas. In addition to restoring the ecological integrity of areas, FLR aims to improve human well-being through multifunctional landscapes.

In Brazil, the need to comply with the Native Vegetation Protection Law (Law 12.651/2012) and the nation's commitments assumed in the Convention on Biological Diversity led to the development of the National Plan for the Recovery of Native Vegetation (Planaveg, in Portuguese), whose core strategy is also FLR. Planaveg intends to create the conditions for Brazil to achieve its self-declared goal of restoring 12.5 million hectares of native vegetation over a 20-year period. More recently, the National Policy for the Recovery of Native Vegetation (Proveg, in Portuguese - Decree 8,972/2017) was also created. Its objectives include promoting the environmental regularization of 12 million hectares by December 2030, as well as defining the Planaveg guidelines.

The State of Pará, in turn, has recently launched a development plan called "Pará 2030", which aims to improve the state's social and economic development indicators. One of the aspects of this program is the use of productive restoration as a strategy to generate income and seek sustainability. The expectation is that Paragominas, a municipality that already participates in the state Green Municipalities Program (PMV), is one of the municipalities in Pará where the work demonstrating this plan will be developed.

Concomitant to this, Imazon, in partnership with the World Resources Institute (WRI) and the International Union for Conservation of Nature (IUCN), has been developing for nearly four years the project "Inspire, support and mobilize forest and landscape restoration". The goal of the project is to create the basis for the restoration of at least 10 million hectares in Brazil, Indonesia, Rwanda, Kenya and Peru by 2017 as a new contribution to the Bonn Challenge.

As part of this project, Conserve Brasil and Imazon performed the diagnostic of key success factors for restoration, which is one of the main components of the Restoration Opportunity Assessment Methodology (ROAM), designed to guide decision makers, specialists and implementers of restoration interventions. Diagnostics were carried out in depth for the municipality of Paragominas and in a more simplified manner for the State of Pará. This report presents the results of these diagnostics and,

from the gaps identified, recommends strategies to promote restoration elaborated by the theory of change, based on the key factors that are absent. Finally, it is recommended to include forest landscape restoration in the public policies of Paragominas and Pará, since the success of restoration requires the strengthening and development of these policies.

# 2 Methodological considerations

## 2.1 What is ROAM?

The Restoration Opportunity Assessment Methodology (IUCN & WRI, 2014) was developed by IUCN in partnership with WRI to collect key data regarding forest landscape restoration to guide decision makers, specialists and those who implement restoration interventions. It also supports the development of restoration strategies and programs at the national and sub-national levels. ROAM identifies opportunities, articulates key actors, analyses data and promotes FLR, reconciling the increase in forest cover with the generation of environmental, social and economic benefits for the community, highlighting the recovery and conservation of soils and the generation of opportunities and income for rural producers

A handbook to ROAM (IUCN & WRI, 2014) was developed to assist decision-makers, specialists, practitioners, and project implementers who support the development of restoration strategies and programs at the sub-national and national levels. Accordingly, ROAM has supported countries and states that assume commitments to forest landscape restoration, such as the Bonn Challenge, which is a global effort to restore 150 million hectares of the world's deforested and degraded land by 2020.

To propose a set of policies and actions for restoring forest landscapes in an area/region, ROAM requires a step-by-step approach. The entire process has been developed to answer the following questions:

- Where is restoration socially, economically and ecologically feasible?
- What is the total extent of restoration opportunities in the country/region?
- Which types of restoration are feasible in different parts of the country?
- What are the costs and benefits, including carbon storage, associated with different restoration strategies?
- What policy, financial and social incentives exist or are needed to support restoration?
- Who are the stakeholders with whom we need to engage?

ROAM uses a powerful combination of stakeholder engagement ("best knowledge") with the analysis of available data ("best science") to identify and investigate FLR opportunities. The intention is to increase the resilience of landscapes and establish future options that allow the adjustment and optimization of goods and services, according to the needs of society (IUCN & WRI, 2014).

## *ROAM component: diagnostic of key success factors for restoration*

The diagnostic of key success factors for restoration is one of the components of ROAM (Hanson et al., 2015). It analyses three major themes, 14 necessary conditions and 31 key success factors, as shown in Table 1. Previous experiences show that the presence of key factors — either naturally or the result of measures to make them present — increases the likelihood of successful forest landscape restoration.

The three major themes of the diagnostic methodology are:

1. **Motivate** - In this theme, the necessary factors are verified to inspire and motivate decision-makers, rural landowners and/or citizens to recover their degraded areas. They are considered present when these actors are aware of the need to restore the forest landscape and are motivated or inspired to support it. This means that the case for restoration must be presented in their terms and meet their priorities.
2. **Enable** - In this theme, the necessary factors are verified to create the conditions (ecological, market, policy, social and/or institutional) necessary to promote the recovery of native vegetation.
3. **Implement** - In this theme the factors necessary to enable the implementation of recovery in the field in a sustained way are verified, such as resources and training, monitoring etc.

The diagnostic verifies, in particular, how the institutional, marketing, legal and policy guidelines of selected landscapes can help or hinder the development and implementation of FLR activities. It can also analyze to what extent the social and ecological conditions of the area under evaluation are conducive to the expansion of restoration efforts.

The key success factors for restoration are classified as: i) in place, when present; Ii) partly in place, when only some aspects are present; and iii) not in place, when they do not exist in the evaluated region. In this way, it is possible to identify the opportunities present and, at the same time, the existing gaps to serve as the basis for the development of strategies and actions necessary to strengthen a large-scale forestry landscape restoration initiative. The greater the number of success factors present, the greater the likelihood of FLR being successful. However, not all key success factors need to be present and no single factor is sufficient for the success of the restoration.

The information for the diagnostic can be collected through reference literature, interviews and technical meetings. Analysis of the data and the definition of the status of each of the conditions are performed qualitatively, according to the structure defined by ROAM.

*Table 1. Key success factors for restoration and their structure, by theme and necessary conditions (IUCN & WRI, 2014)*

| Theme | Feature | | Key success factor |
|---|---|---|---|
| Motivate | a. Benefits | 1 | Restoration generates economic benefits |
| | | 2 | Restoration generates social benefits |
| | | 3 | Restoration generates environmental benefits |
| | b. Awareness | 4 | Benefits of restoration are publicly communicated |
| | | 5 | Opportunities for restoration are identified |
| | c. Crisis events | 6 | Crisis events are leveraged |
| | d. Legal requirements | 7 | Law requiring restoration exists |
| | | 8 | Law requiring restoration is broadly understood and enforced |
| | | | |
| Enable | e. Ecological conditions | 9 | Soil, water, climate, and fire conditions are suitable for restoration |
| | | 10 | Plants and animals that can impede restoration are absent |
| | | 11 | Native seeds, seedlings, or sources populations are readily available |
| | f. Market conditions | 12 | Competing demands (e.g., food, fuel) for degraded forestlands are declining |
| | | 13 | Value chains for products from restored areas exists |
| | g. Policy conditions | 14 | Land and natural resource tenure are secure |
| | | 15 | Policies affecting restoration are aligned and streamlined |
| | | 16 | Restrictions on clearing remaining natural forests exist |
| | | 17 | Forest clearing restrictions are enforced |
| | h. Social conditions | 18 | Local people are empowered to make decisions about restoration |
| | | 19 | Local people are able to benefit from restoration |
| | i. Institutional conditions | 20 | Roles and responsibilities for restoration are clearly defined |
| | | 21 | Effective institutional coordination is in place |
| | | | |
| Implement | j. Leadership | 22 | National and/or local restoration champions exist |
| | | 23 | Sustained political commitment exists |
| | k. Knowledge | 24 | Restoration "know how" relevant to candidate landscapes exist |
| | | 25 | Restoration "know how" transferred via peers or extension services |
| | l. Technical design | 26 | Restoration design is technically grounded and climate resilient |
| | | 27 | Restoration limits "leakage" |
| | m. Finance and incentives | 28 | Positive incentives and funds for restoration outweigh negative incentives |
| | | 29 | Incentives and funds are readily accessible |
| | n. Feedback | 30 | Effective performance monitoring and evaluation system is in place |
| | | 31 | Early wins are communicated |

# 3 Diagnostic of key success factors for restoration in Paragominas

## 3.1 Study area

One of the studies was carried out in the municipality of Paragominas, which lies in the eastern region of Pará State (Figure 1), on latitude 2.995 degrees south and longitude 47.353 degrees west (decimal degrees), at an altitude of 90 meters. The area of the municipality is approximately 1.93 million hectares.

Paragominas has a population of approximately 100 thousand people and a gross domestic product of around BRL 1.2 billion (IBGE *apud* Nunes et al., 2014), generated in large part by the economy associated with mechanized agriculture, livestock ranching, selective forest extraction, bauxite mining and planted forests with exotic and native species (Pinto et al., 2009). The process of occupation, colonization and development of the region over the past 40 years has led to the deforestation of about 9 thousand square kilometers, or 44% of the total area of the municipality (Inpe apud Nunes et al., 2016). Despite this, Paragominas still shows good potential for forest restoration with respect to the landscape matrix, which is still predominantly forest. So far, there is no evidence of major problems with drought.

According to Pinto et al. (2009), the Amazon rainforest in Paragominas is composed of i) sub-montane dense forest, which currently covers 18.4% of the municipality; ii) dense lowland forest (34% of the territory); and iii) dense alluvial forest, distributed mainly on the banks of the Capim and Surubiju Rivers, covering 2.9% of the municipality.

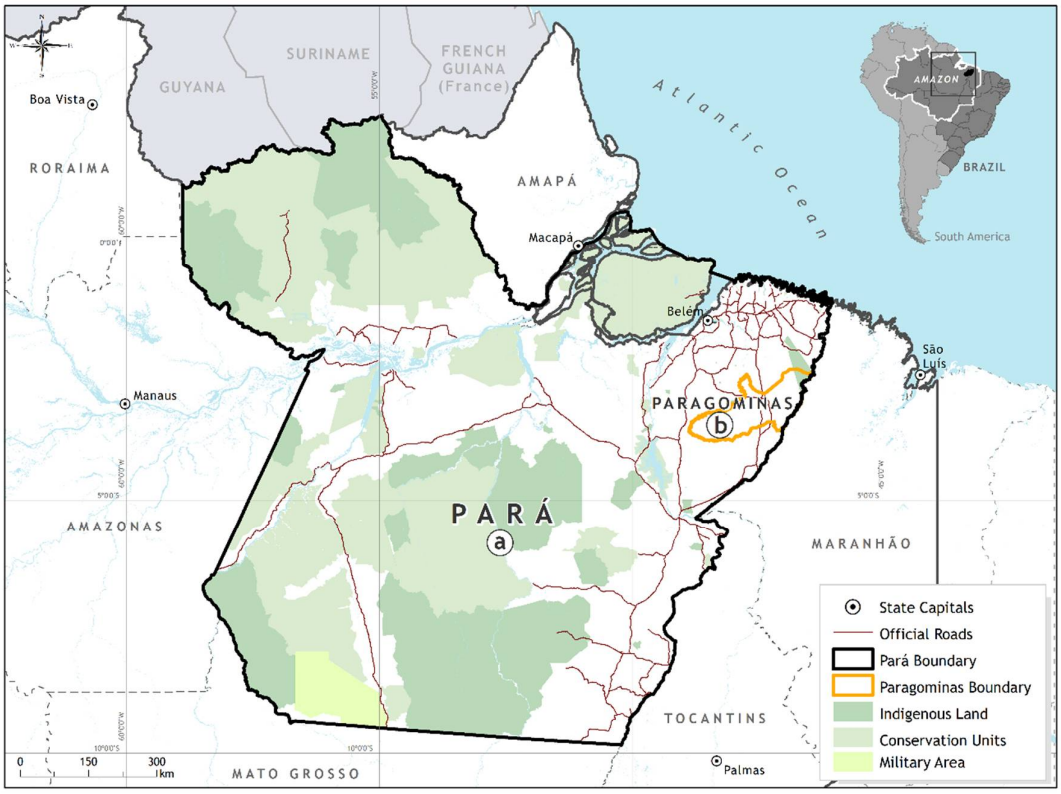



*Figure 1. Location of the (a) State of Pará and the (b) municipality of Paragominas; and the distribution of indigenous lands, conservation units and military areas (Source: Nunes et al., 2016)*

The main anthropic (human intervention) disruption to the forest matrix in the municipality is the deforestation associated with agriculture and livestock, although more controlled now than in the past. In both cases, it can be said that these are changes without high expectations of a reversion to forest cover. However, there are several underutilized or even abandoned areas that could be restored, as well as areas with low suitability for agriculture and livestock, which can be considered fundamental to the environmental compliance of property, without affecting productivity.

Deforestation associated with bauxite mining in the municipality should also be considered. Although currently occurring in specific areas and on a reduced scale, forest remnants around the mines may also undergo future conversion. However, it is worth mentioning that in Paragominas the mining sector has attended meetings and promoted actions and related to environmental recovery.

In 2008, after a protracted period of intense deforestation of the Amazon rainforest and the articulation of civil society organizations, government agencies, the media, society in general, the Ministry of the Environment (MMA) published a 'red list'

of the Amazon's most deforested municipalities (MMA, 2008). Paragominas was among these and, like the other municipalities listed, has suffered severe sanctions, such as restrictions on access to rural credit and embargoes on the products from illegally deforested areas. In the face of this, the municipality reacted by launching the "Paragominas: Green Municipality" project (Guimarães et al., 2013).

The actions taken under this project were largely successful, and deforestation has been reduced to a level considered acceptable. The success of the project has had national repercussions, such that is served as an example for the formulation of a state policy, the "Green Municipalities Program" (Guimarães et al., 2013).

More recently, however, the use of remote sensing for monitoring deforestation by Imazon has detected frequent signs of forest degradation (Fonseca et al., 2016) in the municipality. This degradation is basically a result of the selective extraction of timber and damage caused by fires, which have intensified in the region. However, with the continuous improvement of remote monitoring systems, the detection of forest degradation is gaining more attention, precisely because of the expansion of logging and fires in the region.

## 3.2 Method

The elaboration of the diagnostic of key success factors for forest restoration in Paragominas required three stages of information gathering. The first involved a workshop which included the participation of actors whose activities are related to forest restoration. The second stage involved interviews with actors who are involved with restoration. Then the third stage required an examination of the existing literature. Below are key findings on each of these steps.

### 3.2.1 Workshop

The workshop "Diagnostic for the presence of key success factors for restoration", Paragominas, Pará: Application of ROAM consisted of two parts. The first was introductory presentations (Figure 2) on the context of forest restoration, ROAM, and what has been developed on this theme in this region by Imazon. The second involved meetings with two focus groups (Figure 3) to assess the presence of key success factors for restoration in Paragominas. The detailed information regarding the workshop methodology and the results obtained are in Appendix I.


*Figure 2. Participants attending the workshop presentations in Paragominas-PA (Photos: Imazon)*

During the group meetings, the participants had the opportunity to analyze key success factors and to discuss their existence in the study region (Figure 3).


*Figure 3. Workshop steps: focus group discussion and classification of key factors (Photos: Imazon and Conserve Brasil)*

The group analyses revealed that the municipality is experiencing a "post-CAR" phase, that is, there is already concern over activities related to environmental compliance (e.g., restoration of APP and LR), besides the registration of property in the CAR system, the Sicar. The participants also recognized that the different actors related to the theme should work in a more integrated way to avoid efforts overlapping and to support scaling up the restoration.

### 3.2.2 Interviews

For the interviews, professionals from the region who operate in areas related to forest landscape restoration were selected. In each interview, the factors related to the respondent's sphere of operations were emphasized, that is, when the respondent's expertise was political, policy factors were emphasized, and so on. The interviews were conducted face-to-face or by telephone with eight representatives from seven different institutions listed below, namely:

1. Adnan Demachki - Sedeme

2. Armindo Felipe Zagalo Neto – Executive Core of PMV
3. Brenda Brito - Imazon
4. Ian Thompson - The Nature Conservancy
5. Joice Nunes Ferreira - Embrapa
6. Lilian Blanc - Cirad
7. Paulo Pombo Tocantins – Paragominas City Hall
8. Rubens Benini - The Nature Conservancy

The interviews provided a moment of critical reasoning with respect to the key factors and strategies necessary for the construction and implementation of restoration interventions in Paragominas and in the State of Pará.

### 3.2.3 Bibliographic research

Information was gathered on topics related to key success factors for restoration in the Amazon, the State of Pará and, specifically, to the municipality of Paragominas. The bibliography included articles from scientific journals, books, technical reports, manuals and project communication material. These references were used to complement the information acquired during the workshop and interviews. The references consulted are cited throughout the detailed classification analyses for each of the key factors and listed in the references.

## 3.3 Results

Below is the situation for each of the 31 key success factors for restoration in Paragominas according to the following classification: in place, highlighted in green; partly in place, in yellow; or not in place, in red. They are listed by theme: Motivate, Enable and Implement, and their respective necessary conditions to favor the recovery of native vegetation in Paragominas. These results were based on the amalgamated information gathered from the workshop, interviews and bibliographic references.

### 3.3.1 Motivate

This theme evaluated whether decision-makers, rural landowners and/or citizens are inspired or motivated to catalyze processes that lead to forest landscape restoration (Table 2).

Table 2. Result of the diagnostic of key success factors for forest landscape restoration under the theme Motivate, in Paragominas-PA, in 2016

| *Theme* | *Necessary condition* | | *Key success factor* | *Paragominas current situation* |
|---|---|---|---|---|
| **Motivate** | **a. Benefits** | 1 | Restoration generates economic benefits | In place |
| | | 2 | Restoration generates social benefits | In place |
| | | 3 | Restoration generates environmental benefits | Partly in place |
| | **b. Awareness** | 4 | Benefits of restoration are publicly communicated | Partly in place |
| | | 5 | Opportunities for restoration are identified | In place |
| | **c. Crisis events** | 6 | Crisis events are leveraged | Partly in place |
| | **d. Legal requirements** | 7 | Law requiring restoration exists | In place |
| | | 8 | Law requiring restoration is broadly understood and enforced | Partly in place |

Of the eight success factors considered under the motivate theme, four are in place and four others, partly in place (Table 2). This demonstrates a favorable environment to inspire and motivate decision-makers, rural landowners and/or citizens to recover their degraded areas in Paragominas. It was identified that there is knowledge regarding the benefits that restoration can offer, highlighting priority areas such as riparian APP.

#### 3.3.1.1 BENEFITS

Most of the interviewees recognized that restoration can generate social and economic benefits in the municipality (such as the possibility of employment and income generation, food security and an improved quality of life derived from the production associated with forest restoration); and environmental benefits (such as forest recovery for water security). In the case of Paragominas, restoration of the Uraim river catchment, which is responsible for most of the municipality's water supply, has great potential to provide these benefits.

The performance of different actors in environmental actions, even, in some cases, by those with an indirect relationship with restoration also demonstrates an understanding of the potential benefits of restoration in the municipality. This mobilization stems from the legal obligation of environmental compliance of rural properties.

Below is a detailed analysis of each of the 31 key success factors.

| **Theme** | **MOTIVATE** |
|---|---|
| Necessary condition | a. Benefits |
| Key success factors | **1. Restoration generates economic benefits.** |
| Question | Restoring the candidate landscape is expected to yield economic benefits (e.g., economic diversification, avoided damages, new marketable products) that create a net positive financial impact (private benefits) and/or net positive economic impact (public benefits) relative to the status quo land use. |
| Definition | Restoring the candidate landscape is expected to yield economic benefits (e.g., economic diversification, avoided damages, new marketable products) that create a net positive financial impact (private benefits) and/or net positive economic impact (public benefits) relative to the status quo land use. |
| Status | **IN PLACE** |
| **Status information**: - Moved by the implementation of the Green Municipalities Program and, related to this, the need for compliance of the rural property, landowners and other actors in the region begin to recognize the economic benefits of restoration, generating expectations related to financial returns. “Restoration | |

must occur in association with production" (Paulo Tocantins, Mayor of Paragominas). The municipality also intends to promote economic opportunities linked to restoration.

- Paragominas is one of the study areas of the Sustainable Amazon Network (RAS, in Portuguese), a multidisciplinary scientific consortium that includes restoration as one of its activities. More than 30 research and teaching institutions participate in the RAS, in collaboration with representatives of the productive sector, civil society and the Brazilian government. This network evaluates the social and economic dimensions of sustainable land use in the Amazon, as well as investigating and seeking a balance between agricultural activities and forest conservation through alternative production activities (Gardner, 2013; RAS, 2014).

•What are the expected economic benefits?
- Economic diversification and poverty reduction. For example, the enrichment of Legal Reserve (LR) with native hardwood species and fruit trees, the sale of timber and non-timber products, such as açaí, in the areas to be restored. Possible implementation of Agroforestry Systems (AFS) for LR recovery (Pinto, 2009; Globo Rural, 2013; Appendix 1).

- "Restoration is seen as potential additional income for the smallholders, bringing diversity to the family income" (Paulo Tocantins, Paragominas City Hall).

- Access to credit through the environmental compliance of the property, which includes, in general, APP restoration.

•Who are the beneficiaries?
- Restoration can benefit both large and small producers.

| **Theme** | **MOTIVATE** |
|---|---|
| Necessary condition | a. Benefits |
| Key success factor | **2. Restoration generates social benefits.** |
| **Question** | Is the restoration expected to produce social benefits from the candidate landscape? |
| **Definition** | Restoring the candidate landscape is expected to yield social benefits, which include those supporting cultural ties and generating political gains. |
| **Status** | **IN PLACE** |

**Information about the status:**
- The social benefits generated through restoration can be seen in different spheres. Paragominas was the first municipality to participate in the Green Municipalities Program, which placed it in a prominent position in the state and in society. Often the municipality is invited to participate in new partnerships, such as the implementation of research projects, pilot projects in the environmental area, management system tests that are linked, in some cases and in a complementary way, with restoration initiatives.

- Paragominas is one of the study areas of the Sustainable Amazon Network (RAS), a multidisciplinary scientific consortium that includes restoration as one of its activities. More than 30 research and teaching institutions participate in the RAS, in collaboration with representatives of the productive sector, civil society and the Brazilian government. This network evaluates the social and economic dimensions of sustainable land use in the Amazon, as well as investigating and seeking a balance between agricultural activities and forest conservation through alternative production activities (Gardner, 2013; RAS, 2014).

- The Refloramaz Project - Forest recovery by family farmers in the eastern Amazon: how to improve the balance between environmental and socioeconomic benefits? (Cirad-Embrapa-UFPA) is under development in northeast Pará, including Paragominas. The project evaluates the favorable conditions necessary to balance the supply of environmental services and social and economic benefits, to support the implementation of national and state policies for environmental recovery (Joice Nunes, Embrapa).

- There is also social mobilization, such as the Clean Source Project, led by the Lions Club in partnership with the City Hall and includes the participation of volunteers, reflecting a concern for the quality of the environment and the Uraim River. This initiative does not yet directly undertake restoration, but demonstrates potential.

- The actors also recognize that an increase in income can promote an improvement in the quality of life for the population involved, since the generation of economic benefits by the restoration is linked to the generation of social benefits.

• What are the expected social benefits?
- Food security - There is an understanding that restoration on smallholdings generates the opportunity for plant species that serve as food, contributing to food security. The possibility of implementation of AFS for the generation of income for agro-extraction producers.

- Employment - Another social benefit is the opportunity to generate jobs (direct and indirect) and income from restoration interventions, thus contributing to the increased income of the producers.

- The credibility of the producer - The environmental suitability of rural properties gives the producer more credibility, facilitating, for example, access to credit (NBL & TNC, 2013).

- The credibility of managers - The managers of Paragominas understand the restoration theme as being an important agenda for the municipality. If implemented, the municipality can assume a leading role in the state along with other municipalities, such as São Félix do Xingu.

| **Theme** | **MOTIVATE** |
|---|---|
| Necessary condition | a. Benefits |
| Key success factor | **3.Restoration generates environmental benefits.** |
| Question | Is the restoration of the candidate landscape expected to yield environmental benefits.? |
| Definition | Restoring the candidate landscape is expected to yield environmental benefits. |
| Status | **PARTLY IN PLACE** |

**Status information**:
- Paragominas was the first municipality to participate in the Green Municipalities Program, with one of its indirect objectives being forest restoration linked to the environmental compliance of the property and net loss of forests (Strategy in development, also known as Zero Net Deforestation).

- The Refloramaz Project – "Forest recovery by family farmers in the eastern Amazon: how to improve the balance between environmental and socioeconomic benefits?" (Cirad-Embrapa-UFPA) is under development in northeast Pará, including Paragominas. The project evaluates the favorable conditions necessary to balance the supply of environmental services and social and economic benefits, to support the implementation of national and state policies for environmental recovery (Joice Nunes, Embrapa).

- Paragominas is one of the study areas of the Sustainable Amazon Network (RAS), a multidisciplinary scientific consortium that includes restoration as one of its activities. More than 30 research and teaching institutions participate in the RAS, in collaboration with representatives of the productive sector, civil society and the Brazilian government. This network evaluates the social and economic dimensions of sustainable land use in the Amazon, as well as investigating and seeking a balance between agricultural activities and forest conservation through alternative production activities (Gardner, 2013; RAS, 2014).

- Several key players (Paulo Tocantins, Mayor of Paragominas; Jaqueline Peçanha, Semma; Felipe Zagalo, PMV) recognize the importance of the Uraim River basin as a source of water for the population of Paragominas. There is a proposal to create a Conservation Unit in the region.

- There is also social mobilization, such as the Clean Source Project, led by the Lions Club in partnership with the City Hall and includes the participation of volunteers, reflecting a concern for the quality of the

environment and the Uraim River. This initiative does not yet directly undertake restoration, but demonstrates potential and reflects the concern for the conservation of the forest and the quality of the water.

• What's still missing?
- Although there is some understanding of the benefits of preserving municipal water supplies, there is still a lack of understanding of the environmental benefits related to nature conservation and the importance of mitigating and adapting to climate change.

•What are the expected environmental benefits?
- Biodiversity - Conservation of biodiversity and "reduction of habitat fragmentation" (Adnan Demachki, Sedeme).

- Soil - Prevention of erosion and silting (NBL & TNC, 2013).

- Water - Production of good quality water and in quantity for the population of Paragominas. Filtration of rainwater that flows through the soil.

#### 3.3.1.2 AWARENESS

There is a need to strengthen the public dissemination of the benefits of restoration. Regarding the opportunity for restoration, the Uraim River catchment was chosen as a priority to which efforts could be directed, as it is responsible for the municipality's water supply. Considering that Paragominas has a LR surplus (Nunes et al., 2016), some rural property owners have opted for compensation mechanisms. The restoration priority areas are degraded APP, as part of the process of environmental compliance of the properties. These areas are already mapped for the entire municipality. There are also other opportunities for restoration beyond the Uraim River catchment, through the establishment of productive chains in smallholdings, for example.

| **THEME** | **MOTIVATE** |
|---|---|
| Necessary condition | b. Awareness |
| Key success factor | **4. Benefits of restoration are publicly communicated.** |
| Question | Are the benefits that would arise from the candidate landscape being restored clearly identified and communicated to stakeholders and the public? |
| Definition | Benefits that would arise from the candidate landscape being restored have been clearly identified and communicated to land managers, the public, and other relevant stakeholders. |
| Status | **PARTLY IN PLACE** |

**Status information**:
- Some aspects of the media (TV and publications) address and publicize the benefits of restoration. (NBL & TNC, 2013; Imazon, 2013; Globo Rural, 2013). "The most important ecological zones for restoration are areas of permanent preservation along rivers and other watercourses" (Rodrigues et al., 2011).

- In 2009, the Imazon project "Landscape Planning and Forest Restoration in the Uraim River Catchment" developed communication material aimed specifically at 60 rural landowners.

- Projects and/or institutions that have divulged the benefits of the restoration mentioned in the workshop: Project Clean Source, Project Pitu, Nucleus of Studies in Agroecology, Youth Forum, Ideflor in the Capim River, Green Livestock Project, Ufra.

•What benefits could arise?
- Several environmental, social and economic benefits are presented in the Forest Restoration Manual

(NBL & TNC 2013). “This understanding must occur due to the capacity of forest restoration to return the restored areas to the minimum conditions that guarantee compliance with Brazilian environmental legislation, the continuity of economic activities and the environmental services responsible for long-term sustainability.”

• Which stakeholders would benefit?
- Rural land owners (large, medium and small), the municipality and the community.

• What is absent from the disclosure?
- Communication materials need to be developed in a strategic way. The disclosure must be more comprehensive and consistent with regard to benefits to prevent information being restricted only to a specific public that is more related to the subject.

| **Theme** | **MOTIVATE** |
|---|---|
| Necessary conditions | b. Awareness |
| Key success factor | **5. Opportunities for restoration are identified.** |
| Question | Have candidate areas for restoration been identified and quantified? |
| Definition | Candidate areas for restoration are identified and quantified |
| Status | **IN PLACE** |

**Status information**:
• Where are the candidate areas located?
- Mainly in the “arc of deforestation”: southeast Pará and the Amazon, site of greater environmental deficits in the State of Pará. A study by Nunes et al. (2016) shows that Paragominas has a surplus of LR (300 thousand hectares) despite the 60,500 hectares of deficit. The restoration opportunities are mainly in degraded APP which, by law, must be recovered. This study further argues that it is not yet clear to what extent landowners will opt to compensate or restore their LR deficit. The option to restore or compensate will very much depend on the actors. Smallholders should have a preference for recovery, as it also serves as subsistence and is a process to which they are most accustomed. The largest landowners may prefer compensation in order not to lose their productive area and to continue their agriculture and livestock activities on a large scale. For these reasons, we cannot know the extent of the LR area that landowners will recover or restore. In addition, recovery of part of the LR that was deforested after 2008 must occur.

- The Uraim River catchment is the municipality’s main source of water supply and is considered a priority area in which the municipality should focus its restoration efforts (Paulo Tocantins, Mayor of Paragominas).

- A study by Imazon found that 50% of the APP in the Uraim river catchment is deforested. Imazon carried out a diagnostic for forest restoration of APP in the Uraim river catchment covering 60 small rural properties (2 thousand hectares) (Imazon, 2009). There is also opportunity for restoration in properties with livestock, through the strengthening and expansion of the Green Livestock Project or individual initiatives.

• What is the size of the area with opportunities for restoration?
- Data from 2010 shows that almost 40% (50 thousand hectares) of the total area of riparian APP in Paragominas were deforested and, according to environmental legislation, approximately 22% (28.7 thousand hectares) of this total must be restored (Nunes et al., 2014). In addition to APP that need to be restored, there are areas that have been deforested irregularly after 2008 (Rubens Benini, TNC) and these also need to be considered.

#### 3.3.1.3 CRISIS EVENTS

The crisis of increased deforestation has generated for Paragominas a great opportunity to strengthen and implement public policies favorable to the conservation

of forest cover. In a short period of time, the municipality – due to the results of its actions, such as the creation of Paragominas: Green Municipality, adherence to the CAR and zero deforestation policy – was the first to exit the list of the largest deforesters in the Amazon, becoming a model of sustainable management. Paragominas is beginning to experience a post-CAR phase, the phase of property compliance, which mainly includes forest conservation through the mechanisms of LR compensation and the restoration of degraded APP, both linked to the strategy of zero net deforestation.

| **Theme** | **MOTIVATE** |
|---|---|
| Necessary condition | c. Crisis events |
| Key success factor | **6. Crisis situations leverage opportunities for restoration.** |
| Question | Is the region experiencing a crisis event, or the risk of one, that would motivate restoration in the candidate landscape? |
| Definition | The government and/or civil society use the risk or occasion of crisis events to build political and public support for forest landscape restoration. |
| Status | **PARTLY IN PLACE** |

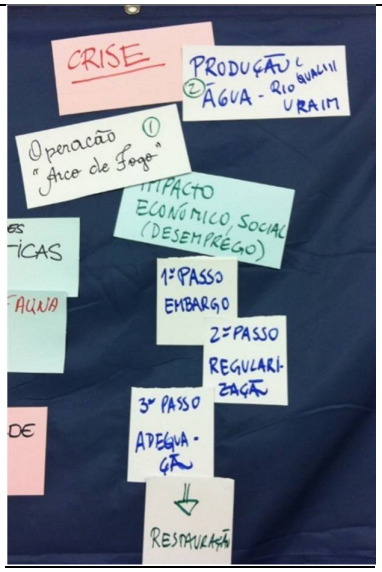
**Status information**:

- The history of deforestation and forest degradation in Paragominas led to the municipality achieving the 33rd position on the list of the largest deforesters in the Amazon in 2008. "These municipalities became subject to intense surveillance. Deforestation gained space in municipal policy, requiring action by managers and local society" (Paragominas, 2016). This situation culminated in the creation of the Paragominas Project: Green Municipality. "The crisis led to the closure of several logging companies, turning an image crisis into a serious socioeconomic crisis" (Paragominas, 2016). By 2010, Paragominas had reduced deforestation to below 40 square kilometers per year and placed 80% of the municipality's registered area in the CAR, and became the first municipality to exit this list.

- In 2011, this municipal initiative became a state policy called the Green Municipalities Program, (State Decree 54/2011).

- What has been lacking from the crisis to fully benefit restoration?

- It is still necessary to strengthen, the restoration strategy linked to the goal of zero net deforestation in the agenda of the Green Municipalities Program (Imazon, 2015; Brenda Brito, Imazon). Restoration is one of the pillars, but there is no plan for the implementation of large-scale recovery at both the municipal and state level.




Mapping of the crisis situation in Paragominas carried out by the focus groups in the

| workshop |
|---|

### 3.3.1.4 LEGAL REQUIREMENTS

The existence of forest legislation that promotes the conservation of the forest and the recovery of degraded areas according to specific rules, through the process of environmental compliance of the property, is a key factor present throughout the country. This legislation generates opportunities for sustainable development linked to the enhancement and conservation of natural environments. However, it is still necessary to expand the knowledge and application of the law that requires the recovery of native vegetation, within established criteria.

| **Theme** | **MOTIVATE** |
|---|---|
| Necessary condition | d. Legal requirements |
| Key success factor | **7. Law requiring restoration exists.** |
| Question | Does the government have a law requiring landowners or managers to reforest or restore forest areas that have been cleared? |
| Definition | The government has legislation that requires landowners to reforest or restore forest areas that have been cleared in the candidate landscape. |
| Status | **IN PLACE** |

**Status Information**:

- In Brazil, there is the Federal Law for Protection of Native Vegetation (Law 12.651/2012), which requires the restoration of APP and irregularly deforested LR.

- In addition, there is Planaveg, which is one of the instruments provided in the proposal of National Policy for the Recovery of Native Vegetation. Planaveg is an important tool for discussing and promoting the recovery of native vegetation in the country (MMA, 2013).

- In Paragominas there is the Law 765/2011, which institutes the Municipal Environmental Code (CAM, in Portuguese), which establishes: the Policy and Municipal Environmental System of Paragominas; the obligation to effect CAR to verify the environmental regularity; and the purpose of the Municipal Environment Fund (Foam, in Portuguese), in which funding for various activities related to the environment, including "conservation, protection, preservation, recovery and restoration of the environment" is contemplated (Law 765/2011, Paragominas, 2011). The CAM also incorporates the restoration of the environment and the recovery of degraded areas.

| **Theme** | **MOTIVATE** |
|---|---|
| Necessary condition | d. Legal requirements |
| Key success factor | **8. Law requiring restoration is broadly understood and enforced.** |
| Question | Is the law requiring forest restoration or reforestation broadly understood by relevant actors and enforced in a visible, credible, and fair manner? |
| Definition | The law requiring forest restoration or reforestation in the candidate landscape is understood by relevant actors and is enforced in a visible, credible, and fair manner. |
| Status | **PARTLY IN PLACE** |

**Status information**:

- In Paragominas there are some actions geared towards recovery and forest restoration. In these areas, the laws are applied and the environmental regularization of the property is made possible:

a) Green Livestock Project - Environmental compliance of property, based on the elaboration of Projects for the Restoration of Degraded or Changed Areas (Prada), including the recovery of APP in a passive manner. This project is led by the Rural Producers Union of Paragominas (SPRP), with technical support from TNC, Imazon and the Laboratory of Ecology and Forest Restoration (LERF), Esalq/USP Department of Biological Sciences, under the coordination of Professor Ricardo Ribeiro Rodrigues, specialist in research on forest restoration (SPRP, 2014).

b) "Environmental compliance is directly associated with access to resources. The producers interested in receiving investment strive for compliance. Livestock is heading in this direction. There is great potential for restoration in livestock ranching. "The producers accept environmental compliance to legitimize and increase production efficiency" (Ian Thompson, TNC).
c) Regularized areas of the Amata reforestation company with certified planting of Paricá (*Schizolobium amazonicum*) - Compliance linked to the forest certification process.
d) Biodiversity project, propagation of plant species and recovery of areas degraded by bauxite mining in the northeastern region of Pará, Paragominas, Pará - A cooperation between the Federal Rural University of Amazonia (Ufra), Hydro Brasil, the Federal University of Pará (UFPA), the Emílio Goeldi Museum (MPEG) and the University of Oslo (Norway).

• What is the nature of the gap
- The legislation is not understood by everyone in the same way. Smallholders have less knowledge of environmental regulation, while large producers, even when they do not have the knowledge, are in a better position to pay for technical assistance. "It is doubtful whether the smallholders know that the recovery can be carried out via natural regeneration, for example" (Joice Nunes, Embrapa). The technicians who participate in the process of environmental compliance of the property are not aligned and, in some cases, are unprepared to interpret the legislation in the field. In addition, LR compensation mechanisms are not well understood and unregulated (Nunes et al., 2016).
- Concerning the application of the legislation, it is known that "recovery in APP is far below what is required for private properties to comply with the law" (Nunes et al., 2016). The focus of the Green Municipalities Program is still on the reduction of deforestation and, more recently, the fight against the degradation mainly resulting from fires.


Evaluation of Factor 8 "Laws that require restoration are widely understood and applied" by the focus groups in Paragominas

### 3.3.2 Enable

This theme evaluated whether the necessary conditions are working and creating a favorable context that facilitates and enables forest landscape restoration (Table 3). Of the 13 success factors considered in this theme related to the necessary conditions, two are in place, nine are partly in place and two are not in place (Table 3). The two factors in place are related to current restrictions on deforestation of native forests and the awareness of the local community about the benefits of restoration. This demonstrates that there is some level of knowledge of illegal deforestation practices and the social return that restoration can bring. The absence of the two factors related to market conditions demonstrates that it is necessary to develop the value chain of the products of restoration in order to make this activity more competitive with other

practices that demand deforestation and for communities to benefit economically from the restoration.

*Table 3. Result of the diagnostic of key success factors for forest landscape restoration under the theme Enable, in Paragominas-PA, in 2016*

| *Theme* | *Necessary condition* | | *Key success factor* | *Paragominas current situation* |
|---|---|---|---|---|
| Enable | e. Ecological conditions | 9 | Soil, water, climate, and fire conditions are suitable for restoration | Partly in place |
| | | 10 | Plants and animals that can impede restoration are absent | Partly in place |
| | | 11 | Native seeds, seedlings, or sources populations are readily available | Partly in place |
| | f. Market conditions | 12 | Competing demands (e.g., food, fuel) for degraded forestlands are declining | Not in place |
| | | 13 | Value chains for products from restored areas exists | Not in place |
| | g. Policy conditions | 14 | Land and natural resource tenure are secure | Partly in place |
| | | 15 | Policies affecting restoration are aligned and streamlined | Partly in place |
| | | 16 | Restrictions on clearing remaining natural forests exist | In place |
| | | 17 | Forest clearing restrictions are enforced | Partly in place |
| | h. Social conditions | 18 | Local people are empowered to make decisions about restoration | Partly in place |
| | | 19 | Local people are able to benefit from restoration | In place |
| | i. Institutional conditio | 20 | Roles and responsibilities for restoration are clearly defined | Partly in place |
| | | 21 | Effective institutional coordination is in place | Partly in place |

### 3.3.2.1 ECOLOGICAL CONDITIONS

The Amazon rainforest still presents favorable ecological conditions for the establishment of vegetation regeneration and restoration processes. In the Paragominas region, the predominance of a forest matrix provides a context that favors the establishment of natural regeneration processes by the isolation of areas where intervention will only be necessary in cases of more severe disturbance and degradation. However, the occurrence of fires is an unfavorable aspect, which degrades the forest and represents a risk to the process of regeneration and recovery of native vegetation. There is still a need for a better understanding of the restoration capacity in the municipality in line with the potential demand.

| **Theme** | **ENABLE** |
|---|---|
| Necessary condition | e. Ecological conditions |
| Key success factor | **9. Soil, water, climate, and fire conditions are suitable for restoration.** |
| Question | Are the candidate landscape's soil, rainfall, temperature, and fire conditions suitable for enabling trees to regrow? |
| Definition | The candidate landscape's soil, rainfall, and temperature conditions are suitable for forest regrowth, and the fire regime does not hinder forest regrowth. |
| Status | **PARTLY IN PLACE** |

**Status information**:

- The ecological conditions of the landscape are favorable. The predominantly forest matrix favors the process of natural regeneration (Joice Nunes, Embrapa). The municipality has a total of 54.5% of forest cover; and the Uraim River catchment has 55% forest cover (Imazon, 2009). The climate of Paragominas is also favorable: "Paragominas has a warm and humid climate, with an annual average temperature of 26.3 C and a relative humidity of 81%. The average annual rainfall is 1,800 millimeters, with a wetter season between December and May, and a drier one between June and November" (Embrapa, 1986).

- Paragominas recently launched the Green Flame Project, through Municipal Decree 321/2016, with the objective of recovering areas degraded by fires, as well as APP (Paragominas, 2016). It is necessitous to follow the results and impacts of the project.

• What are the gaps in ecological conditions?

- APP with overgrazing are degraded; and in mechanized areas the soil becomes more degraded and restoration becomes a challenge (Joice Nunes, Embrapa).

- Degradation due to fires has been increasing in the region (Imazon, 2016), although it is prohibited in the municipality (Municipal Law 765/2011), and represents a great risk to the areas in recovery since these are more susceptible to fire, and also for primary forest areas. Fires "reduce resilience by preventing rapid regeneration and the emergence of pioneer species" (NBI and TNC, 2013).

| **Theme** | **ENABLE** |
|---|---|
| Necessary condition | e. Ecological conditions |
| Key success factor | **10. Plants and animals that can prevent restoration are absent.** |
| Question | Is the candidate landscape free of unwanted plants and unwanted animals that could hamper tree recovery? |
| Definition | The candidate landscape is free of unwanted plants (e.g., persistent invasive species) and unwanted animals (e.g., uncontrolled grazing) that can hamper tree growth or recovery. |
| Status | **PARTLY IN PLACE** |

**Status information**:

• What are the species of problem plants and/or animals?

- In some regions there are exotic grasses, mainly in areas with no canopy, which prevent the growth of native species and generate a lot of shade, preventing seed germination (NBL and TNC, 2013). The presence of cattle and capybaras, if not dealt with, can cause damage such as trampling and herbivory to areas in recovery.

| **Theme** | **ENABLE** |
|---|---|
| Necessary condition | e. Ecological conditions |
| Key success factor | **11. Native seeds, seedlings, or source populations are readily available** |
| Question | Does the candidate landscape have source populations, underground root systems, or low-cost sources of native tree seeds and seedlings that can be the basis for forest regrowth? |
| Definition | The candidate landscape has source populations (e.g., sizable patches of remnant native trees), underground root systems, animal dispersal agents, or low-cost sources of native tree seeds and seedlings that can be the basis for forest regrowth. |
| Status | **PARTLY IN PLACE** |

**Status information**:

- The National Seed Registry (Renasem, in Portuguese) database does not indicate nurseries registered in Paragominas although, during the workshop, the participants mapped the existence of 7 to 11 nurseries in the municipality (Figure 4). There is at least one nursery producing native species on a commercial scale. The State of Pará contains 106 nurseries producing native forest species (Ipea, 2015).

- A seed collecting course promoted by Embrapa Amazônia Oriental in 2009 has been held in the municipality. The Tembé Indigenous Land located in Paragominas was suggested as a site for seed collecting.

- In general, in the Amazon, "the logistical support necessary to implement the restoration is often absent (seed availability, access to seedlings and nurseries and technical support)" (Nunes et al., 2016).

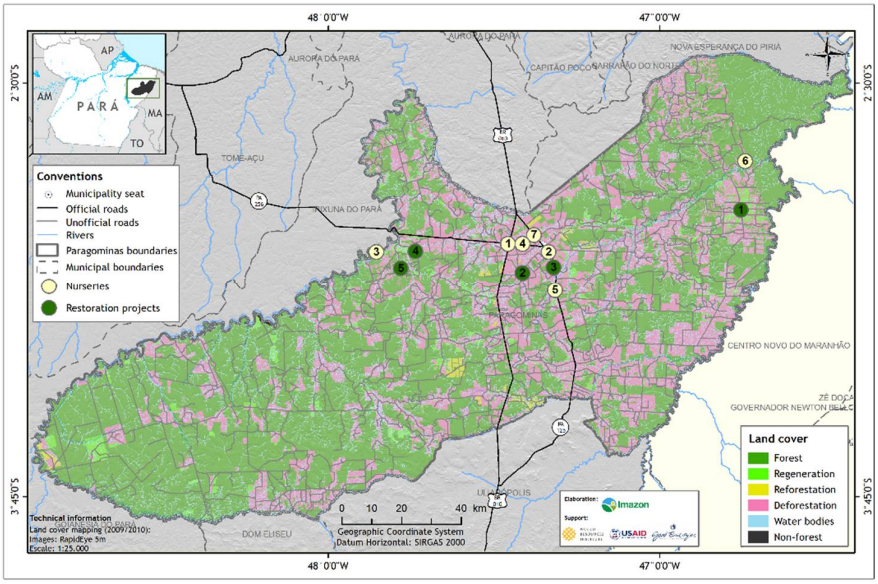
• What is the gap (e.g., seeds, seed collectors, seedling nurseries, population matrices, subsurface root systems)?

- Due to the municipality's forest cover, there are seed matrices and sources available that could be used in the restoration. However, the community in general has no knowledge of how to collect these in a sustainable manner, resorting to seedling production that is still incipient in the region or is not easily accessible.

- It is still necessary to make a more complete survey of nurseries that produce native species in the municipality (name, location, production capacity, responsible, species, Renasem registration etc.). Another step is to evaluate whether the existing production capacity in the municipality considers, for example, the demand for seedlings in the areas to be reclaimed by planting in the Uraim river catchment. This is important for analyzing current supply and demand for restoration.

- It is understood that one of the factors that would stimulate increased production is the legal demand for environmental compliance of the property and the need for recovery of the APP and LR degraded illegally.

A)




B)

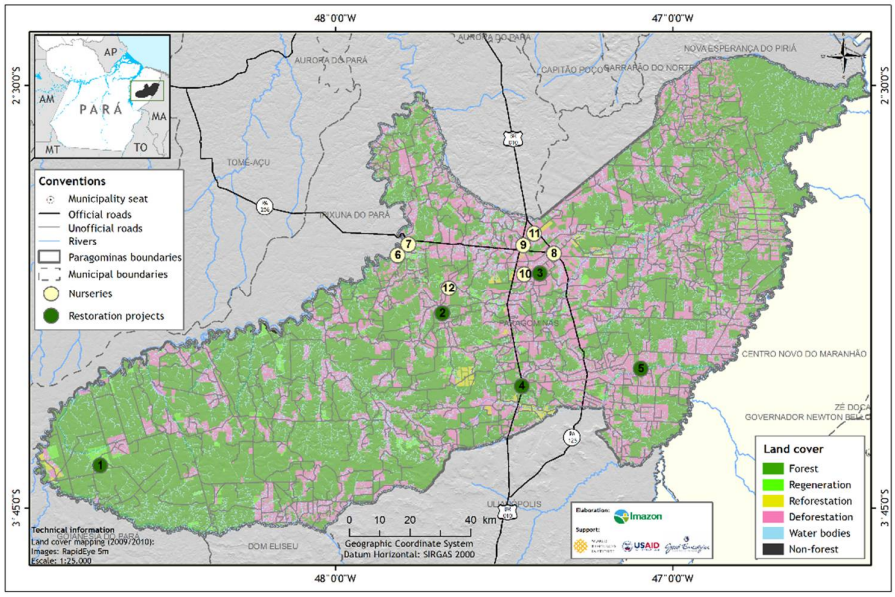


*Figure 4. Location of nurseries (yellow dots) and restoration projects (green dots) identified by focus groups 1 (Map A) and 2 (Map B) in the workshop on Paragominas-PA.*

#### 3.3.2.2 MARKET CONDITIONS

Market conditions were identified as one of the most crucial points in this analysis. The expansion of soybean, which is stimulating deforestation in the municipality, and the absence of a value chain for products from restored areas are among the greatest challenges. The implementation of large-scale restoration depends, among other things, on reducing further deforestation and developing the restoration value chain in order to make restoration products more competitive.

| **Theme** | **ENABLE** |
|---|---|
| Necessary condition | f. Market conditions |
| Key success factor | **12. Competing demands (e.g., food, fuel) for degraded forestlands are declining.** |
| Question | Is demand for crop, livestock, fuel wood, and/or biofuel production on degraded or former forestlands in the candidate landscape declining? |
| Definition | Demand for crop, livestock, fuel wood, and/or biofuel production on degraded or former forestlands in the candidate landscape is declining (e.g., due to productivity improvements elsewhere), thereby "freeing up" land for forest restoration. |
| Status | **NOT IN PLACE** |

**Status information**:

• What are the main alternative uses for land that compete with candidate areas to be restored?

- A recent study shows that the secondary forest areas in the Amazon are subject to deforestation that is not captured by official systems (i.e., Prodes). An independent analysis of deforestation in these areas indicated that annual rates of deforestation in native forests could be double if logging of secondary forests were accounted for (Richards et al., 2017).

- Paragominas shows an increase in the demand for soybean plantation. This demand is expected to be from the legal deforestation of LR surplus. The study points out that "8% of the surplus forest area located in rural properties in Paragominas can still be cleared legally" (Nunes et al., 2016). The municipality has a clear vision of what should be the use of the soil in its territory. Currently the municipality has 130 thousand hectares of soybean and there are plans for 200 thousand hectares. There are an additional 70 thousand hectares that will be deforested. In this context, soybean is very attractive for production and it is expanding.

- A change in the profile of the producer and land use has occurred in Paragominas. Older ranchers usually raise livestock for cultural reasons. More recently there are farmers producing mainly soy and corn in areas already cleared (Paulo Tocantins, Mayor of Paragominas). There is a great interest from the government in encouraging sustainable production in the municipality, to add value to the products and to promote the specialization of the producer's activities. By contrast, there is little incentive for restoration, even in areas important for the conservation or production of ecosystem services. For example, landowners still receive more incentives to clear, where permitted by law (in the case of forest cover over 80%), than to use those areas in the LR compensation market (Nunes et al., 2016).

| **Theme** | **ENABLE** |
|---|---|
| Necessary condition | f. Market conditions |
| Key success factor | **13. Value chains for products from restored area exist.** |
| Question | Are value chains in place allowing products from restored forests to reach end consumers? |
| Definition | To the degree that forest restoration in the candidate landscape generates marketable products and services, value chains are in place allowing these products to get from the restored forest to the end consumer. |

| Status | NOT IN PLACE |
|---|---|

**Status information**:

• Where is the gap in the value chain?

- The researchers carried out confirmed the absence of value chains for products and services in restored areas in a way that generates an expressive economic benefit for the community. There are some isolated and/or reduced scale cases such as: production of reforested paricá (*Schizolobium amazonicum*); rubber tapping in some small properties of Colônia do Uraim; and fresh produce (fruit and veg) from settlements around the municipality for school meals, but that is practically extinct due to transportation difficulties.

- Some business chains are in development in São Felix do Xingu, in Pará, such as the cacao produced by the communities originating from AFS. However, a functioning business chain related to restoration is still lacking in Paragominas. It is part of this strategy's development to involve the potential buyer at the beginning of the process to plan and tailor production to demand. For this to occur, several measures need to be taken, such as: access to credit, technical assistance, market analysis for potential products and mapping of demands and offers of seeds and seedlings.

### 3.3.2.3 POLICY CONDITIONS

The policy conditions of Paragominas are considered favorable. Linked to the existence of environmental legislation that controls deforestation, the municipality participates in the Green Municipalities Program (PMV), a policy for the control of illegal deforestation and environmental regularization. However, it is necessary to align and detail the Environmental Regularization Program (PRA, in Portuguese) to clarify the technical aspects of the Pradas. It is essential to set restoration targets for Paragominas so that the municipality's contribution to national and international targets is clear and to achieve zero net deforestation.

| **Theme** | **ENABLE** |
|---|---|
| Necessary condition | g. Policy conditions |
| Key success factor | **14. Land and natural resource tenure are secure.** |
| Question | Do those who manage the candidate landscape have clear and secure rights to the benefits from restoring trees? |
| Definition | Those who manage the candidate landscape have clear and secure rights (e.g., in the form of land ownership or natural resource management rights) to the benefits from restoring trees. |
| Status | **PARTLY IN PLACE** |

**Status information**:

- The land tenure is still a problem, not only in Paragominas, but in the entire Amazon region. However, even without a land title, the landowner has rights to restore and benefit from the products, besides being free to define how the land is used on the property, provided that is within the criteria established by the legislation.

- Approximately 90% of the municipality comes under state jurisdiction, according to a survey by the Terra Legal Program (Brito and Barreto, 2011), which attributes to Iterpa a large part of the responsibility for solving land disputes in Paragominas. State Decree 739/2013 establishes a special land regularization process. It is defined that: "v - grant greater juridical security to the legitimate occupant of public lands, as well as strengthen the sustainable development of the municipality, pending the land regularization process, allowing access to credit and new investments". Chap. 1 Art. 2.

- In Paragominas, Iterpa and the PMV have established a partnership to encourage land regularization (Brito and Cardoso Jr., 2015).

• What rights are lacking and for whom?

- The LR deficit compensation model via an easement, for example, has been hampered by the lack of

land titles in Pará.
- "In Paragominas, despite the progress of the PMV, the municipality still has land tenure issues that make it difficult to advance environmental policies, such as compensation for LR and recovery of degraded areas. Without certainty over land rights, these long-term actions remain unfeasible or have partial implementation" (Brito and Cardoso Jr., 2015).

| **Theme** | **ENABLE** |
|---|---|
| Necessary condition | g. Policy conditions |
| Key success factor | **15. Policies affecting restoration are aligned and streamlined.** |
| Question | Are policies that may affect forest restoration in the candidate landscape aligned and streamlined? |
| Definition | Relevant public policies are aligned, streamlined (e.g., not too bureaucratic), and mutually reinforcing to support forest restoration in the candidate landscape. |
| Status | **PARTLY IN PLACE** |

**Status information**:
- There are state and federal policies in Paragominas that address the restoration issue indirectly and/or as a necessary consequence of existing policies (e.g., compliance of rural property).

a) At the state level, "the existence of the PMV supports the implementation process of existing laws" (Felipe Zagalo, PMV). The restoration theme relates to PMV goal 1, which deals with zero net deforestation (PMV, 2013; PMV, 2016).

b) The Pará Environmental Regulation Program (PRA) establishes implementation guidelines for the Law for Protection of Native Vegetation (Law 12.651/012) concerning restoration, with the rules and deadlines for APP and LR restoration. The program contains a computerized system, under development, of the various environmental situations and recovery techniques available for the development of Pradas. A system is under development that will assist producers in their decision-making on restoration procedures as part of the PRA.

c) At the national level, Proveg, based on Planaveg, seeks to "expand and strengthen public policies, financial incentives, private markets, agricultural practices and other measures that will allow the expansion of native vegetation recovery to a minimum of 12, 5 million hectares over the next 20 years" (Planaveg, 2013).

• Which policies are not aligned or not simplified?
- Both Paragominas and the State of Pará are still without targets "related to the reduction of forest degradation, increase of forest management areas or goal for reforested and recovered areas" (Sousa et al., 2015). The PMV report (PMV, 2013) outlines goal 1 for "reducing deforestation to zero net deforestation by 2020". The inclusion of the zero net deforestation theme opens up an opportunity to create a link with the restoration agenda (Brenda Brito, Imazon).

- More clarity is needed on how the restoration theme will be handled in the municipal and state agendas and establish restoration goals in both spheres. The establishment of goals will contribute to the alignment and optimization of the process of implementation of the forest landscape restoration.

| **Theme** | **ENABLE** |
|---|---|
| Necessary condition | g. Policy conditions |
| Key success factor | **16. Restrictions on clearing remaining natural forests exist** |
| Question | Does the candidate landscape have laws restricting the clearing or cutting of remaining natural forests? |
| Definition | The candidate landscape has laws restricting clearing or cutting of remaining natural forests. |

| Status | IN PLACE |
|---|---|

**Status information**:

- Law for Protection of Native Vegetation (Law 12.651/2012) provides for the protection of native vegetation on rural properties, provided they are located outside the LR surplus that is permitted to be deforested by law. The general objective of this law is "to establish general rules for the protection of vegetation, APPs and LR areas, forest exploitation, supply of forest raw material, control of the origin of forest products and control and prevention of forest fires" (Zakia & Pinto, 2014).

- State Normative Instruction 08/2015 defines procedures for the deforestation of secondary vegetation, protects secondary forests more than 20 years old, and restricts forest deforestation between 6-19 years outside LR and APP.

| **Theme** | **ENABLE** |
|---|---|
| Necessary condition | g. Policy conditions |
| Key success factor | **17. Forest clearing restrictions are enforced.** |
| Question | Are these clearing or cutting restrictions adequately enforced? |
| Definition | Laws that restrict clearing of remaining natural forests are adequately enforced. |
| Status | **PARTLY IN PLACE** |

**Status information**:

- In 2010, two years after the launch of "Paragominas: Green Municipalities Program", the municipality exited the list of the Amazon's largest deforesters, with a 90% reduction in deforestation and the registration of 80% of its area in the CAR.

• What are the gaps?

- A recent study shows that the secondary forest areas in the Amazon are subject to deforestation that is not captured by official systems (i.e., Prodes). An independent analysis of deforestation in these areas indicated that annual rates of deforestation in native forests could double if the logging of secondary forests was accounted for (Richards et al., 2017).

- A historical analysis comparing deforestation inside and outside APP in Paragominas, showed that the legal protection granted to APP has been ineffective in reducing deforestation in these areas. By way of contrast, deforestation was proportionally similar inside and outside the APP, and in 2010, logging in APP was higher than in the rest of the municipality (Nunes et al., 2014).

- Embrapa Amazônia Oriental technically supported the PMV and Semas in the elaboration of Normative Instruction 08/2015, which defines the criteria for clearing and authorization for suppression of secondary vegetation in the initial stage of regeneration in areas outside APP and LR. Although this law is fundamental to reducing deforestation in secondary forests, deforestation is still on the increase, mainly because of the failures to monitor this type of forest. In addition, given that Brazilian legislation is usually complex, there are differences of understanding with regard to whether these forests should be cleared or not. As such, it is perceived that although there are restrictions on deforestation, the laws are not usually imposed in an effective way to contain it.

- The degradation, mainly through fires, has grown considerably and illegal deforestation still occurs (SAD Imazon, 2016).

- A recent study in Pará shows that, in addition to deforestation, there is also a significant loss of biodiversity in the region through forest degradation resulting from fires and selective logging (Barlow et al., 2016).

### 3.3.2.4 SOCIAL CONDITIONS

Here, the decision-making power concerning restoration was analyzed as to whether the local community would benefit socially, economically and

environmentally from the actions of forest restoration. Rural landowners have a key role in implementing restoration interventions on their properties. There is an understanding that they need to be better empowered with regard to restoring their properties in order to increase knowledge of planning and execution of the property's compliance. This requires the support of the government and educational, research and extension institutions and non-governmental organizations (NGO).

| **Theme** | **ENABLE** |
|---|---|
| Necessary condition | h. Social conditions |
| Key success factor | **18. Local people are empowered to make decisions about restoration** |
| Question | Are people living in and around the candidate landscape empowered to become involved in making decisions about restoration (e.g., program design, goal-setting, management)? |
| Definition | People living in and around the candidate landscape are empowered to become involved in the design of the forest restoration program, help defining restoration goals, and play a role in management. |
| Status | **PARTLY IN PLACE** |
| **Status information**:<br>- Rural property owners are responsible for the environmental compliance of their properties. In the context of the new Law for Protection of Native Vegetation, "the process of environmental regularization and compliance with forest rules depends on the individual initiative of rural landowners" (Chiavari, s. d.).<br><br>- There are landowners interested in adapting to the regulations so that they can produce without environmental obstacles. However, in general, they have limited knowledge to plan the restoration of their rural property.<br><br>• In what ways are people not empowered?<br>- The government and experts still do not enter into effective partnerships with rural landowners, for example, offering technical assistance to promote forest restoration. | |

| **Theme** | **ENABLE** |
|---|---|
| Necessary conditions | h. Social conditions |
| Key success factor | **19. Local people are able to benefit from restoration.** |
| Question | Are people living in and around the candidate landscape able to capture or enjoy the benefits generated by restoration? |
| Definition | People who live in or around the candidate landscape can capture or enjoy the benefits from restoration (e.g., improved water quality, increased supply of forest products) or have alternative means of livelihood. |
| Status | **IN PLACE** |
| **Status information**:<br>- In the manner that restoration is being planned for Paragominas, the local community will benefit directly. The benefits will be social, economic and environmental. In the case of products generated in the restoration areas, rural landowners will be the direct beneficiaries. "From 2017, only those farmers who register with CAR can have access to lines of credit" (Ipea, 2015), which demonstrates a concrete example of benefiting producers that restore. | |

### 3.3.2.5 INSTITUTIONAL CONDITIONS

Paragominas brings together various actors who work in an integrated manner on strategic issues related to the management and implementation of environmental projects in the municipality, especially the PMV and the CAR agenda. In addition, the

municipality has partnerships with research institutions, such as Imazon and TNC, to monitor changes in land use. Currently, Paragominas and its actors need to expand this work, including the restoration agenda.

| **Theme** | **ENABLE** |
|---|---|
| Necessary conditions | i. Institutional conditions |
| Key success factor | **20. Roles and responsibilities for restoration are clearly defined.** |
| Question | Are the roles and responsibilities for forest restoration in the candidate landscape clearly defined, understood among relevant actors, and coupled with authority? |
| Definition | Are the roles and responsibilities for forest restoration in the candidate landscape clearly defined, understood among relevant actors, and coupled with authority? |
| Status | **PARTLY IN PLACE** |

**Status information**:

- Paragominas has been successful in building partnerships for the environmental agenda. For example, during efforts to reduce deforestation and increase the number of properties registered in CAR, institutions like TNC and Imazon and rural producers worked together with PMV and Semas to achieve this goal. Currently, the municipality is experiencing a post-CAR phase, in which the environmental adjustment agenda of rural properties is gaining space.

- Some examples that demonstrate the beginning of cooperation for this new phase:
The municipality shows interest in taking a leading role in the restoration initiative and wants to work together with the institutions that operate in the region

a) There are specific restoration initiatives carried out by the farmers' union, university and research institutions, NGOs and companies.
b) There was a workshop on the theme of restoration in partnership with Semma in Paragominas, which was an integral part of this diagnostic. This work was received with interest by the various actors involved, creating an expectation for continuity of the research.
c) The Refloramaz Project - Forest recovery by family producers in the eastern Amazon: how to improve the balance between environmental and socioeconomic benefits? Led by the Cirad-Embrapa-UFPA partnership, it is fostering a restoration network in north-eastern Pará similar to the Pact for Restoration of the Atlantic Forest (Joice Nunes, Embrapa)
d) There is an understanding and recognition that rural producers are a key link in this process and therefore need to be involved in the discussions on the subject.
e) The workshop in Paragominas carried out an initial mapping of potential actors and responsibilities, such as: Semma - management and supervision; Semagri and Emater - extension; Lions Club and Youth Forum - awareness raising and mobilization; NGOs - research, training and implementation; Embrapa and universities - research and extension; Companies - production chain.

• What is lacking in terms of clarity with regard to roles and responsibilities?
- Unlike the efforts to get Paragominas removed from the MMA red list, the roles of the various actors are still unclear and established with regard to forest restoration. While there is Semma's interest in taking this lead, the community still does not recognize one or more institutions as leaders in the field. In part, this is because the restoration agenda in the municipality is still recent, since historically the main concern has been the reduction of deforestation rate.

- It is also necessary to strengthen this new role, in which these leaderships work in partnerships, involving different sectors so that it is possible to scale the restoration. It is necessary to establish a new social pact in the municipality that considers restoration goals to be achieved with the commitment and participation of all.

- The process of environmental compliance, as defined by legislation, will naturally generate the demand for restoration (or compensation) and define the roles.

| **Theme** | **ENABLE** |
|---|---|
| Necessary conditions | i. Institutional conditions |
| Key success factor | **21. Effective institutional coordination is in place.** |
| Question | Are relevant actors from government, civil society, and/or the private sector sufficiently coordinated to design, implement, and monitor forest restoration in the candidate landscape? |
| Definition | Relevant actors from government, civil society, and/or the private sector are sufficiently coordinated to design, implement, and monitor forest restoration in the candidate landscape. |
| Status | **PARTLY IN PLACE** |

**Status information**:
- The first steps are being taken to achieve effective institutional coordination, such as: a) the preparation of the Forest Restoration Manual: an instrument to support the environmental compliance of rural properties in Pará (NBL and TNC, 2013); b) actions by Semmas and partner institutions to increase validation and adherence to CAR; c) improvements in deforestation and degradation monitoring systems and the workshop to diagnose key success factors in Paragominas; and d) the "Inspire, support and mobilize forest and landscape restoration" project of the WRI in partnership with Imazon, one of whose objectives is to generate information to support public policies for restoration in Pará.

• What is lacking in terms of coordination?
- The various actors involved are not yet working in an integrated way to scale projects that occur in isolation in the region. That is, the articulation to scale forest landscape restoration is still incipient. The next step is to strengthen the agenda for working together. Semma Paragominas is currently seeking experienced partners with which to work consistently. The expansion of the PMV's activities together with the municipal environment secretariats and research and teaching institutions on the theme of restoration may contribute to this articulation.

### 3.3.3 Implement

In this theme, existing capacity and resources were evaluated as to whether they were mobilized in order to implement forest landscape restoration (Table 4).

*Table 4. Result of the diagnostic of key success factors for forest landscape restoration under the theme Implement, in Paragominas-PA, in 2016*

| *Theme* | *Necessary condition* | | *Key success factor* | *Paragominas current situation* |
|---|---|---|---|---|
| Implement | j. Leadership | 22 | National and/or local restoration champions exist | Partly in place |
| | | 23 | Sustained political commitment exists | Partly in place |
| | k. Knowledge | 24 | Restoration "know how" relevant to candidate landscapes exist | Partly in place |
| | | 24 | Restoration "know how" transferred via peers or extension services | Not in place |
| | l. Technical design | 26 | Restoration design is technically grounded and climate resilient | Partly in place |
| | | 27 | Restoration limits "leakage" | In place |
| | m. Finance and incenti | 28 | Positive incentives and funds for restoration outweigh negative incentives | Not in place |
| | | 29 | Incentives and funds are readily accessible | Partly in place |
| | n. Feedback | 30 | Effective performance monitoring and evaluation system is in place | Partly in place |
| | | 31 | Early wins are communicated | In place |

Of the ten key success factors contained in the Implement theme, two are in place, six are partly in place, and two are not in place. The factors present are: the restoration limits the movement or "leakage" of deforestation to another landscape and communication of early achievements (wins). This demonstrates that the possibility of deforestation being relocated to another region due to restoration is

small and that success stories are being reported. The two factors that will require greater attention are rural extension and the promotion of financial incentives to encourage restoration. This is because the technical assistance for rural producers relating to restoration is still incipient in the region and, in addition, the existing financial incentives for this activity do not surpass the incentives for other activities (e.g. agriculture and livestock). The other factors have some aspects present, which shows that the first steps for the implementation of forest landscape restoration are already being taken in Paragominas (Table 4).

#### 3.3.3.1 LEADERSHIP

Paragominas has a broad group of leaders and actors whose performance in a strengthened restoration agenda can influence not only municipal policy, but also state and national policy. The municipality has a history of political continuity that demonstrates capacity for implementation and maintenance of public policies, with the main example being the creation of the Paragominas: Green Municipality project. The leaders in Paragominas are interested in the theme, but the strategy to scale forest landscape restoration has not yet been established. It is fundamental that in addition to the commitment to reducing deforestation and registering with the CAR, a goal and planning for the FLR should be established.

| **Theme** | **IMPLEMENT** |
|---|---|
| Necessary condition | j. Leadership |
| Key success factor | **22. National and/or local restoration champions exist.** |
| Question | Is there a charismatic, committed champion(s) of restoration for the candidate landscape? |
| Definition | Charismatic people (or powerful institutions) exist who can effectively inspire decision makers to pursue restoration, mobilize support, and maintain momentum over time in the candidate landscape. |
| Status | **PARTLY IN PLACE** |

**Status information**:

- The municipality of Paragominas has a history of implementation and maintenance of pioneering public policies and actions, with repercussions at state, national and even international level. This is the result of the work of several political and technical leaders. The actors in Paragominas and the results of their actions have the capacity to influence other municipalities, serving as a "showcase" for other localities.

• Who is the leader (or who are the leaders)?

- Some actors stand out for their actions on environmental issues, including support for forest restoration (individuals and institutions):

a) Individuals: Adnan Demachki - Former mayor of Paragominas and current Secretary of Sedeme; Paulo Tocantins - re-elected Mayor of Paragominas; Jaqueline Peçanha - Secretary of environment for Paragominas; Mauro Lúcio Costa - Producer and former President of SPRP; Felipe Zagalo Neto - Director of the PMV Executor Nucleus.
b) Institutions: Imazon, Embrapa, TNC, RAS, SPRP, Environment Council, PMV, Lions Club.

- Semma demonstrates an interest in leading the restoration agenda in the city given that it drives the environmental compliance of rural properties.

• What is still lacking?

It is also necessary to strengthen the prominence of restoration. There is still no vision and planning on the part of these leaders for large-scale forest landscape restoration. For this reason, the experts in the area who participated in the workshop and interviews were not able to readily indicate a restoration leader in the region.

| **Theme** | **IMPLEMENT** |
|---|---|
| Necessary conditions | j. Leadership |
| Key success factor | **23. Sustained political commitment exists.** |
| Question | Is there expressed, long-term commitment from government and non-governmental institutions to restoration in the candidate landscape? |
| Definition | Commitment from the government (at multiple levels if relevant) and non-governmental institutions to restoration in the candidate landscape exists and is sustained. |
| Status | **PARTLY IN PLACE** |

**Status information**:

- There is a municipal government effort by past and present management for the implementation and maintenance of the PMV with a focus on the deforestation reduction agenda, adherence to CAR and, more recently, the environmental compliance of rural properties.

PMV's First Steps in Establishing a restoration goal:

a) In the document about the lessons learned from the PMV, Whately & Campanili (2013) present as a target for discussion for 2013 and 2014: "Recovering the environmental deficits of LR and APP - Initiate a recovery process in all licensed properties by 2015, seeking to zero the deficits of APP and LR. The monitoring will be done through an electronic system created specifically to provide transparency to the process of environmental regularization of rural properties. This process of forest restoration will enter into the 'assets' account to neutralize recorded deforestation rates, thus enabling the achievement of zero net deforestation". The discussion of the goals for 2013-2014 still presents restoration as an intention, which was not fulfilled, and without presenting an established restoration goal (Sousa et al., 2015).

b) For 2015, the first goal of the PMV was for zero net deforestation by 2020 (PMV, 2016). To achieve this goal, it is necessary to control deforestation rates and increase forest area.

c) Both established goals (from 2013, 2014 and 2015) indirectly bring the theme of restoration associated with the zero net loss deforestation with the mechanisms and definitions under construction (Brito, 2016).

- Another point for consideration is that while the municipality declares the importance of, and its interest in, restoration, there are movements in the municipality with interests in the deforestation of new areas, in a legal way, to allow soybean expansion. In this discussion, when we talk about forest conservation, it is fundamental to prioritize the standing forest and the use of underutilized or abandoned areas to avoid further deforestation.

• What is the next step to take?

- For the implementation of forest landscape restoration to be feasible on a large scale, the municipality must adopt a coherent policy with clear and monitored goals and restoration deadlines. In addition, it is important to link these goals to the climate change agenda, even to facilitate the search for financial resources. There is also the challenge for Paragominas to seek opportunities in forest conservation and restoration, creating incentives to protect forests that can be deforested, and selecting the priority areas for restoration.

### 3.3.3.2 KNOWLEDGE

The existence of various research initiatives in Paragominas is noteworthy. Often the municipality is chosen to be the pilot for innovative research that advances the frontiers of knowledge. Although there is a lot of information, there are still many questions to be answered, especially when considering the scale factor. In addition, the increasing demand for the environmental compliance of the property requires greater efficiency of the technical training in the municipality.

| Theme | IMPLEMENT |
|---|---|
| Necessary condition | k. Knowledge |
| Key success factor | **24. Restoration "know-how" relevant to candidate landscape exists.** |
| Question | Does local knowledge on how to implement restoration at scale in the candidate landscape exist? |
| Definition | Local experts know of or generate research into restoration techniques (e.g., natural and assisted regeneration, traditional knowledge) tailored to the candidate landscape. |
| Status | **PARTLY IN PLACE** |

**Status information**:

- There are some small-scale restoration projects in the municipality:
  a) Project developed by the Cirad-Embrapa-UFPA partnership, called Refloramaz - Forest recovery by family farmers in the eastern Amazon: how to improve the balance between environmental and socioeconomic benefits? The main scientific objectives of the project are to identify, through a process of multi-stakeholder collaboration, the main factors that motivate, or limit, family farmers becoming involved in forest restoration; and evaluate the favorable conditions necessary to balance the supply of environmental services and social and economic benefits to support the implementation of national and state environmental recovery policies (Joice Nunes, Embrapa).
  b) Green Livestock Project - A pilot project on best agriculture and livestock practices carried out in 2011 by SPRP, in partnership with Imazon, TNC, Esalq-USP and Unesp, and which includes eleven farms with environmental compliance and livestock intensification activities in the region. It acts for the recovery of degraded areas with no aptitude for production and a LR enrichment project with native species of hardwood and fruit trees. It is considered a reference for the Amazon and currently needs to be strengthened and expanded.
  Biodiversity project, propagation of plant species and recovery of areas degraded by bauxite mining in the northeastern region of Pará, Paragominas, Pará – A cooperation between the Federal Rural University of Amazonia (Ufra), Hydro Brasil, Federal University of Pará UFPA), Emílio Goeldi Museum (MPEG) and University of Oslo (Norway).

- Examples of technical information on the subject:
  a) Forest Restoration Manual - Aimed at the agricultural and environmental compliance of rural properties in Paragominas (NBL and TNC, 2013).
  b) System under development for decision making with regard to restoration methods, developed from the environmental situations identified in the region of Paragominas and with recommendations of the Bioflora company.
  c) Strategic Plan for Forest Restoration for the Alto Teles Pires and Alto Juruena Regions in Mato Grosso (Timotheo et al., 2016; TNC, 2016).
  d) Manual for forest restoration: transitional forests (Cury, 2011).
  e) (Nunes et al., 2014) and Pará (Nunes et al., In preparation) and LR in Pará (Nunes et al., 2016) developed by Imazon.
  f) F) Analysis and economic modeling of the restoration in Pará performed by Terra Nativa and Imazon (Silva & Nunes, 2017).

• What are the most important knowledge gaps?

- The projects under implementation in Paragominas are considered isolated and small-scale (Nunes et al., 2016). Joice Nunes, Embrapa, points out that "there is a lack of knowledge of the initial intervention of the restoration process in degraded areas" and that "the focus now is to see restoration in the context of landscape and matrix, identifying and valuing restoration through natural regeneration. There is a need for knowledge of conducting regeneration considering the strong potential for natural regeneration in the region".

- The challenge will be scaling and seeking ways to stimulate the productive chain for some native species, thereby reducing the cost of restoration and increasing interest in the activity.

- In general, the literature also points to "the need for additional research, especially with regard to the development of a strong theoretical basis for ecological restoration, cost reduction and monitoring"

(Rodrigues et al., 2009) and "studies and monitoring of the effects of large-scale restoration on people and the environment" (Latawiec, 2015).

- There is a lack of more successful restoration cases to be shared that could influence other rural property owners to implement restoration. There is a cattle rancher, Mauro Lúcio, who has been using his property as a model where it is possible to have an economic return, even without environmental deficits, through LR enrichment and selection of areas of low agricultural ability to carry out the restoration, without, for example, the space for livestock. But there is still a lack of cases where the productive chain arising from restoration is functioning well, in order to be more profitable to the holders of rural properties regardless of the size of the property.

| **Theme** | **IMPLEMENT** |
|---|---|
| Necessary condition | k. Knowledge |
| Key success factor | **25. Restoration "know-how" transferred via peers or extension services** |
| Question | Are extension services, farmer-to-farmer visits, and/or other means of awareness raising and capacity building for restoration in place and adequately resourced in the candidate landscape? |
| Definition | Technical assistance and rural extension ("extension services"), farmer-to-farmer visits, and/or other means of awareness raising and capacity building for restoration are in place and adequately resourced in the candidate landscape. |
| Status | **NOT IN PLACE** |

**Status information**:

- There is an opinion that existing knowledge is not reaching those responsible for implementation. Many rural producers are not aware of where and how to carry out the restoration properly.
- There are also professionals without technical qualification who work directly with the theme and are responsible for the terms of commitment to fit the property. In the field, technicians are not aware of potential species (Joice Nunes, Embrapa).
- "There is a lack of technical capacity to identify APP in the field and to be able to more securely assess the deficits of landowners, as well as a better understanding of environmental legislation". (Sâmia Nunes, Imazon) This competence needs to be installed in Semma, both for planning as well as for the monitoring. The rural landowner needs technical support to ensure the effectiveness of the restoration. At present, the Pradas are presented without established specific criteria. This is one of the main bottlenecks identified.

- Examples of actions that contribute (or contributed) to the training:
  a) Integration and dissemination of knowledge in Paragominas by RAS (Joice Nunes, Embrapa).
  b) The Refloramaz Project (Cirad-Embrapa-UFPA) promotes restoration training in areas with family agriculture (Joice Nunes, Embrapa).
  c) Training the municipalities in geoprocessing, remote sensing and verification of deforestation by Imazon with support from the PMV.
  d) The Green Livestock Project included a strong training component.
  e) The PMV offers training in various topics. There is a need to include and strengthen the restoration component.

• Which entities are best positioned to perform extension services for the candidate landscape?

- Some examples are: NGOs (Imazon, WRI and TNC), universities (UFPA, Ufra, USP) and Research Intuitions (Embrapa, MPEG) and rural extension (Technical Assistance and Rural Expansion Program - Ater).

### 3.3.3.3 TECHNICAL DESIGN

The municipality has several technically based restoration projects but these are small scale. Restoration interventions in Paragominas do not promote deforestation in other regions.

| **Theme** | **IMPLEMENT** |
|---|---|
| Necessary condition | I. Technical design |
| Key success factor | **26. Restoration design is technically grounded and climate resilient** |
| Question | Is the forest restoration plan for the candidate landscape based on best practices, incorporating the best available science and climate-smart approaches? |
| Definition | The forest landscape restoration plan for the candidate landscape is based on best practices, incorporating the best available science and climate-smart approaches. |
| Status | **PARTLY IN PLACE** |

**Status information**:

- Below are sample project examples that feature the restoration component:
  a) The Green Livestock Project considers the diagnostic of the area to be restored and identifies the best restoration technique for each situation.
  b) The Refloramaz project (Cirad-Embrapa-UFPA) supports the development of forest recovery actions that are more inclusive and participatory, in which the scientific knowledge actively integrates the different actors of society (Joice Nunes, Embrapa).
  c) The Sustainable Amazon Network has a component that contributes to the development of REDD + initiatives and the production of knowledge in this area (Gardner, 2013).
  d) The Amata restoration project includes carbon stock analyses for the paricá (*Schizolobium amazonicum*) plantation areas.
  e) Embrapa has conducted research on restoration and carbon stock in tropical forests.

- Also under construction is the strategy of zero net deforestation, which has the potential to reconcile the restoration agenda with the climate change agenda, as it is based on reducing deforestation and increasing forest area (Brenda Brito, Imazon).

• What is lacking in the projects?

- Ongoing projects are localized and are not connected with climate change policies and are not thought of on the scale of the landscape. Although forest restoration has direct consequences on the climate agenda, in general, current projects have not been designed for this purpose. It is still necessary to link restoration interventions with the national climate change agenda.

| **Theme** | **IMPLEMENT** |
|---|---|
| Necessary condition | I. Technical design |
| Key success factor | **27. Restoration limits "leakage".** |
| Question | Does the forest landscape restoration process have in place measures (e.g., policies, practices, incentives, yield improvements) that limit leakage or is unfolding in a manner that leakage is limited? |
| Definition | Forest landscape restoration in the candidate landscape avoids transferring forest clearing activities to other locations ("leakage"), resulting in net increase in forest landscape area. |
| Status | **IN PLACE** |

**Status information**:

Considering that the initial focus of restoration in Paragominas is on degraded APP, for which restoration is mandatory by law in Brazil, the possibility of deforestation being moved to another region due to this planned restoration intervention is very small.

### 3.3.3.4 FINANCE AND INCENTIVES

Paragominas has been able to access some resources for the strengthening of municipal management and for the implementation of projects. For example, the municipality receives Ecological ICMS through a mechanism linked to the PMV. However, it is essential that there is more guidance for the actors involved, especially for landowners, in order to clarify what resources are available and the procedures for accessing them, as well as a strategy that makes these incentives more competitive with other contesting activities.

| **Theme** | **IMPLEMENT** |
|---|---|
| Necessary condition | m. Finance and incentives |
| Key success factor | **28. "Positive" incentives and funds for restoration outweigh "negative" incentives.** |
| Question | Do financial incentives and funds for the restoration of the candidate landscape exist and are sufficient to outweigh the financial incentives for activities that prevent trees from growing back? |
| Definition | From the perspective of the land manager, financial incentives and funds for restoration of the candidate landscape exist and are sufficient to outweigh the financial incentives for activities that prevent trees from growing back. |
| Status | **NOT IN PLACE** |

**Status information**:

- Currently, landowners have limited access to financial resources for restoration interventions (Nunes et al., 2016) and no access to City Hall. Incentives for restoration, while existing, do not outweigh the incentives for the counter activities. "It is feasible and necessary to expand and create new economic incentives for the conservation and restoration of natural resources in production units that benefit from agricultural policies", Cardoso (2011) points out. The same author also highlights that "agencies tend to prioritize products or services with low risk of default and that contribute to the best margins in the financial result. The credit operations for environmental recovery are presented as high risk and small margin in the financial result".

• What are the relevant positive incentives and resources?

- Examples of existing incentives and resources already accessed or available:

a) ABC Program - The Greenhouse Gas Emission Reduction Program in Agriculture, carried out in partnership with the National Bank for Economic and Social Development (BNDES), created a line of financing for Sustainable Projects.
b) Amazon Fund - Resource already accessed by the PMV, Embrapa, Imazon, among others
c) International support - Children Investment Fund Foundation (CIFF), Good Energies Foundation (GEF).
d) Partnerships with NGOs (TNC, Imazon, WRI, IUCN) and research institutions (universities and Embrapa).
e) The environmental compliance of properties allows access to credit that is not available for the non-compliant properties and facilitates access to markets (Nunes et al., 2016). Integrated credit lines between livestock, infrastructure and the environment: can be accessed through livestock (Example of São Felix do Xingu).
f) Ecological ICMS - Paragominas receives Ecological ICMS, for municipalities that have restored forest. The transfer is linked to the CAR information.
g) Safra Family Agriculture Plan - "provides differentiated financing lines for family producers who adopt agroforestry practices (Pronaf Floresta), agroecological practices (Pronaf Agroecologia and Eco), as well as a pilot initiative that supports socio-environmental and economic planning of the property in medium term (Sustainable Pronaf)" (Cardoso, 2011).
h) BNDES lines - "Commercial Planting and Forest Recovery Program (Propflora) and Program to Stimulate Sustainable Agriculture and Livestock Production (Produsa)" (Cardoso, 2011).
i) Constitutional Funds - FCO Pró-Natureza, FNE Verde, FNO Biodiversity and Sustainable Amazon "(Cardoso, 2011). Payment for Environmental Services (PES) (Ipea, 2015) - A feasibility analysis is required to assess potential and generate subsidies for the design of

this strategy.

• Why do the counter-incentives outweigh the incentives?
- There is a greater, more attractive and more accessible range of incentives that promotes Brazilian agriculture and livestock. This leads the producer to opt for these activities rather than restoration.

| **Theme** | **IMPLEMENT** |
|---|---|
| Necessary conditions | m. Finance and incentives |
| Key success factors | **29. Incentives and funds are readily accessible** |
| Question | Are financial incentives and funds for restoration in the candidate landscape available without excessive hurdles or bureaucracy for the relevant land managers or communities? |
| Definition | Financial incentives and funds for restoration in the candidate landscape are available without excessive hurdles or bureaucracy for the relevant land managers or communities. |
| Status | **PARTLY IN PLACE** |

**Status information**:
- From the analysis of access to credit lines available for "regularization, financing of both good agricultural practices and the recovery or compensation of irregularly suppressed native vegetation," Cardoso (2011) found that "rural producers with access to finance for the regularization of their properties are rare". This demonstrates that although resources exist, they are not easily accessed. In addition, this same study coordinated by Cardoso (2011) found the "need to provide incentives to regularized producers or in the process of regularization from the environmental point of view".

• What are the barriers to access?
- Cardoso (2011) suggests that one hypothesis to explain the reasons why current credit policies have low accessibility is the "low appeal of available credit lines, both for rural producers and financial agents" due to the lack of knowledge of the existing possibilities and the lack of interest or sensitivity on the part of the producers on the environmental theme.
- In addition to increasing funding lines for restoration, it is necessary to improve access and redirect the existing resource, as it is known that most of these funds are not accessed because producers are unaware of how to do so.

### 3.3.3.5 FEEDBACK

There are many public policies, research projects and pilot projects under development in Paragominas. For this reason, several of these cases are publicized in the media, such as the Globo Rural program, or produced in material that stimulates access, such as manuals. Remote monitoring is advanced, but field monitoring still needs to be strengthened.

| **Theme** | **IMPLEMENT** |
|---|---|
| Necessary condition | n. Feedback |
| Key success factor | **30. Effective performance monitoring and evaluation system is in place.** |
| Question | Does the candidate landscape have a performance monitoring system in place for tracking and evaluating restoration progress? |
| Definition | A system for monitoring progress and evaluating impact of restoration in the candidate landscape exists. |
| Status | **PARTLY IN PLACE** |

**Status information**:
- Monitoring restoration in the field - The monitoring of restoration in the field by the government is still incipient, mainly due to lack of technical staff.

a) The Forest Restoration Manual contributes to the theme and currently the TNC is perfecting the monitoring protocols (NBL & TNC, 2013).

b) The Refloramaz project (Cirad-Embrapa-UFPA) is evaluating the forest restoration experiments carried out over the last 15 years in Pará, including projects in Paragominas. The project seeks to evaluate the extent to which restoration interventions represent ecological restoration and can promote social benefits (Joice Nunes, Embrapa).

- Remote monitoring systems:

a) There are systems such as TerraClass, Prodes, Deter and SAD, which are effective and operational on the scale of the Amazon. Among these systems, only TerraClass (Inpe: land use) monitors forest growth. The remainder monitor only deforestation and degradation. TerraClass is the result of a partnership between Embrapa and Inpe, and is currently part of the Environmental Monitoring Program of the Brazilian Biomes (PMABB) (MMA, 2016).

b) B) The Integrated Environmental Management System (Sigam, in Portuguese) is being implemented in Paragominas, through a partnership between Imazon and Paragominas City Hall and the PMV, and support from the United States Agency for International Development (USAID). The system covers from the initial phase of submission of documentation, through the CAR, to rural environmental licensing (LAR, in Portuguese), bringing more agility to procedures and information queries. This system will strengthen the monitoring of actions related to the compliance of the property (Imazon, 2016) and reduce the effort of inspection in the field. Currently, data on rural properties are in the process of migrating to Sigam in the municipality. The University of Lavras and Semas/PA are also developing an environmental licensing system at the state level (Felipe Zagalo, PMV).

• Is baseline data already being collected?
- TerraClass's remote monitoring data collection began in 2008 and generates information every two years, including regenerating areas and secondary forests.

• What aspects of the monitoring system are lacking?
- In the case of field monitoring, it is necessary to define a strategy to expedite the monitoring of priority areas in the process of restoration or that need to be restored. In addition, it is essential to increase the technical capacity of the secretariats.
- For remote monitoring, it is recommended the creation of systems for monitoring the growth of forests (secondary forests and restoration), which have more complete information such as the age of regeneration and detection of deforestation and degradation in these areas, and which are more frequent (Annual data).
- In addition, the county's technical capacity and staff size have been limited to monitoring illegal activities in the region, and would need to expand to begin monitoring restoration projects. However, this requires skilled manpower and financial investment (Interview with Jaqueline Peçanha, Semma Paragominas).

| **Theme** | **IMPLEMENT** |
|---|---|
| Necessary condition | n. Feedback |
| Key success factor | **31. Early wins are communicated.** |
| Question | Are early restoration successes being communicated in the candidate landscape? |
| Definition | Early restoration successes in the candidate landscape are communicated to stakeholders. |
| Status | **IN PLACE** |

**Status information:**

- The first achievements have been made public. It should be noted that Paragominas demonstrates the ability to disseminate and communicate initiatives and projects and that this characteristic should be considered in the process of implementing forest restoration.

- Examples of dissemination of the early achievements related to the pre-restoration agenda:

a) Globe Rural Program - History of Paragominas and exiting the MMA red list.
b) Publications from Embrapa, RAS, Imazon, TNC, Fapesp, among others

c) Institutional sites
d) Green Municipalities Program

-Examples of dissemination of projects with a restoration component:

a) Green Livestock Project, in Paragominas.
b) Project of the Amata reforestation company: reforestation for economic purposes with forest restoration component.
c) Project "Inspire, support and mobilize forest and landscape restoration", by Imazon, in partnership with the WRI Brazil and IUCN.
d) Refloramaz Project (Cirad-Embrapa-UFPA).

# 4 Strategies to promote forest restoration in Paragominas

***Environmental Context***

The municipality is on the front line of Amazon deforestation. It is present in Paragominas the "business as usual", backed by legislation that has reduced the area to be recovered, and the increasing economic attractiveness of agricultural commodities that are threatening forest remnants in the municipality, especially secondary forests, have all been poorly monitored. However, due to national and international public pressure, a moratorium on deforestation in the region was established and the "Paragominas: Green Municipality" project was implemented, which was fundamental for reducing illegal deforestation. In this context, Paragominas is currently working to maintain the status of "Green Municipality" achieved after years of combating deforestation. This is an opportunity to avoid the potential for even legal deforestation, focusing on strategies for conservation, recovery of the forest and rational use of natural resources.

***Priority area***

The Uraim River catchment (Figure 5) was identified as a priority area to initiate the implementation of actions forest landscape restoration in Paragominas and to promote forest conservation for the following reasons (Imazon, 2009):

- It is responsible for 80% of the municipality's water supply;
- It has about 8 thousand hectares of riparian APP that need to be restored;
- It is under pressure from deforestation, 45% of the catchment is already deforested and 55% has forest cover;
- Imazon carried out a diagnostic for the purpose of forest restoration of APP in the Uraim river catchment covering 60 small rural properties (2 thousand hectares) and found that a large part of the deficit can be solved through natural regeneration;
- Smallholders represent 5% of the catchment and medium and large producers account for 85% of the catchment.

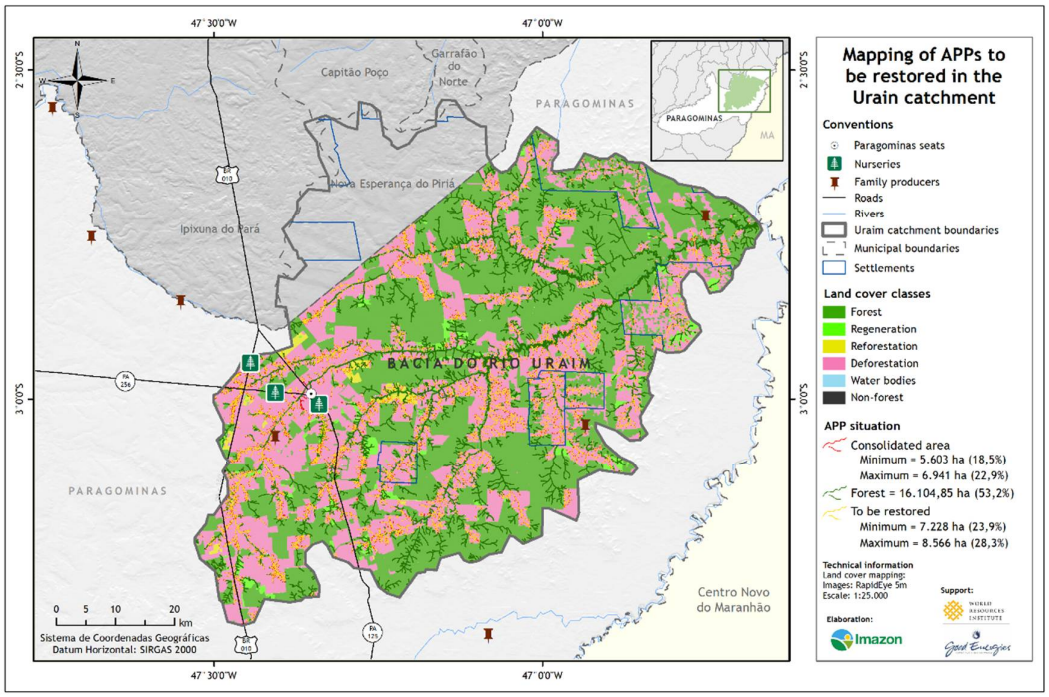



*Figure 5. Land use and the environmental status of APP in the Uraim river catchment in Paragominas-PA.*

The forest restoration strategies in Paragominas were elaborated according to the following design.

### *Strategy design*

The following strategies were designed based on the diagnostic of key success factors for restoration in Paragominas, which identified the strengths, the aspects that still need to be developed, and the barriers and challenges for the implementation of large-scale restoration in the municipality. The absence of four key success factors for forest restoration in Paragominas was identified, demonstrating that:

- Competing demands (e.g. food, fuel) for degraded or converted forest areas are not yet in decline (market conditions).
- There are no value chains for products and services in restored areas (market conditions).
- There is no effective transmission of "know-how" about specialist restoration or knowledge of rural extension.
- Incentives and financial resources for restoration interventions still do not outweigh the incentives of counteractivities opposed to restoration (finance and incentives).

From the detailed contextual analysis of these factors, a conceptual model of the absent factors was generated according to the methodology of the Open Standards for the Practice of Conservation (CMP, 2013).

### Conceptual model

This model sought to relate the absent success factors with cause-and-effect reasoning, biodiversity conservation targets, direct threats, and contributing factors. In summary, the relationships between agriculture and livestock activities, and deforestation for the conversion of land use, were demonstrated, so that these activities generate competition with areas to be restored.

The lack of competitiveness on the part of the legally operating forestry sector is compounded by the strong demand for new areas for agricultural purposes, mainly soybean and livestock ranching, and this is driving the deforestation. Illegal logging and the systematic use of fire contributes to the degradation of forests on a large scale, which is usually an intermediate activity for the conversion of areas.

The fact that the forest crop production is incipient in the region is mainly related to the absence of value chains for forest products in the region, the lack of technical assistance, the difficulty in accessing financial incentives for forest restoration interventions and lack of knowledge on the part of producers about the potential financial returns from restoration. It is even more critical when it comes to forest production in restoration areas, since this would be a movement in the opposite direction to the whole history of deforestation that has been occurring in the municipality in recent decades.

In addition to the weak desire by the local market for products generated by a restored forest, the lack of technical assistance for forest cultivation is also seen as a barrier to the advance of restoration. This does not mean that technical knowledge does not exist at a certain level, merely that it is not sufficiently accessible to the rural producer, who will be the implementing agent of any restoration strategy.

In a similar manner, the difficulty in accessing financial incentives for forest restoration is also a factor that reduces the interest of the rural producer. As identified, there are resources available for restoration that are not accessed by the producer. However, this is still a less accessible and less attractive resource. The general conceptual model is demonstrated in Appendix II.b.

### Application of social exchange theory

Once the conceptual model was consolidated, the rationale of social exchange theory was applied, and strategies and recommendations were then elaborated to promote the restoration in Paragominas under the logic of a strategic plan. In theory, the implementation of this plan, comprising four strategies, should resolve the matter of the absence of key success factors for restoration.

Appendices II.b and II.c show the graphical representations of the exchange theory (conceptual model and result chains). For better visualization, the result chains are presented one by one in this report. However, it is important to clarify that the four strategies are strongly related to each other. The implementation of each of the chains supports the others.

Furthermore, it is graphically demonstrated that some intermediate results depend on the completion of the previous step. For example, in the Development of financial

mechanisms strategy, the design of the PES (Payment for Environmental Services) mechanism should only occur after the definition of the project site (at least from its initial phase). However, the construction and approval of the legal basis that will support the execution of the PES program may occur concomitantly with the work of ensuring that the financial resources will be passed on to the landowners that provide ecosystem services, defining the form of administrative feasibility for this.

Although bauxite mining has been identified as one of the vectors of deforestation and soil conversion, no strategy has been developed to address this issue. This was due to the fact that mining was not associated with any of the four key success factors absent in the diagnostic.

As with any other plan, the assumptions may also not materialize during project implementation. In this case, the planned monitoring of the project should indicate the need for adaptive management, allowing managers to make any necessary adjustments to the intervention logic.

The strategy design is initial and should be discussed with the main actors involved with restoration in the municipality. Once validated, the strategies themselves provide details about alternatives, sometimes through specific studies. Only after these studies have shown the alternatives should decision-makers choose one or another option, or a combination of them. From this point on, it will be possible to deploy the strategic plan in more detail, resulting in an adequate work plan and budget associated with municipal policy.

### *Strategies*

The following subsections present the four strategies developed in alignment with Planaveg, but adjusted for the local situation. One of the strategies addresses issues mainly related to agriculture and livestock, and the other three relate to the forestry sector.

## 4.1 Strategy 1: Intensify the sustainability of agriculture and livestock

This strategy aims to avoid further deforestation and reduce competition with areas to be restored by intensifying production. It addresses the factors that currently contribute to further deforestation and land use conversion for the establishment of new agriculture and livestock areas. In general, this process has been driven by the increase in the price of soybean, which has resulted in a growing demand for new areas for cultivation. This conversion can be rapid and direct in terms of deforestation (both legal and illegal), but can also take place at a slower pace, starting with progressive forest degradation (burning and logging); the latter being more difficult to detect by remote monitoring systems. The intensification of production helps to reduce the competition of areas used for economic activities with the restoration. This strategy is schematically represented in the Appendix II.c.i.

The execution of this strategy will depend on the promotion of actions that focus on two main axes:

- *Conquering new niche markets focused on sustainable agriculture and livestock*

A growing market segment in Brazil and in many other countries is one focused on sustainable production. In this niche, customers are more demanding and are willing to pay a higher price for products proven to have been produced with minimal environmental impact, within a concept of sustainability.

- *Increase in productivity due to the use of sustainable techniques*

  Besides the conquest of new markets, the application of more sustainable techniques has, in many cases, generated not only an improvement in productivity but also a lower production cost. These techniques, also called "best management practices for agriculture", have been applied in many countries. Some practices are quite simple and others depend on an initial investment in technologies that increase production in a less impactful way.

To make these actions feasible, the following is recommended:

✓ MOBILIZE THE DRIVING GROUP

Initially, the municipal government of Paragominas, the government of Pará and civil society organizations should be coordinated and mobilized on the theme of sustainability in agriculture and livestock.

✓ PROVIDE SUPPORT VIA RURAL EXTENSION

An effective rural extension program should be initiated, connecting with rural producers.

✓ CERTIFY AGRICULTURAL PRODUCTION SYSTEMS

With the support of municipal agencies and rural unions, certification systems for sustainable production could be presented to soybean producers. Examples of initiatives with this objective are the Socio-Environmental Responsibility Protocol for the Grain Productive Chain of the State of Pará, launched in 2014 (PMV, 2016), and the Round Table for Responsible Soy (RTRS) global initiative, which is widespread in Brazil.

✓ IMPROVE AGRICULTURAL PRACTICES

In addition to certification, rural extension operators can work with soy producers to adopt practices that are more sustainable, which increase productivity in already cultivated areas, reduce costs, reduce pressure for forest conversion, reduce forest degradation and also the use of areas with low agricultural potential for new silvopastoral (forests with agriculture and livestock raising simultaneously or sequentially) or forest production systems.

✓ PROMOTE LIVESTOCK SUSTAINABILITY

The same institutional arrangement can be used to address livestock sustainability. Areas with high and medium livestock aptitude could see their productivity increased by the adoption of more sustainable practices, as

shown by the Green Livestock Project, developed in Paragominas. By contrast, the areas of low aptitude for livestock that are currently used for this purpose would be converted into silvopastoral (forests with agriculture and livestock raising simultaneously or sequentially) or forest production systems.

## 4.2 Strategy 2: Strengthen the restoration value chain

This strategy aims to strengthen the value chains of products from restored areas. It was proposed primarily because the value chains of forest products from restored areas are still incipient in the region. This strategy works in tandem with the sustainable agriculture and livestock intensification strategy described above. In summary, the interest in converting the forest is also influenced by the low competitiveness of legally produced timber and non-timber forest products in the agricultural sector. This is mainly due to the absence of locally established value chains for forest restoration products or their low attractiveness to the local economy. The representation of this strategy is in the Appendix II.c.ii.

To increase the competitiveness of restoration with the agricultural sector, it is recommended:

✓ MOBILIZE THE STEERING COMMITTEE

Like the sustainable agriculture and livestock strategy, a coordinated movement will also be necessary between municipal and state governments, rural and forestry extension institutions, and civil society organizations on the theme of forest production in restoration areas.

✓ CONDUCT THE FOREST PRODUCT FEASIBILITY STUDY

Initially, a study is needed on the opportunities and feasibility of forest products and their production and marketing chains in the region, clearly identifying the market potential of these products. As a result of this study, a list could be drawn up of candidate products that not only present market potential, but are also of interest to the local community.

✓ GUARANTEE TECHNICAL ASSISTANCE AND FOREST EXTENSION

Forest extension operators should act in a way that encourages both the use of species from LR and the extraction of non-timber forest products from the riparian APP. In the latter case, açaí (Euterpe oleracea), mixed with other species, is highlighted in order to maximize ecosystem services (e.g. water availability, carbon sequestration. Explicitly, it is recommended to prioritize arrangements that present diversity of native species and offer economic and ecological benefits. In addition, extension operators can promote knowledge concerning the best forest restoration techniques.

✓ REVIEW FOREST MANAGEMENT ADMINISTRATION PROCEDURES

Concomitantly, it would be opportune to review the legal procedures for issuing permits to manage native forest species in the region and for non-

timber products from areas that are reclaimed or in the process of forest restoration, in order to simplify them and thus make them more efficient.

### 4.3 Strategy 3: Development of financial mechanisms to promote restoration

This strategy aims to develop financial mechanisms for forest restoration that can increase its competitivity with other productive activities. It relates to the gap identified in the diagnostic for which the incentives and financial resources currently available for restoration do not outweigh the incentives for agricultural activity. The lack of attractive and competitive financial incentives for forest restoration is not conducive to the existence of a forest production culture. Regarding the current economic reality in Paragominas, it is perceived that the incentives and resources available for forest restoration activity do not surpass those destined for agriculture and livestock. It is unlikely that the municipality's current productive activities will suffer a decline due to an exclusive forestry activity. The main goal should be a better balance of productive activities between the agricultural, livestock and forestry sectors, optimizing and diversifying production systems with a focus on sustainability balanced by the conservation of the remaining forest cover. Making restoration financially viable is the major challenge that should be addressed (Brancalion et al., 2012). This strategy is illustrated in the Appendix II.c.iv.

Therefore, to achieve this balance and address this challenge, it is recommended to focus actions on two main axes:

- *Study on plausible financial mechanisms for the financing of restoration activity in Paragominas*

  Although it is known that there are different ways of financing a forest restoration program, it is necessary to know which one or which mechanisms are most appropriate for Paragominas. Funding opportunities range from finance through non-repayable credit lines to funding by investors who expect to make a profit from the investment with attractive rates of return. Examples of the possibilities to be studied include the ABC Program, some BNDES specializations, the National Program for Strengthening Family Agriculture (Pronaf), the Amazon Fund, integrated lines of credit between agriculture and livestock and the environment, the Ecological ICMS, banks that invest in the agrarian sector, among others.

- *Establishment of a payment system for environmental services (PES)*

  As a growing trend in Brazil and the world, PES projects represent a very interesting way of demonstrating the value of a standing forest, which provides a range of ecosystem services to society in various ways. In addition to recognizing landowners that maintain forests and therefore enable ecosystem services, areas under restoration may also participate in this formula in which a win-win relationship is established.

To make these actions feasible, it is recommended:

✓ DISSEMINATE FINANCIAL MECHANISMS

Once information is available about the financial mechanisms available to enable forest landscape restoration in Paragominas, rural producers should be widely informed about the financing alternatives best suited to their needs, which should be linked to the adoption of good Agrosilvopastoral (forests with agriculture and livestock farming simultaneously or sequentially) practices.

✓ DESIGN A PAYMENT SYSTEM FOR ENVIRONMENTAL SERVICES

The second action of this strategy concerns the establishment of a payment for environmental services project. Once a feasibility study has been carried out and the priority area was chosen, the opportunity cost analysis and evaluation of the financial scheme most appropriate to the reality and local objectives should be carried out. It is recommended that landowners in the process of forest restoration are also considered, in addition to those in areas with remaining forest cover.

Although many alternatives to PES models can be considered, a priority project would be a payment mechanism for the water supply, water quality and water maintenance service provided by the areas with native forest cover in the Uraim river catchment.

Over the last decade, new PES projects have been developed in Brazil, many of them focusing on water supply. In this sense, it is important to consider not only the differential benefits in the volume of water available for extraction, but also the stability of the flow of the supply and quality of the water extracted. In many cases, it is possible to obtain very significant results in favor of greater water security and in the reduction of the operating costs. Some examples are the projects developed in the municipalities of Extrema (MG), São Bento do Sul (SC), Rio Claro (RJ) and Camboriú (SC), in which the performance and the engagement of the City Hall presented itself as one of the strong points in the successful implementation of the programs. There are also cases of programs created in other states, such as the Reforestation Program in Espírito Santo. More information on lessons learned and the challenges of PES projects can be found in Guedes & Seehusen (2011).

✓ ADAPT THE LEGISLATION AND GUARANTEE THE RESOURCES

The next steps would be to approve the necessary legislation, thus generating a municipal PES policy; and secure the resources for payments. On completion of this, the program would be implemented.

In the case of this strategy, as well as in the others, both fronts depend on good quality articulation and inter-institutional coordination. However, in this specific strategy, it is essential to have the participation of stakeholders from the financial sector, as well as the municipal agency responsible for water and sanitation in Paragominas, Sanepar.

## 4.4 Strategy 4: Provide technical assistance and rural extension

This strategy aims to broaden the knowledge on how to achieve environmental compliance allied to good production practices. The rural extension cuts across the other strategies and arose because of an identified gap in the transmission of the "know-how" about forest restoration in Paragominas. Although there is a technical "know-how" applicable to forest restoration projects in the region, it is not readily accessible to the rural producer. Hence the need for structuring a consistent program of rural extension and awareness of compliance with environmental legislation in language that is accessible to rural landowners regardless of size. It is important to remember that the extension service is mandatory for small rural properties. In addition to technical and legal issues, extension agents will play a key role in publicizing market and financing opportunities and, consequently, in attracting the producers' interest on the subject of forest restoration. Appendix II.c.iii presents a graphical representation of this strategy.

For this, it is recommended:

✓ DISSEMINATION OF KNOWLEDGE AND OPPORTUNITIES

It is recommended the implementation of a rural and forest extension program that tackles the issues addressed in the other strategies in an integrated way. In summary, rural extension will contribute to the expansion of knowledge of environmental legislation; in the dissemination of best practices in agriculture and livestock, aiming at greater sustainability of the agricultural sector; in the promotion of culture and the forest market, assisting in the generation of value chains for timber and non-timber forest products; and the diffusion of alternative financial mechanisms for the implementation of forest restoration in the region. It is important to remember that government technical assistance is mandatory for small producers, mainly because these actors lack basic resources both for agricultural production and for the environmental compliance of their properties.

✓ ACTUATION OF THE EXTENSION AND RESEARCH INSTITUTIONS

The institutions operating with technical assistance and rural extension will have a fundamental role in the dissemination and implementation of forest restoration strategies. Among them, Emater, Semagri and Ideflor stand out. Likewise, the participation of research institutions in the municipality, such as Embrapa and Ufra, is recommended as an opportunity to exchange knowledge among students, teachers and rural producers.

Taken together, it is expected that the implementation of these four strategies can create the conditions necessary for making FLR feasible at the municipal level. Furthermore, the necessary involvement of the different players and the strengthening of empowerment in the region along the results chain should promote a greater potential for sustainability to the project once the value chain involved in the FLR is better consolidated.

# 5 Diagnostic of key success factors for restoration in the State of Pará

## 5.1 Study area

Pará is the second largest Brazilian state, with an area of 1.25 million square kilometers, located in the eastern Brazilian Amazon (Figure 1). The state was selected for this diagnostic because: i) it has the largest area in the country under CAR registration and until 2014 more than 60% of the area eligible for registration was in the state database; ii) it has one of the highest deforestation rates in the Amazon: an average of 2 thousand square kilometers/year from 2011 to 2015 compared to 5,500 square kilometers/year for the whole of the Amazon; and iii) the state and its municipalities, together with civil society, are mobilizing to reduce deforestation (Nunes et al., 2016).

The economy of the state is comprised of mainly extraction industries (iron, bauxite, wood, coal), agriculture (as palm oil and cassava) and livestock (the fifth largest herd in the country) (IBGE Census, 2013). Even though more than half of the state (58%) is protected by law (Semas, 2009), until 2014 21% of its area was deforested, and it continues to have one of the highest rates of deforestation in the Amazon.

## 5.2 Results

The analysis of key success factors for the State of Pará was performed in a simpler way than the analysis for Paragominas. For this analysis, information obtained from the diagnostic interviews in Paragominas was used and consultations were carried out with reference literature. The data from Pará was also analyzed in a comparative way with the results already obtained for the diagnostics of Paragominas and the Amazon, the latter contained in Planaveg.

In general, Pará presents a set of programs and initiatives aimed at strengthening environmental management, with the main focus on reducing deforestation and adherence to CAR. However, the theme of large-scale restoration and its contribution to biodiversity conservation is not yet effectively present. This situation is reflected in several of the key factors analyzed.

The State of Pará, besides presenting the same four factors absent from Paragominas, presents four others. The analysis for the presence of key success factors led to the conclusion that:

- Laws requiring restoration are not widely understood and applied.
- Seeds of native species, seedlings or native populations are not readily available.
- Competing demands (e.g. food, fuel) for degraded or converted forest areas are not yet in decline.
- There are no effective value chains for the products and services of restored areas.

- The local community is not informed or prepared to get involved and decide on the restoration.
- The roles and responsibilities related to the restoration are not clearly defined.
- There is no transfer of "know-how" about restoration expertise or rural extension.
- The incentives and financial resources for restoration do not outweigh the incentives of other activities contrary to the restoration.

### 5.2.1 Motivate

In this theme, it was evaluated whether decision-makers, rural landowners and/or citizens are inspired or motivated to catalyze processes that lead to forest landscape restoration. Most of this theme's key factors are partly in place. The generation of social benefits and the existence of legislation that requires restoration are the two factors already in place in Pará. However, there is still a lack of effective legislation and a better understanding of the need to restore forest landscapes so that policies related to this theme are created, strengthened and implemented (Table 5).

*Table 5. Result of the diagnostic of key success factors for forest landscape restoration under the theme Motivate, in the State of Pará, in 2016*

| *Theme* | *Necessary condition* | | *Key success factor* | *Para current situation* |
|---|---|---|---|---|
| **Motivate** | **a. Benefits** | 1 | Restoration generates economic benefits | Partly in place |
| | | 2 | Restoration generates social benefits | In place |
| | | 3 | Restoration generates environmental benefits | Partly in place |
| | **b. Awareness** | 4 | Benefits of restoration are publicly communicated | Partly in place |
| | | 5 | Opportunities for restoration are identified | Partly in place |
| | **c. Crisis events** | 6 | Crisis events are leveraged | Partly in place |
| | **d. Legal requirements** | 7 | Law requiring restoration exists | In place |
| | | 8 | Law requiring restoration is broadly understood and enforced | Not in place |

The main arguments that support the evaluation of some of the above factors are:

*Benefits*

- The main benefit identified for restoration is the social due to environmental compliance and consequent improvements in access to existing alternatives for the regularized properties.

*Awareness*

- A study conducted by Nunes et al. (2016) indicated that the State of Pará has a surplus LR (12.6 Mha) more than five times greater than the deficit (2.3 Mha). This suggests that the surplus could offset the entire deficit and that there would still be 10.3 Mha remaining to compensate for the deficit of other states in the same biome, making the forest an important asset for Pará. For the APP, a study by Imazon

estimates that the deficit can reach up to approximately 940 thousand hectares to be restored in Pará. However, since the LR deficits can be solved through compensation or restoration, there are many uncertainties over which areas of Pará will be effectively restored, mainly due to the lack of regulation of compensation mechanisms and lack of information on costs and the benefits of restoration.

*Crisis Events*

- Between 2008 and 2011, 17 municipalities in Pará entered the MMA national deforestation red list. In response to this crisis, in 2011 the Green Municipalities Program (PMV) became a state policy (State Decree 54/2011), with the accession of 107 municipalities to date. "The overall objectives of the PMV are to combat deforestation and to strengthen sustainable rural production through strategic environmental management and land management actions" (Whately and Campanili, 2013). As in Paragominas, the state still does not have a set of concrete actions to scale the restoration in the state. Its priorities have been the reduction of deforestation and adherence to CAR.

*Legal Requirements*

- In Brazil, environmental legislation (Law 12.651/2012) requires the restoration of APP and the compensation or restoration of LR that has been irregularly deforested. However, it is a complex law, poorly understood, mainly by rural holders, and is prone to controversy, partly due to a lack of regulation or clarity of many of its instruments. Not only in Pará, but throughout Brazil, there needs to be a greater understanding of how to adapt rural properties for environmental compliance, adhering to the legislation and maximizing environmental, social and economic gains. Appropriately, on January 23, 2017, the National Policy for the Recovery of Native Vegetation (Proveg) was created by Decree 8,972/2017.

### 5.2.2 Enable

Most of the necessary conditions that favor the recovery of native vegetation in the State of Pará are partly in place or absent. Only the key factor related to deforestation restrictions is in place (Table 6). This scenario reflects the need to implement a series of measures to encourage the creation of better conditions for restoration. The positive aspect is that many of these measures can be implemented by strengthening landscape restoration through existing policies and programs, thus demonstrating that the first steps have already been taken.

*Table 6. Result of the diagnostic of key success factors for forest landscape restoration under the theme Enable, in the State of Pará, in 2016*

| | | | | |
|---|---|---|---|---|
| **Enable** | e. Ecological conditions | 9 | Soil, water, climate, and fire conditions are suitable for restoration | Partly in place |
| | | 10 | Plants and animals that can impede restoration are absent | Partly in place |
| | | 11 | Native seeds, seedlings, or sources populations are readily available | Not in place |
| | f. Market conditions | 12 | Competing demands (e.g., food, fuel) for degraded forestlands are declining | Not in place |
| | | 13 | Value chains for products from restored areas exists | Not in place |
| | g. Policy conditions | 14 | Land and natural resource tenure are secure | Partly in place |
| | | 15 | Policies affecting restoration are aligned and streamlined | Partly in place |
| | | 16 | Restrictions on clearing remaining natural forests exist | In place |
| | | 17 | Forest clearing restrictions are enforced | Partly in place |
| | h. Social conditions | 18 | Local people are empowered to make decisions about restoration | Not in place |
| | | 19 | Local people are able to benefit from restoration | Partly in place |
| | i. Institutional conditio | 20 | Roles and responsibilities for restoration are clearly defined | Not in place |
| | | 21 | Effective institutional coordination is in place | Partly in place |

The above classification was based on the following aspects:

*Ecological Conditions*

- The Diagnostic of the Production of Native Forest Seedlings in Brazil, carried out by Ipea in 2015 (Silva et al., 2015), identified 106 nurseries in Pará producing native species. However, due to the lack of sufficiently detailed data for the state, an analysis of the production capacity of these nurseries is recommended, in addition to an estimate of the potential demand for restoration in the state. In addition, there is little knowledge of how collect seeds in forest fragments, which could supply much of the restoration needs at a lower cost.

*Market Conditions*

- Non-timber products from restoration are still lacking a strengthened market chain, with only a few success stories in specific regions of the state and on a small scale. Some examples are the region that extends from the municipality of Tomé-açu to the Bragantina region, with consortia of fruit trees (northeastern Pará); the region of São Félix do Xingu, with cacao (southeast); and the Transamazônica, near the municipality of Medicilândia (west), also with cacao. Another point to consider is the demand to open new areas for agriculture and livestock expansion rather than the prioritization of abandoned areas and increased productivity to avoid further conversions. This situation is among the most critical key success factors present in this analysis.

*Policy Conditions*

- One of the challenges associated with the creation of policy conditions is the land regularization of the State of Pará. “Pará is the state in the Legal Amazon that has been leading agrarian conflict statistics for the last fifteen years. At the same time, the state has been the object of large investments in energy and infrastructure, without, however, prioritizing the resolution of these agrarian issues, which cover 39% of the state’s territory” (Brito, 2015). Yet, even without a land title, the landowner has the right to restore and benefit from the products, besides being free

to define the land use of his property, provided this is within the criteria established by the legislation.

- The existence of the Law for Protection of the Native Vegetation places restrictions on deforestation, yet Pará still has municipalities on the MMA deforestation red list. In 2013, the list of Illegal Deforestation in the State of Pará (State Decree 838/2013) was created. It specifies the areas under embargoes and fined for illegal deforestation, through the work of municipal environmental secretariats and IBAMA. Once listed, the rural property is ineligible to receive permits, authorizations, services or any other type of public benefit or incentive from the organs and entities of the state public administration (PMV, 2016). The main objectives of this mechanism are the fight against illegal deforestation in Pará and the favoring of rural producers who carry out their activities in compliance with environmental legislation. In addition, the list aims to collaborate with the commitment to achieve zero net deforestation by 2020 assumed by the governor of Pará during Rio + 20.
- State Normative Instruction 08/2015 defines procedures for the deforestation of secondary vegetation, protecting secondary forests over 20 years old, and restricts the deforestation of forests between 6-19 years old outside LR and APP.
- The creation of Proveg at the beginning of 2017 represents a great potential for favoring and promoting the alignment and optimization of policies aimed at forest restoration.
- Over the past two years, an increase in deforestation rates has been detected in Pará (Prodes, 2016), with 68% of deforestation estimated for 2016 occurring in rural properties registered in CAR.

*Social conditions*

- No statewide initiative has been identified that supports producers who implement restoration interventions with information or training. This lack of information makes them unlikely to implement restoration interventions on their properties. Although the PRA of Pará has already been regulated, several of its mechanisms (e.g., species composition and system to assist in restoration decision making) have not yet been defined.

*Institutional conditions*

- The definition of roles and responsibilities is essential for the creation of an agenda that includes restoration in state initiatives. However, the institutions at the state level that currently lead this effort and could act in the different niches of action in restoration, were not identified.

### 5.2.3 Implement

Except for the ability of the state and partners to disseminate successful experiences, all other key success factors are partial or absent in this area. This demonstrates the need to implement a landscape restoration agenda in the state (Table 7), including stakeholder mobilization, access to financial resources, and

effective monitoring. These factors include an absence of knowledge transmission and a lack of financial incentives for restoration. Both are considered fundamental success factors.

*Table 7. Result of the diagnostic of key success factors for forest landscape restoration under the theme Implement, in the State of Pará, in 2016*

| Theme | Necessary condition | | Key success factor | Para current situation |
|---|---|---|---|---|
| Implement | j. Leadership | 22 | National and/or local restoration champions exist | Partly in place |
| | | 23 | Sustained political commitment exists | Partly in place |
| | k. Knowledge | 24 | Restoration "know how" relevant to candidate landscapes exist | Partly in place |
| | | 24 | Restoration "know how" transferred via peers or extension services | Not in place |
| | l. Technical design | 26 | Restoration design is technically grounded and climate resilient | Partly in place |
| | | 27 | Restoration limits "leakage" | Partly in place |
| | m. Finance and incenti | 28 | Positive incentives and funds for restoration outweigh negative incentives | Not in place |
| | | 29 | Incentives and funds are readily accessible | Partly in place |
| | n. Feedback | 30 | Effective performance monitoring and evaluation system is in place | Partly in place |
| | | 31 | Early wins are communicated | In place |

The evaluation of the above factors was based on the following information:

*Leadership*

- The issue of forest landscape restoration is not yet part of the action agenda of environmental leaders, even though environmental policies are advancing and establishing restoration goals.

*Knowledge*

- Restoration interventions, like other land use activities, require technical knowledge from the producer and the extension agencies. No training or training programs have yet encountered on the state level. There is some knowledge generated by restoration interventions in municipalities, such as Paragominas and São Felix do Xingu.

*Technical design*

- There are restoration projects in the state, but these are usually specific and small-scale. The integration of existing and future projects with the climate change agenda needs to be strengthened.

*Finance and incentives*

- In general, there is little incentive for restoration, even in areas important for biodiversity conservation or ecosystem service provision (Nunes et al., 2016). This makes the restoration unattractive when compared to other activities with a greater possibility of financial return. Among the positive financial incentives for the environmental policy in the state is the Green ICMS, created to benefit municipalities that are reducing deforestation and have a higher percentage of CAR and protected areas, allocating part of the state tax according to environmental criteria. In 2014, the government transferred more than BRL 36 million to municipalities in the form of Green ICMS (PMV, 2016). This incentive, however, still does not consider the restoration initiatives as a criterion.

- The Pará State Environmental Fund was created in 1995 and regulated the following year with the objective of financing plans, programs, projects, research and technologies aimed at the rational and sustainable use of natural resources, as well as the implementation of actions aimed at control, monitoring, defense and recovery of the environment. It was assessed that this fund should improve governance, including allocation of staff for the management and dissemination of periodic financial reports (Brito et al., 2014).

*Feedback*

- The migration of the State Environmental Monitoring and Licensing System (Simlam) to the Federal Rural Environmental Registration System (Sicar) is recent. It is not yet clear whether it is possible to consult the restoration areas in the state contained in the terms of the conduct adjustment agreement and how these areas will be monitored by the municipal and state environment secretariats. Systems such as TerraClass, Prodes, Deter and SAD are in place, which are effective and operational on the scale of the Amazon. Among these systems, only TerraClass (Inpe: land use) monitors the growth of forests. The remainder monitor only deforestation and degradation. TerraClass is the result of a partnership between Embrapa and Inpe and is currently part of the Environmental Monitoring Program of the Brazilian Biomes (PMABB) (MMA, 2016).
- In the case of field monitoring, it is necessary to define a strategy to expedite the monitoring of priority areas in the process of restoration or that need to be restored. In addition, it is essential to increase the technical capacity of the secretariats. For remote monitoring, it is recommended to create systems for tracking the growth of forests (secondary forests and restoration) that have more complete information, such as the age of regeneration, and detection of deforestation and degradation in these areas, and which of these are more frequent (annual data).

# 6 Diagnostics comparison of Paragominas, Pará and the Amazon

In this section, a comparison is made between the diagnostic of key success factors for the restoration of Paragominas, Pará and the Amazon biome; the latter was carried out by Planaveg in 2013. It should be emphasized, however, that some components of the methodology used for the Amazon diagnostic are different from the current one because, after 2013, the methodology was subsequently updated. Thus, in table 8, below, only the corresponding factors are presented.

Among the evaluated areas, Paragominas presented the highest number of key success factors for restoration in place. This result is due in large part to the public policy actions and pilot projects developed by the 'Paragominas: Green Municipality' and the state's 'Green Municipalities Program', together with research and conservation institutions (e.g., Imazon and TNC), universities (e.g. Ufra), Semas, associations of rural producers, municipal agencies, among others.

It was also observed that the number of key success factors that are present increased as the scale of observation (biome > state > municipality) increased. This

result was expected since the larger the scope, the greater the chances of missing factors due to the difficulty of large-scale implementation. Since forest restoration is still a recent issue in the Amazon, few municipalities are advanced in their actions to recover their deficits, since they are still focused on reducing deforestation and degradation. This demonstrates that the implementation of public policies in the case of Paragominas has been more efficient and that this model can be used in other municipalities, incorporating the recommendations that were cited in this work. Municipalities considered critical to deforestation should be prioritized.

*Table 7. Comparison of the diagnostic results of Paragominas and the State of Pará, performed in this study, with the diagnostic of the Amazon biome performed by Planaveg (2013).*

| Theme | Necessary condition | | Key success factor | Paragominas current situation | Para current situation | Amazon (PLANVEG, 2013) |
|---|---|---|---|---|---|---|
| Motivate | a. Benefits | 1 | Restoration generates economic benefits | In place | Partly in place | Partly in place |
| | | 2 | Restoration generates social benefits | In place | In place | In place |
| | | 3 | Restoration generates environmental benefits | Partly in place | Partly in place | In place |
| | b. Awareness | 4 | Benefits of restoration are publicly communicated | Partly in place | Partly in place | Not in place |
| | | 5 | Opportunities for restoration are identified | In place | Partly in place | Partly in place |
| | c. Crisis events | 6 | Crisis events are leveraged | Partly in place | Partly in place | Not in place |
| | d. Legal requirements | 7 | Law requiring restoration exists | In place | In place | In place |
| | | 8 | Law requiring restoration is broadly understood and enforced | Partly in place | Not in place | Not in place |
| Enable | | 9 | Soil, water, climate, and fire conditions are suitable for restoration | Partly in place | Partly in place | Partly in place |
| | | 10 | Plants and animals that can impede restoration are absent | Partly in place | Partly in place | Partly in place |
| | | 11 | Native seeds, seedlings, or sources populations are readily available | Partly in place | Not in place | Not in place |
| | | 12 | Competing demands (e.g., food, fuel) for degraded forestlands are declining | Not in place | Not in place | Not in place |
| | | 13 | Value chains for products from restored areas exists | Not in place | Not in place | Not in place |
| | g. Policy conditions | 14 | Land and natural resource tenure are secure | Partly in place | Partly in place | Partly in place |
| | | 15 | Policies affecting restoration are aligned and streamlined | Partly in place | Partly in place | Partly in place |
| | | 16 | Restrictions on clearing remaining natural forests exist | In place | In place | In place |
| | | 17 | Forest clearing restrictions are enforced | Partly in place | Partly in place | Partly in place |
| | h. Social conditions | 18 | Local people are empowered to make decisions about restoration | Partly in place | Not in place | Not in place |
| | | 19 | Local people are able to benefit from restoration | In place | Partly in place | Not in place |
| | i. Institutional condition | 20 | Roles and responsibilities for restoration are clearly defined | Partly in place | Not in place | Not in place |
| | | 21 | Effective institutional coordination is in place | Partly in place | Partly in place | Partly in place |
| Implement | j. Leadership | 22 | National and/or local restoration champions exist | Partly in place | Partly in place | Partly in place |
| | | 23 | Sustained political commitment exists | Partly in place | Partly in place | Partly in place |
| | k. Knowledge | 24 | Restoration "know how" relevant to candidate landscapes exist | Partly in place | Partly in place | Partly in place |
| | | 24 | Restoration "know how" transferred via peers or extension services | Not in place | Not in place | Not in place |
| | l. Technical design | 26 | Restoration design is technically grounded and climate resilient | Partly in place | Partly in place | Partly in place |
| | | 27 | Restoration limits "leakage" | In place | Partly in place | |
| | m. Finance and incentive | 28 | Positive incentives and funds for restoration outweigh negative incentives | Not in place | Not in place | Not in place |
| | | 29 | Incentives and funds are readily accessible | Partly in place | Partly in place | Not in place |
| | n. Feedback | 30 | Effective performance monitoring and evaluation system is in place | Partly in place | Partly in place | Partly in place |
| | | 31 | Early wins are communicated | In place | In place | Partly in place |

# 7 Recommendations for the strengthening of public policies

## 7.1 Municipality of Paragominas

Successful forest landscape restoration in Paragominas requires proposed strategies be integrated and consolidated into existing public policies in the municipality and that new public policies be created.

Paragominas has eight key success factors in place, nineteen partly in place and four not in place. These results are positive and largely result from the implementation of public environmental policies in the municipality, such as “Paragominas: Green Municipality”.

### 7.1.1 Main existing programs

- Green Municipalities Program (PMV)

The PMV acts directly in the municipalities and presents two main lines of action linked to the existing environmental legislation (Law 12.651/2012): combat deforestation and the inclusion of property in the CAR. In Paragominas, the pact against deforestation was signed in 2010. More than 80% of its registered area is recorded in the CAR and the municipality has now exited the list of the most deforested municipalities in the Amazon. These steps are crucial to the implementation of a large-scale restoration program. CAR is the basis for the process of environmental compliance for the rural property and provides a picture of demand and supply for restoration in degraded and deforested areas of rural properties.

- Green Livestock Project

Created in 2011 (Silva and Barreto, 2014), the Green Livestock Project stands out for having included forest restoration in the participating properties as a component of environmental compliance. Restoration, associated with forest conservation, was implemented in the LR and APP, with the assistance of professionals with recognized experience in the theme. Among the techniques selected are the isolation of areas to allow natural regeneration and planting of native species. In the case of planting in LR areas, native species with economic value were also used. Another highlight was the search for increased productivity, which may contribute to a reduction in demand for the deforestation of new areas.

## *Recommendations*

✓ Include forest restoration in existing municipal policies

For the PMV, it is recommended to use a regeneration monitoring system capable of generating information on the progress of increasing forest cover and identifying deforestation in secondary forest areas. In addition, it is recommended to promote the post-CAR agenda focusing on the environmental compliance of rural property and, consequently, the requirement for forest restoration when necessary. The training and technical expertise programs promoted by the PMV should contemplate the rural property compliance and stimulate the government to provide more effective technical assistance to the producer.

For the Green Livestock Project, its continuity and expansion for new rural properties is recommended, which will promote increased productivity and the conservation and restoration of rural property.

✓ Create a Municipal Policy on Climate Change and set restoration goals

It is recommended that Paragominas establish a municipal policy on climate change, which incorporates restoration goals and incentives for the maintenance of forests that could be deforested, in accordance with the zero net deforestation targets.

Currently, the existing restoration goal of the PMV is to reduce deforestation to zero net loss, from 2020. In addition, the Native Vegetation Protection Law (Law

12.651/2012) is in force, which requires the compliance of the rural property and, consequently, in many cases demands the recovery and forest restoration of certain areas of the rural property.

As has occurred on other occasions and considering the connection of the climate change agenda with restoration, Paragominas needs to exercise its leadership and establish its goal for restoration. This goal can be based on previous studies already carried out for the municipality that assesses deficits and forest surpluses in APP and LR (Nunes et al., 2014; Nunes et al., 2016). In addition, it is necessary to monitor the areas under restoration with the technical support of research institutions that collaborate with the theme.

Forest landscape restoration in Paragominas would contribute to achieving the national restoration goals in the context of the Bonn Challenge and the Paris Climate Agreement, as well helping to increase the resilience of water production. In addition, combating deforestation would contribute to the reduction of greenhouse gasses, an action that is also in line with the Paris Agreement. Thus, the establishment of targets aligned with the national policies and international agreements mentioned could raise the interest of potential investors, facilitate access to credit lines for the theme, and encourage the implementation of forest restoration projects in the municipality.

- ✓ Support the implementation of the Pará 2030 Program

The creation of the Pará 2030 Program, in June 2016, by the state government of Pará represented a new opportunity to promote forest landscape restoration in Paragominas. The program supports the development of family agriculture and income generation with a focus on a sustainable economy. In addition, it includes the forestry sector, biodiversity and environmental services, among others. Paragominas has proven competence to undertake and implement new policies. In this way, supporting the implementation of the 2030 Program is a natural step forward to collaborate with the first initiatives and actions established. However, it is still necessary to identify specifically within the program what productive activities are in line with the strategies proposed for Paragominas and, thus, to promote their implementation in the field associated with forest restoration.

- ✓ Encourage the expansion of forestry activity

It is important to expand forestry activity in the Paragominas region (including areas of forest management, non-timber forest products - NTFPs, AFS, etc.), as this could increase local economic stability through diversification and consequently assist during critical periods in the commodities cycles, the current municipal economic base.

- ✓ Create a municipal policy for the Payment of Environmental Services

It is recommended to create a municipal PES policy to promote the conservation and recovery of the Uraim River catchment, aimed at improving and maintaining

long-term water production for the municipality. In addition to promoting the conservation and restoration of the catchment, producers would benefit economically from this policy through payments. Considering the importance of watersheds and drainage basins for water production, the PES policy should promote conservation and restoration in areas larger than those established by law. In addition, based on the experience of ongoing PES programs in Latin America (Bremer et al., 2016), it is recommended that rural landowners participate in the early stages of the process.

✓ Promote actions to combat deforestation and valorize the standing forest

It is recommended that Paragominas create incentives to protect and enhance the standing forest, even in areas where this is not required by law, in addition to the use of abandoned areas. Combining these actions with forest restoration provides an opportunity to achieve net forest loss and retain the leading role of effective environmental management.

## 7.2 State of Pará

### 7.2.1 Main existing programs

Pará has two main state policies aimed at controlling deforestation, improving environmental management and promoting sustainable development, namely:

- Green Municipalities Program

  Currently, the PMV is present in 107 Pará's municipalities. The program contributed to the reduction of deforestation by 2014 and the high rate of properties inclusion in the CAR. Nevertheless, in the last two years an increase in deforestation rates has been detected in Pará (Prodes, 2016), with 68% of deforestation estimated for 2016 occurring in rural properties registered in the CAR. In addition, the state still lacks a plan to implement and monitor large-scale restoration. To this end, efforts are still needed to achieve net forest loss by reducing deforestation and increasing forest area.

- Pará 2030 Program

  The Pará 2030 Program aims to improve the social and economic development indicators of the state. One of the interesting aspects of this program is the use of productive restoration as a strategy to generate income and seek sustainability. In this way, the doors to the market of forest products, and the creation of values chains associated with these products, will be opened.

At the federal level, the main policy for encouraging forest landscape restoration is the National Policy for the Recovery of Native Vegetation (Proveg), created in January 2017 (Decree 8,972/2017). Proveg has the objectives of promoting restoration and boosting the environmental regularization of rural properties. Its implementation will be effected as part of Planaveg and will be integrated with national policies related to the theme.

## *Recommendations*

- ✓ Include forest restoration in existing state policies

  Considering public policies and existing actions by the state, it is important to bring the theme of forest restoration to various spheres, such as training, promotion, resource allocation and prioritization of actions, so that the implementation process of the restoration goal is facilitated. It is fundamental to strengthen compliance with environmental legislation to achieve the environmental compliance of rural properties.

  Through the PMV, Pará has demonstrated its capacity to work in partnership and in collaboration with the various actors in society. The next step is the clear definition of roles and effective institutional coordination to ensure this progress.

  The Pará 2030 Program provides opportunities for the promotion of economic development based on the low carbon economy. In this agenda, restoration should be included as one of the ways to provide income alternatives for landowners through the sale of timber and non-timber forest products, according to what is permitted by the Native Vegetation Protection Law (Law 12,651/2012).

- ✓ Create State Policy on Climate Change

  It is fundamental to create a State Policy on Climate Change that promotes active participation by the State of Pará in complying with the Brazilian Nationally Determined Contribution (NDC) and the Climate Agreement.

  Brazil is committed to restoring and reforesting 12 million hectares of forests stipulated in the Brazilian NDC and 10 million in the Low Carbon Agriculture Plan (ABC Plan), of which five million are for Agriculture-Livestock-Forestry Integration (iLPF) and five million for the recovery of degraded pastures (WRI, 2016).

  The states of São Paulo, Mato Grosso and Espírito Santo have established the goal of restoring 3.28 million hectares. Pará has the potential to contribute to the national agenda and establish an integrated restoration goal of zero net deforestation.

- ✓ Advance the land regularization process

  Pará needs to continue its efforts in the land regularization process. This has been one of the main bottlenecks for the promotion of a large-scale forest restoration agenda. For example, some LR deficit compensation mechanisms run up against the lack of land titles, which makes it impossible to certify the environmental compliance of that property.

- ✓ Create a sustainable economic policy

Potentially, this is a great economic opportunity for the state of Pará: the implementation of a policy focused on a sustainable low carbon economy. In this setting, forest conservation and reduction of deforestation become the main objectives on which production is based.

In this context, there is an opportunity to promote the forest market, ensuring the establishment of a market for legal and certified forest products, the promotion of rural extension, and the development of financial mechanisms for forest restoration in conjunction with the business sector.

In relation to the restoration agenda, the livestock and agriculture sectors and environmental planning authorities play a central role in planning the actions, while assuming their responsibilities in complying with environmental legislation (Latawiec, 2015). In this process, the communication between these actors must be directed to the intensification of agriculture and livestock sustainability. Thus, the strengthening of agreements between the state government of Pará and civil society, such as the Timber Conduct Adjustment Agreement and the Protocol for Socio-Environmental Responsibility in the Grain Production Chain in the state of Pará, are extremely strategic.

Pará should articulate for the establishment of a more stable economy that does not allow the variation of commodity prices to foment the demand for new deforestation. The forest market based on forest landscape restoration can contribute to this by diversifying production.

These programs, associated with the creation and implementation of a State Policy on Climate Change, have the potential to provide the necessary conditions for the restoration of the large-scale forest landscape in the State of Pará.

Both municipal and state policies must consider and act in conjunction with federal policies. The strategies and policies addressed in this report are directly related to Planaveg and Proveg and seek to promote their implementation.

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# 9 Appendices

## Anexo I - Appendix 1. Report of the Workshop in Paragominas

*Title*: Diagnostic Workshop for the presence of key success factors for restoration in Paragominas, Pará. Application of the Restoration Opportunity Assessment Methodology (ROAM).

*Fulfillment date:* June 7, 2016.

*Organization and support*: Organized by Imazon and Conserve Brazil, with the support of the Municipal Secretariat of Green and the Environment of Paragominas (Semma).

*Objective*: Perform a diagnostic of the presence of key success factors for forest restoration in Paragominas.

*Workshop stages*: The workshop was held in two stages:

- **First stage** - Introductory presentations, held at the headquarters of the Paragominas Union of Sawmill Industries (Sindiserpa), which consisted of a presentation on Imazon's restoration interventions carried out in the region, mainly the project to restore APP in the Uraim river catchment, and two presentations on the ROAM method and forest landscape restoration.
- **Second stage** - Working group meetings held at Semma's headquarters, where two focus groups simultaneously evaluated the 31 key success factors under the three themes required by ROAM.

*Participants*: There were twenty-six contributors, all operating in areas related to the restoration agenda in Paragominas, such as representatives of the City Hall, NGOs active in the region, research institutions, extension (assistance) agencies and companies, as listed below.

### Workshop participants

| | Name | Institution |
|---|---|---|
| 1 | Ana Carolina Borges de Andrade | Ideflor |
| 2 | André Luiz Ferreira | Amata Corp. |
| 3 | Andréia Pinto | Imazon (writer) |
| 4 | Ciro Rodrigues | Semma Paragominas |
| 5 | Denes Barros | Ufra Paragominas |
| 6 | Denis Conrado da Cruz | Ibam |
| 7 | Diego R. Ferreira | Youth Forum |
| 8 | Dinilde Ribeiro Serrão | Emater |
| 9 | Diomar Farias | Semagri - PGM |
| 10 | Fabrício Nascimento Ferreira | Embrapa |
| 11 | Izael Costa Silva | Semma Paragominas |
| 12 | Jadir Fernando Bazoni Jr. | Youth Forum |
| 13 | Jaqueline de Carvalho Peçanha | Semma Paragominas |
| 14 | Jorge Moura de Souza | Consultant |
| 15 | Juhn Henin da Silva Muroi | Ufra Belém |

| | | |
|---|---|---|
| 16 | Larissa S. de Vilhena Rauber | Mayor of Paragominas |
| 17 | Layse Braga | NEA - Ufra |
| 18 | Oze Tatiele O. Mauricio | Semma Paragominas |
| 19 | Paulo Amaral | Imazon |
| 20 | Rodrigo Mauro Freire | TNC |
| 21 | Sâmia Serra Nunes | Imazon (writer) |
| 22 | Selma Toyoko Ohashi | Ufra Belém |
| 23 | Tarcisio Lemos | IFPA Campus Paragominas |
| 24 | Valéria L. de Almeida | Ideflor-bio |
| 25 | Anita Diederichsen | Conserve Brasil (moderator) |
| 26 | Gustavo Gatti | Conserve Brasil (moderator) |

*Description*: The workshop addressed the ROAM component relating to the diagnostic for the presence of key success factors for restoration for a preliminary evaluation of these factors in the municipality.

The themes evaluated in the workshop were:

1. **Motivate.** Evaluates the necessary factors that can inspire and motivate decision-makers, property owners and/or citizens to recover their degraded areas. In Paragominas, the motivations of the main actors were evaluated, such as compliance with laws, etc.
2. **Enable.** Evaluates the necessary factors to create conditions (ecological, market, policy, social and/or institutional) that are indispensable to the recovery of native vegetation. In Paragominas, the conditions presented in the study region were evaluated, such as participatory mapping of inputs for restoration, etc.
3. **Implement.** Evaluates the necessary factors to enable the implementation of recovery in the field in a sustained manner, such as resources and training, monitoring, etc. In Paragominas, the capacity for implementation was evaluated by mapping the active leaderships and projects in course.

## Method

For the discussions on the key factors, participants were divided into two working groups. In the presence of a moderator and a writer — the authors of the diagnostic — a dialogue was conducted with each group. The dialogue structure was organized in sessions according to the themes Motivate, Enable and Implement. In each section, participants were asked to assess the presence or absence of key success factors related to the theme.

Participants were then asked to rate the key factors on the basis of their assessment as follows: In place, when the factor is present; Partly in place, when certain aspects are present; and Not in place, when it absent or does not exist, as shown below.

GREEN = IN PLACE

YELLOW = PARTLY IN PLACE

RED = NOT IN PLACE

After individual classification, the information was transferred to cards and pasted on the wall so that everyone could view the integrated classification of the participants. In this way, through a visual interpretation of the votes on the cards, it was possible to analyze the overall results.

The assignment of the current situation for each of the key success factors was performed by each of the participants. After the workshops, the results of the vote were summed and organized by the moderators on a worksheet structured and proposed by WRI.

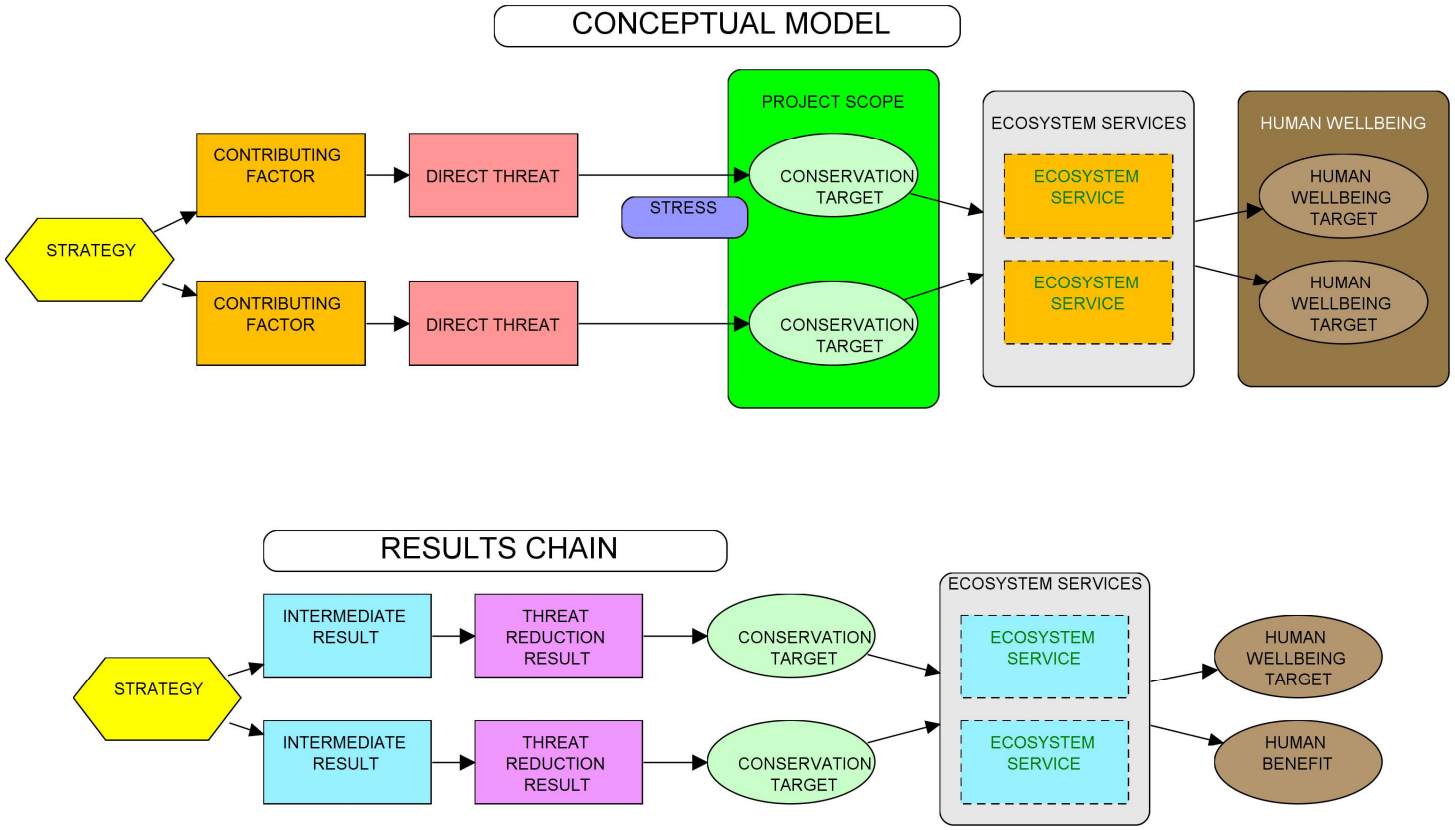
## Results

The following figure presents the situation concerning the key success factors for restoration as defined by the participants, indicating the percentage of votes attributed to each of the factors by the participants.

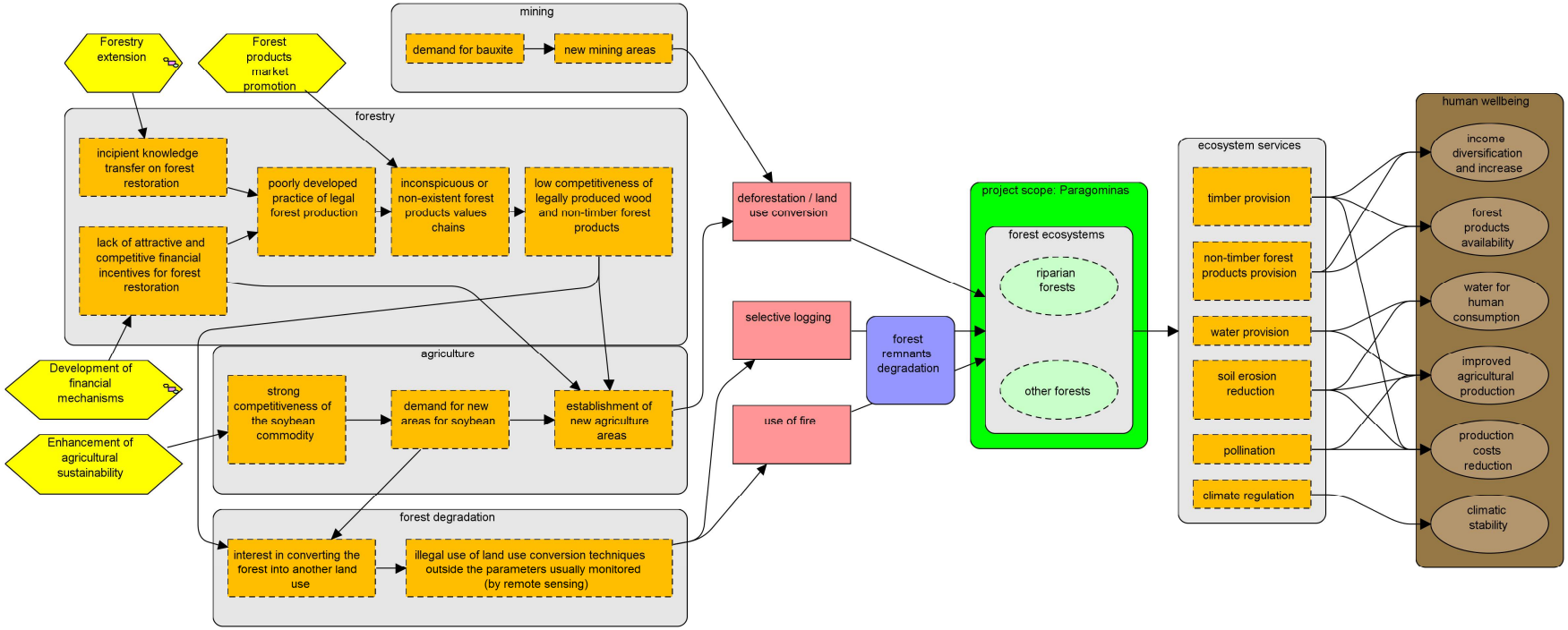
| *Theme* | *Necessary condition* | | *Key success factor* | % | % | % | *No of votes* | *Current situation* |
|---|---|---|---|---|---|---|---|---|
| Motivate | a. Benefits | 1 | Restoration generates economic benefits | 0 | 69 | 31 | 13 | Partly in place |
| | | 2 | Restoration generates social benefits | 0 | 60 | 40 | 15 | Partly in place |
| | | 3 | Restoration generates environmental benefits | 0 | 47 | 53 | 15 | In place |
| | b. Awareness | 4 | Benefits of restoration are publicly communicated | 14 | 86 | 0 | 14 | Partly in place |
| | | 5 | Opportunities for restoration are identified | 27 | 64 | 9 | 11 | Partly in place |
| | c. Crisis events | 6 | Crisis events are leveraged | 8 | 42 | 50 | 12 | In place |
| | d. Legal requirements | 7 | Law requiring restoration exists | 0 | 0 | 100 | 14 | In place |
| | | 8 | Law requiring restoration is broadly understood and enforced | 13 | 87 | 0 | 15 | Partly in place |
| Enable | e. Ecological conditions | 9 | Soil, water, climate, and fire conditions are suitable for restoration | 27 | 27 | 45 | 11 | In place |
| | | 10 | Plants and animals that can impede restoration are absent | 9 | 73 | 18 | 11 | Partly in place |
| | | 11 | Native seeds, seedlings, or sources populations are readily available | 18 | 36 | 45 | 11 | In place |
| | f. Market conditions | 12 | Competing demands (e.g., food, fuel) for degraded forestlands are declining | 100 | 0 | 0 | 13 | Not in place |
| | | 13 | Value chains for products from restored areas exists | 33 | 17 | 50 | 12 | In place |
| | g. Policy conditions | 14 | Land and natural resource tenure are secure | 0 | 10 | 90 | 10 | In place |
| | | 15 | Policies affecting restoration are aligned and streamlined | 33 | 17 | 50 | 12 | In place |
| | | 16 | Restrictions on clearing remaining natural forests exist | 0 | 23 | 80 | 10 | In place |
| | | 17 | Forest clearing restrictions are enforced | 0 | 43 | 57 | 14 | In place |
| | h. Social conditions | 18 | Local people are empowered to make decisions about restoration | 10 | 60 | 30 | 10 | Partly in place |
| | | 19 | Local people are able to benefit from restoration | 0 | 8 | 92 | 12 | In place |
| | i. Institutional conditions | 20 | Roles and responsibilities for restoration are clearly defined | 0 | 83 | 17 | 12 | Partly in place |
| | | 21 | Effective institutional coordination is in place | 8 | 83 | 8 | 12 | Partly in place |
| Implement | j. Leadership | 22 | National and/or local restoration champions exist | 67 | 33 | 0 | 15 | Not in place |
| | | 23 | Sustained political commitment exists | 40 | 60 | 0 | 15 | Partly in place |
| | k. Knowledge | 24 | Restoration "know how" relevant to candidate landscapes exist | 36 | 57 | 7 | 14 | Partly in place |
| | | 24 | Restoration "know how" transferred via peers or extension services | 64 | 36 | 0 | 11 | Not in place |
| | l. Technical design | 26 | Restoration design is technically grounded and climate resilient | 18 | 64 | 18 | 11 | Partly in place |
| | | 27 | Restoration limits "leakage" | 67 | 25 | 8 | 12 | Not in place |
| | m. Finance and incentives | 28 | Positive incentives and funds for restoration outweigh negative incentives | 43 | 50 | 7 | 14 | Partly in place |
| | | 29 | Incentives and funds are readily accessible | 23 | 62 | 15 | 13 | Partly in place |
| | n. Feedback | 30 | Effective performance monitoring and evaluation system is in place | 64 | 36 | 0 | 14 | Not in place |
| | | 31 | Early wins are communicated | n/a | n/a | n/a | | Not listed |

## Anexo II - Appendix 2. Strategy for forest restoration and biodiversity conservation

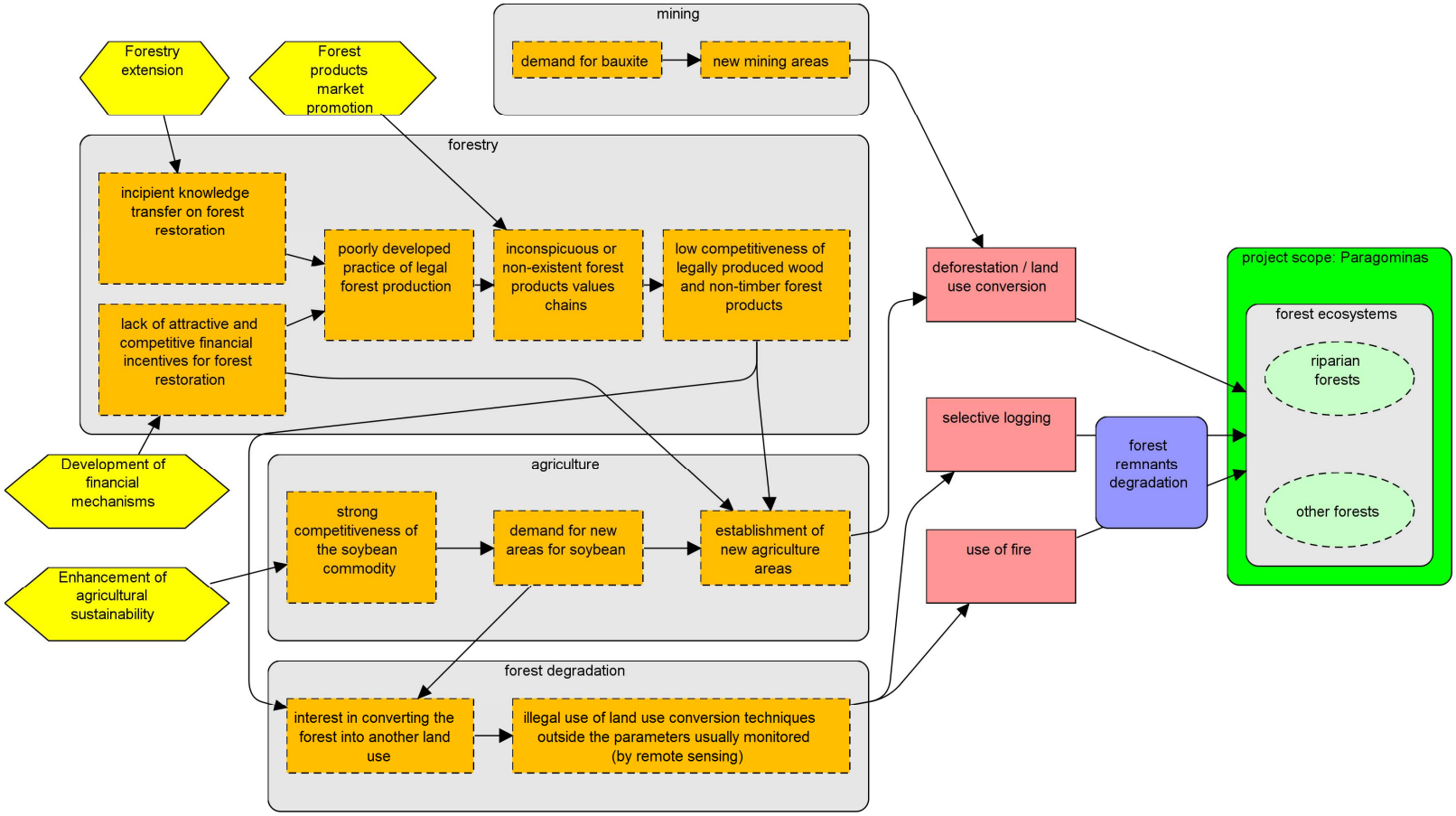
### a. Captions



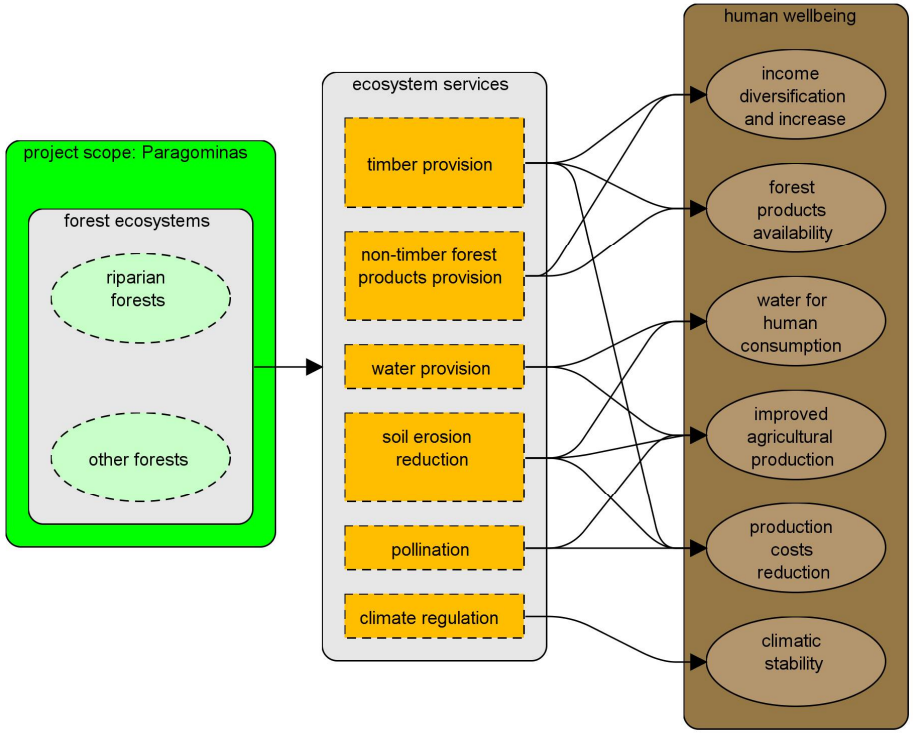
## b. Conceptual Model




i. Complete conceptual model for key success factors absent for restoration in Paragominas, PA.




ii. Partial conceptual model of key success factors absent for restoration in Paragominas, PA.

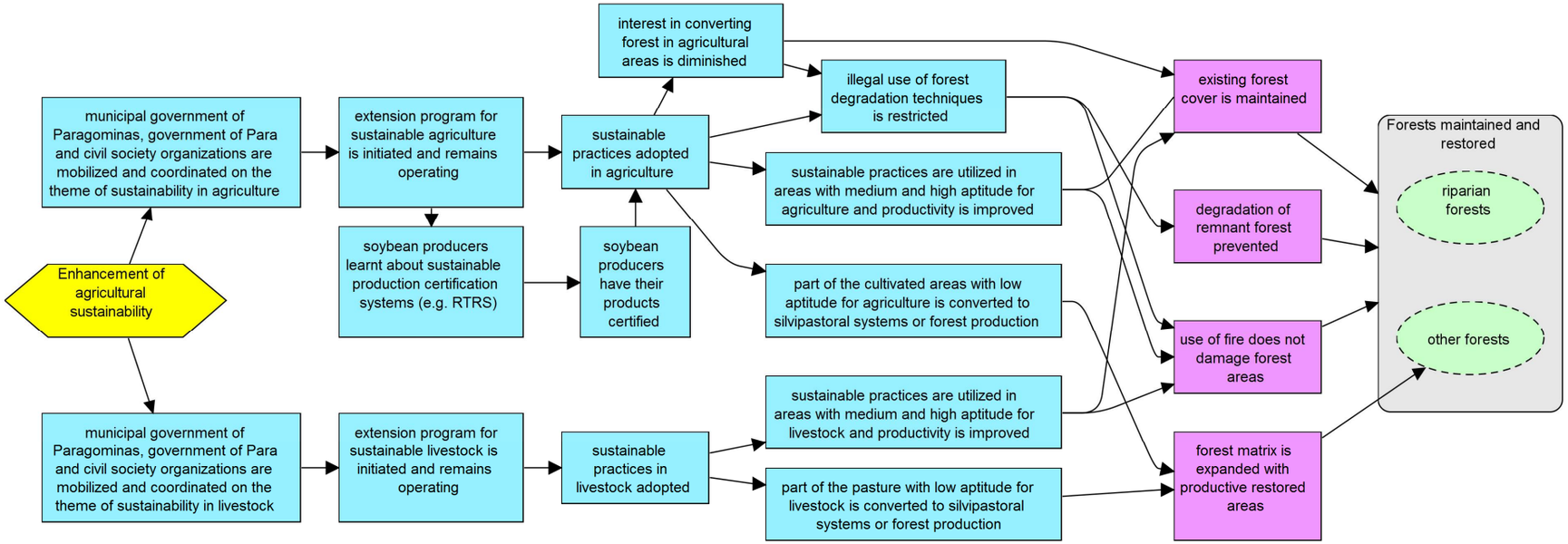



For projects aiming to implement strategies that promote biodiversity conservation, it is essential to have identifiable conservation targets to ensure a strategic view of the process and its clarity of purpose. In this case, the restoration strategy aims to combat the loss of forest cover and the degradation of forest formations.

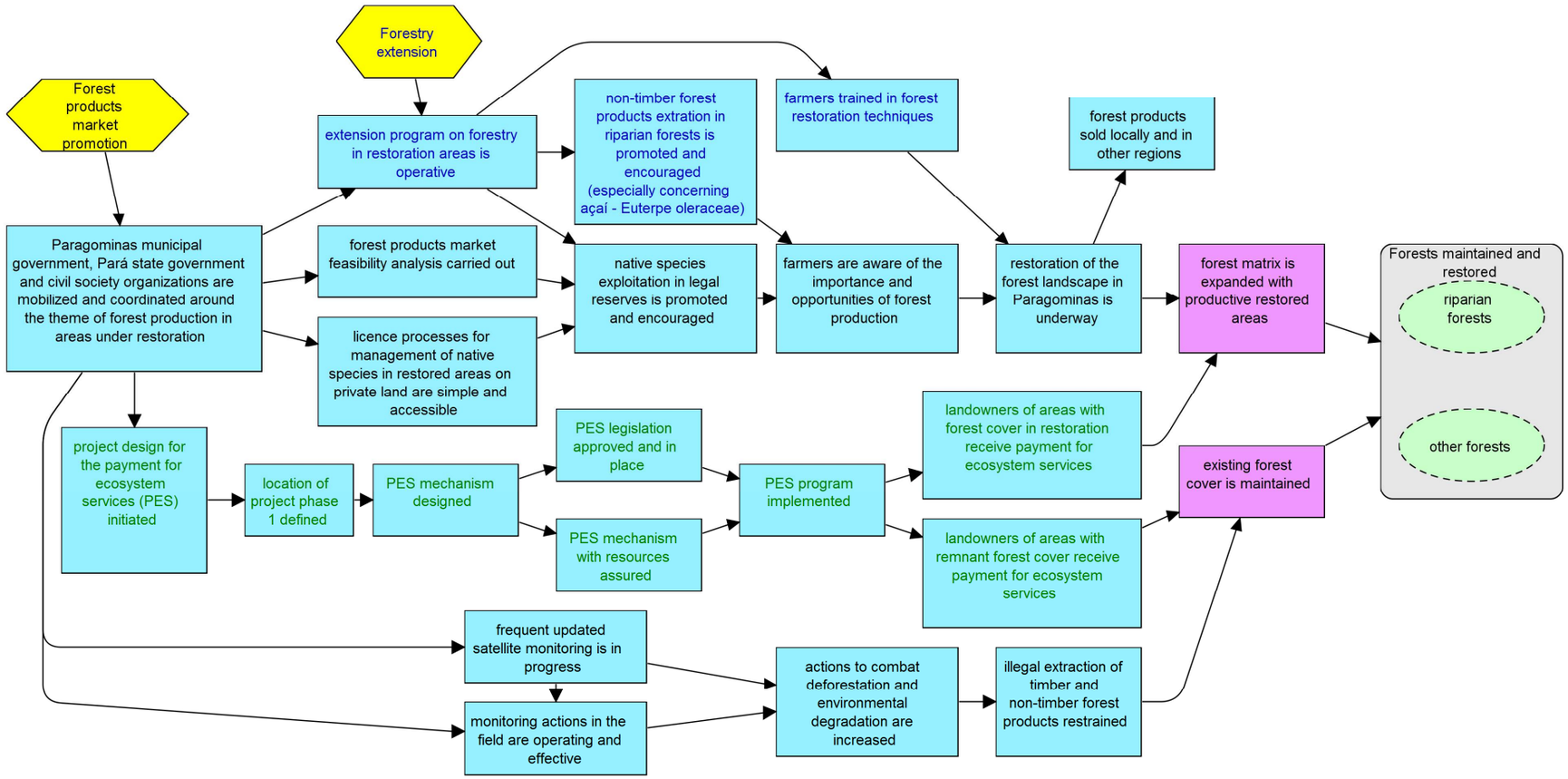
The conservation targets for the Paragominas restoration strategy were identified; then they were associated with ecosystem services produced and with goals for human well-being. Understanding the link between implementation of the restoration strategy, biodiversity conservation, ecosystem services, and the generated benefits to human well-being is critical for an integrated and comprehensive understanding of the results of the efforts undertaken.

iii. Relationship between conservation targets and human well-being in Paragominas, PA.

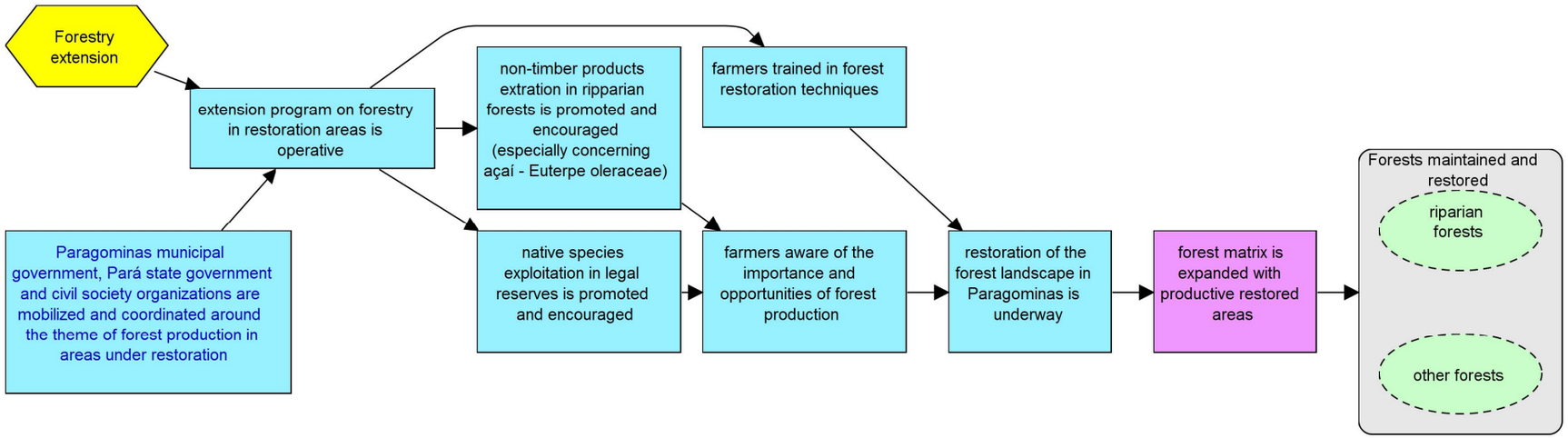
## c. Result chains of main strategies



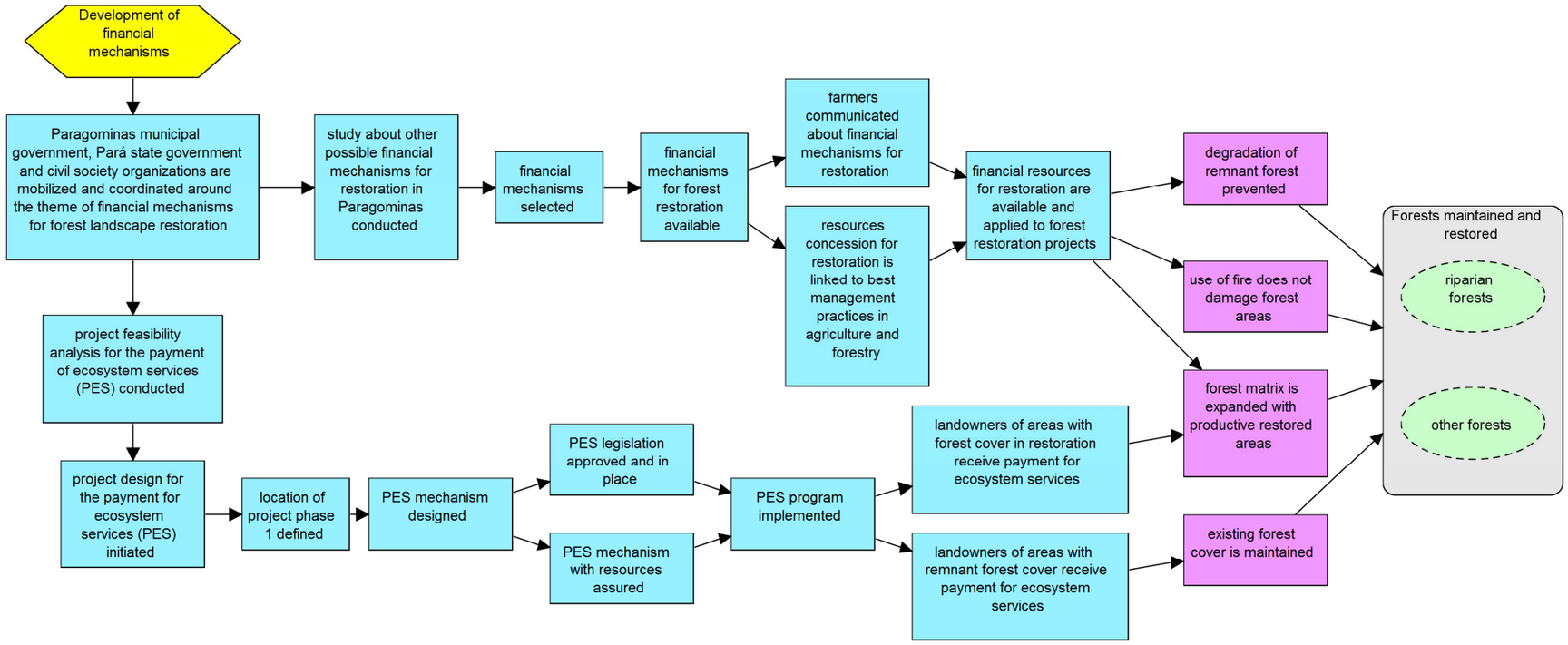

### i. Results chain of the Sustainable Agriculture and Livestock Intensification strategy for key success factors absent for restoration in Paragominas, PA.




ii. Results chain of the Forest Encouragement strategy for key success factors absent for restoration in Paragominas, PA.




iii. Results chain of the Technical Assistance and Forestry Extension strategy for key success factors absent for restoration in Paragominas, PA.




iv. Results chain of the Development of Financial Mechanisms Strategy for key success factors absent for restoration in Paragominas,PA