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AMAZONAS
GOVERNO DO ESTADO

The Juma Sustainable Development Reserve Project: Reducing Greenhouse Gas Emissions from Deforestation in the State of Amazonas, Brazil

PROJECT DESIGN DOCUMENT (PDD)

For validation at

"CLIMATE, COMMUNITY & BIODIVERSITY ALLIANCE (CCBA)"

VERSION 5.0

(29/09/2008)

TECHNICAL COORDINATION

IDESAM
Instituto de Conservação e Desenvolvimento Sustentável do Amazonas

SDS
Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável

PARTNERS

ceuc Amazonas

CECLIMA
Centro Estadual de Mudanças Climáticas

SEPLAN
Secretaria de Estado de Planejamento e Desenvolvimento Econômico

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I. GENERAL INFORMATION

Location of the project:
Country: Brazil
Nearest City: Novo Aripuanã, State of Amazonas (AM)

Precise location of project activities: The "Juma" Sustainable Development Reserve (*Reserva de Desenvolvimento Sustentável do Juma*,) Novo Aripuanã municipality, Southern Amazonas.

Implementing Organization

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Primary functions of institution proposing the project: FAS is responsible for the overall project coordination

Institutional Partners

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Primary functions of institutional partner in the project: CECLIMA will be responsible for the activities of the State Program of Climate Changes

B) State Center for Protected Areas (CEUC) within the Secretariat of Environment and Sustainable Development of the Government of the State of Amazonas (SDS/AM) *(Centro Estadual de Unidades de Conservação vinculada à Secretaria do Meio Ambiente e Desenvolvimento Sustentável do Amazonas)*

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Primary functions of institutional partner in the project: Technical coordination of field activities

C) Institute for Conservation and Sustainable Development of Amazonas (IDESAM)
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Primary functions of institutional partner in the project: Coordination of the carbon methodology and Project Design Document (PDD)

D) **Marriott International, Inc.**

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Primary functions of institutional partner in the project: Financial input

II. EXECUTIVE SUMMARY

Historical Context

The Brazilian Amazon is under great pressure. An estimated 17 percent of the original forest cover has already been lost. From 2000 to 2007, more than 150,000 square kilometers of the region's forests were destroyed, an area equal to 3.7 percent of the total area of the Legal Amazon (INPE, 2008). In contrast, during this same period the State of Amazonas, the largest Brazilian State (1.5 million square kilometers), lost only 0.4% of its forested area (INPE, 2008). Historically, Amazonas has always had the lowest deforestation rate in the Brazilian Amazon with ninety-eight percent (98%) of the State's original forest cover still intact.

However, over the past few years the decline in forest cover and the lack of available land resulting from the intense historic deforestation in the other states of the Brazilian Amazon, such as Acre, Mato Grosso, Pará and Rondônia, have driven an obvious trend of migration towards the central region of the Amazon, primarily in the State of Amazonas. The agriculture and cattle production expansion makes the large expanses of sparsely populated forests of the Amazon even more attractive. The scenario going forward is clear: if the historic trends of deforestation in the Amazon continue, then millions of hectares in the State of Amazonas will be deforested and replaced with large areas of pasture and agricultural crops.

The most advanced models for simulating deforestation indicate that the rate of deforestation in the State of Amazonas will increase rapidly in the coming decades. Many experts consider the SOARES-FILHO *et al.* (2006) deforestation simulation model, SimAmazonia I, designed by the program "Amazon Scenarios," and led by the Amazonas State Institute for Environmental Protection (IPAM), The Federal University of Minas Gerais and the Woods Hole Research Center, to be one of the most refined models for the Amazon region. SimAmazonia I indicates that there will be a strong deforestation trend in the near future, which could result in a loss of up to 30 percent of Amazonas' forest cover by 2050. If concrete measures to prevent deforestation are not undertaken, deforestation in the protected areas of the State of Amazonas could emit close to 3.5 billion tons of CO_2 into the atmosphere[1].

The Juma Reserve RED Project

The Juma Sustainable Development Reserve Project for Reducing Greenhouse Gas Emissions from Deforestation ("Juma Reserve RED Project") aims to address deforestation and its resulting emission of greenhouse gases (GHG) in an area of the State of Amazonas, which is under great land use pressure. Its implementation is part of a wide strategy planned and initiated in 2003 by the current Government of the State of Amazonas to halt deforestation and promote sustainable development in Amazonas, based on giving value to the environmental services provided by its standing forests. (BRAGA & VIANA *et al.*, 2003; AMAZONAS, 2002).

[1] This volume of GHG emissions is the same amount that is released annually by the European Union or China. These emissions are four times as much as Germany releases in a single year.

According to the SimAmazonia I model, the region in which the Novo Aripuanã municipality is located is in an area under high risk for deforestation. Under the "business as usual" scenario, the paving of large highways (BR-319 and AM-174) will result in the loss of large expanses of forest by 2050. These deforestation forecasts were strongly considered by the Government of Amazonas when it established the Juma Sustainable Development Reserve in 2006. The objectives of creating the reserve were to protect forests with high conservation value. The reserve seeks to protect species in risk of extinction while also preserving the quality of life of the hundreds of families that live in these areas.

The Juma Reserve RED Project involves the establishment of a Protected Area for Sustainable Use *(Unidade de Conservação de Uso Sustentável)* in a region that would be almost completely deforested under the "business as usual" scenario if the current land use practices in the Amazon region continue. The Juma Reserve was created in an area of 589,612 hectares of Amazonian forest located alongside the BR-319 highway and crossed by the AM-174 highway. Its creation and effective implementation was only possible due to the perspective of the Government of the State of Amazonas' plan to create a financial mechanism for generating a financial compensation from activities reducing emissions from deforestation (RED). The resources raised from the sale of these credits will permit the State Government to implement all of the measures necessary to control and monitor deforestation within the project site, enforce the law, and improve the welfare of local communities.

The Juma Reserve RED Project will be the first project of its kind to be implemented since the creation and approval of the State Policy on Climate Change Law (*Lei da Política Estadual de Mudanças Climáticas*, PEMC-AM) and the State System of Protected Areas (*Sistema Estadual de Unidades de Conservação*, SEUC-AM). This legislation provides the entire legal framework necessary to implement these types of projects in the Amazonas.

Based on the baseline scenario for the project area, the project expects to prevent the deforestation of about **329.483 hectares of tropical forests** that would release **189.767.027,9 tons of CO_2** into the atmosphere. It will only be possible to implement the project if the RED financial mechanism proves viable and capable of generating the resources necessary to cover the operational costs of implementing the activities to protect the Juma Reserve. In addition to the climate change mitigation benefits associated with the reduction of greenhouse gas emissions (GHG), the project expects to generate a variety of social and environmental benefits in the project area. These benefits will come from the following programs and groups of activities:

1. **<u>Strengthening of environmental monitoring and control</u>** by making improvements in the existing monitoring system managed by the local communities and by making large investments in the work of the environmental protection infrastructure and staff and the land titling agencies, as well as in advanced remote sensing monitoring techniques. The costs of monitoring remote areas like the Juma Reserve are very expensive because the area is very difficult to access. The RED mechanism will provide the resources necessary to overcome the great deficiencies of the State's ability to monitor such areas.

2. **<u>Income Generation Through the Promotion of Sustainable Businesses</u>[2]:** Community organization and business training will be combined to improve the local capacity in forest management and forest product extraction. Research and development of new technologies will allow for innovation in the quality and types of products local communities produce. Furthermore, market development activities will be undertaken to improve market access. This combination should enhance the production of forest products from the local communities involved in the project.

3. **<u>Community Development, Scientific Research and Education</u>[3]:** Education centers will be constructed to train and transmit scientific information to local communities in conservation efforts as well as to provide opportunities for the training of professionals specializing in biology, forest management, environmental education, etc. The involvement of local communities will only be possible through the existence of solid and active organizations, which are also necessary for organizing and strengthening local populations.

4. **<u>Direct Payment for Environmental Services ("Bolsa Floresta" Program):</u>** The communities will receive direct benefits for their contributions to conservation, such as access to clean water, healthcare, information, productive activities and other improvements in their quality of life. Furthermore, a portion of the financial resources generated by the project will be paid to traditional communities in the Juma Reserve for environmental services through the establishment of all four components of the "Bolsa Floresta" Program: i) Bolsa Floresta **Family**; ii) Bolsa Floresta **Social**; iii) Bolsa Floresta **Association;** and iv) Bolsa Floresta **Sustainable Income Generation**. This translates into concrete and direct benefits for some of the most marginalized and vulnerable populations, who are dependent on the forest for their survival.

The "Juma Reserve RED Project" will be implemented by the Amazonas Sustainable Foundation (*Fundação Amazonas Sustentável*, FAS) in partnership with the State Secretariat of the Environment and Sustainable of Amazonas (*Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável do Amazonas*, SDS/AM) with technical assistance from the Institute for Conservation and Sustainable Development of Amazonas (*Instituto de Conservação e Desenvolvimento Sustentável do Amazonas*, IDESAM). IDESAM will be responsible for the technical coordination of the development process for the Baseline Methodology and Monitoring as well as the Project Design Document (PDD). The project implementers will provide investors and donors with a guarantee that the execution and completion of the project will be done in a manner that complies with all of the relevant legal, governmental and regulatory structures. The project was designed through a transparent process involving participatory workshops and political consultations in order to guarantee the involvement and commitment of all the local stakeholders.

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[2] Marginalized communities are more likely to participate in the illegal exploitation of natural resources. The lack of training in forest management results in the use of destructive practices that produce low quality products with limited market demand.

[3] Because the influence and deforestation pressure normally comes from outside the protected areas, it is essential to help the communities living inside these areas, especially helping the future generations of decision makers understand the importance of Forest conservation.

III. GENERAL SECTION

G1. Original Conditions at the Project Site

General Information

G1.1 - Describe the location of the project and basic physical parameters (e.g., soil, geology, climate).

Location of the Project

The Juma Sustainable Development Reserve RED Project encompasses 589,612.8 hectares in the municipality of Novo Aripuanã, in the southeastern region of the Brazilian State of Amazonas (Figure 01). The Reserve is located 227.8 km south of the city of Manaus. The urban area of the city of Novo Aripuanã is found about 10 km east of the northern boundary of the Reserve, which runs along the right bank of the mouth of the Aripuanã river.

The western boundary of the Reserve is defined by the Mariepauá river, which forms the frontier between the municipalities of Novo Aripuanã and Manicoré. The southern boundary is defined by Federal land (100 km north of Transamazon Highway – BR-230), and the eastern boundary is defined by the left bank of the Acari River. The Reserve's relatively narrow northern boundary is defined by the Madeira River (SDS, 2007).

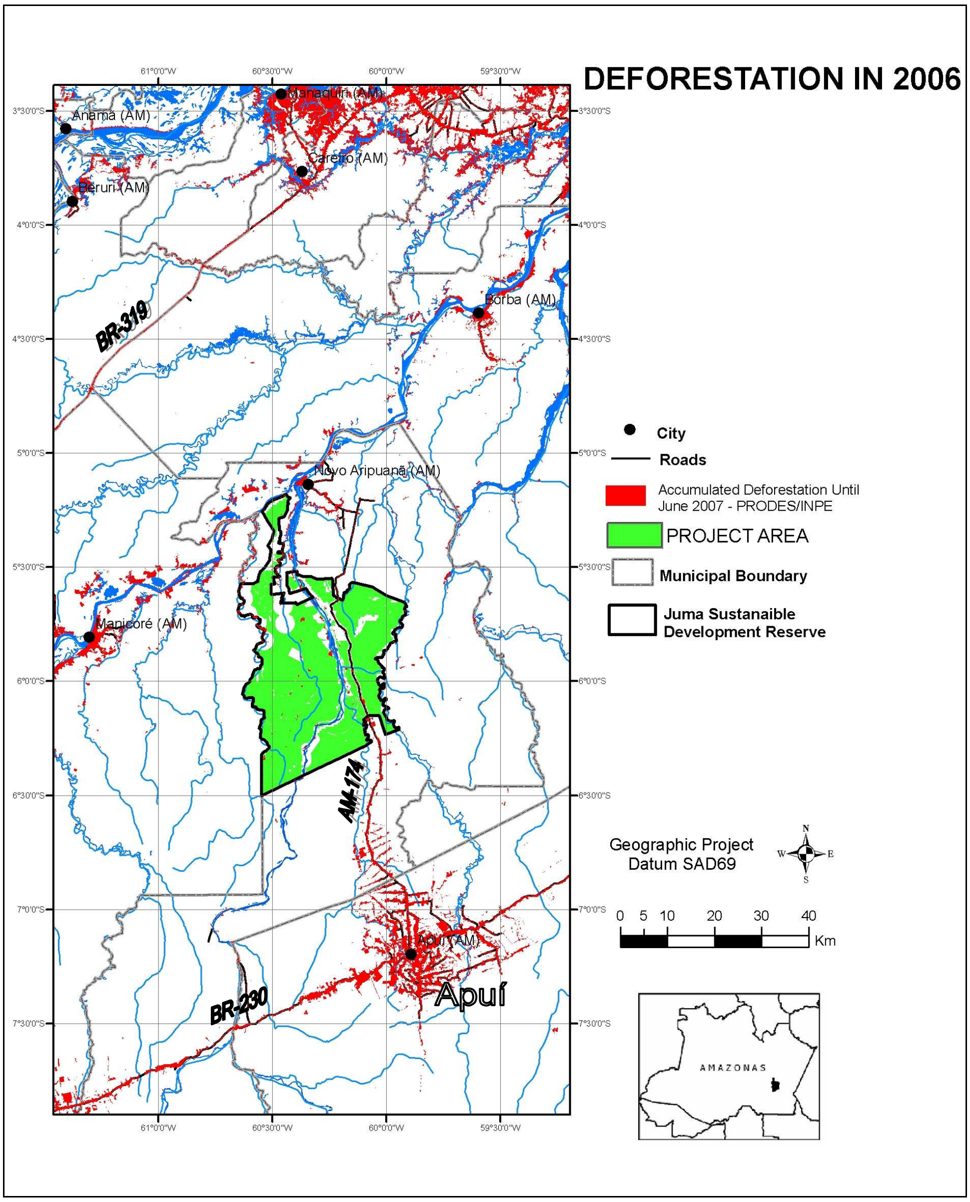

Figure 01. Location of the Juma Reserve RED Project, showing also the BR-319, AM-174 and BR-230 highways and the municipalities of Novo Aripuanã, Manicoré and Apuí

Hydrology

The Juma Reserve RED Project is located in one of the two most important interfluvial regions in Amazonas, between the Madeira and Purus Rivers. Its area is drained by a complex system of rivers and streams, including both banks of the lower region of the Aripuanã River, the main tributary of the Madeira River. The main tributaries of the Aripuanã River in the region of the Reserve are the Acari River (the left bank of which defines the eastern boundary of the Reserve), the Mariepauá River (the right bank of which defines the western boundary of the Reserve) and the Juma River (which defines the southern limit of the Juma Reserve).

Geology

Most of the geology of the region comprises Cenozoic Deposits, with sediments from the Tertiary and early Quaternary periods, which make up the Solimões Formation, occupying practically all of the central and northern regions of the Juma Reserve (Figure 02) (RADAMBRASIL, 1978). The geology of the southern region of the Reserve is formed mainly by two different deposits from the Early Precambrian of the Uatumã Supergroup. The first, the Beneficente Group, includes marine deposits as well as continental deposits with volcanic and pyroclastic inclusions. The second, the Roosevelt Formation, includes acidic volcanic rock. The eastern section of the Reserve contains the Prosperança formation from the Upper Pre-Cambrian to the Ordovician, which comprises a group of reddish and young sediments and which is considered the cover of the platform. Recent alluvium is also found all over the Aripuanã River floodplain, while the old alluvium, which comprises mostly fine-grained quartz sands, is sparse and is limited to small patches within the Juma Reserve's area.

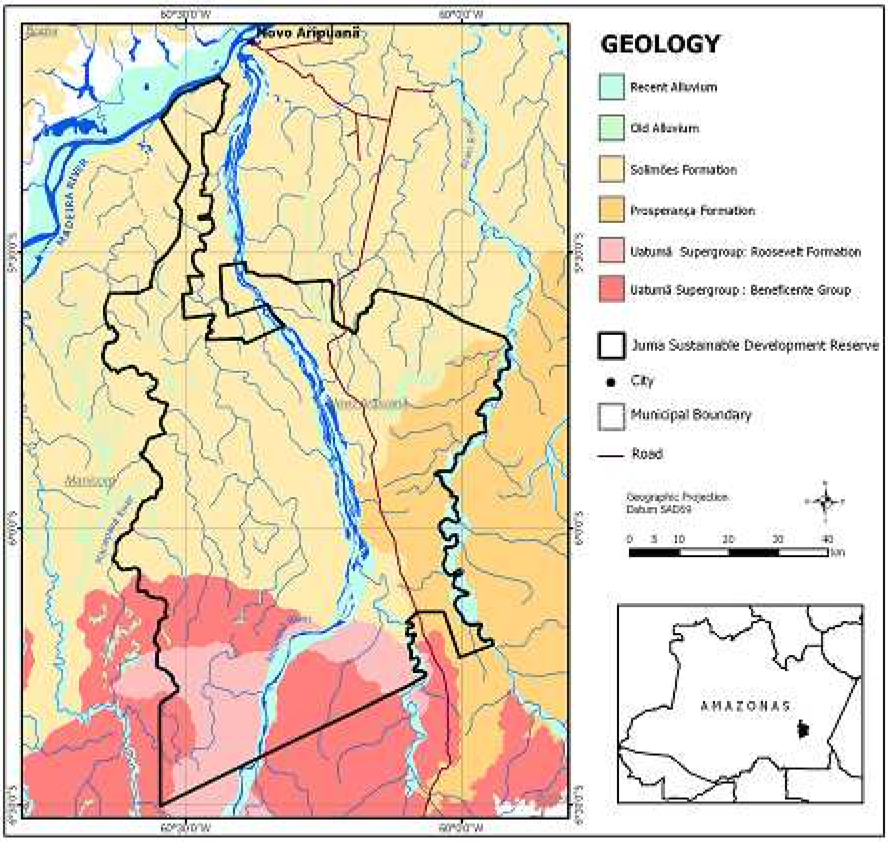

Figure 02 - The Geology of the Juma Sustainable Development Reserve

Geomorphology and soils

The Juma Reserve is located mostly within a morpho-climatic domain in plateaus and dissected depressions and pedi-plained surfaces, with sub-thermaxeric regional climate (one to two dry months per year), gentle or severe. The Aripuanã River, which crosses a large portion of the Juma Reserve, is a sinuous river with straight sections that are occupied by elongated islands that run parallel to the course of the river. These islands are located over Pre-Cambrian and Plio-Pleistocene rocks. The strip of fluvial deposits from the Aripuanã River is narrow and continuous, stabilized by fluvial terraces (RADAMBRASIL, 1978).

The Juma Reserve has three dominant morpho-structural units. The first is the Western Amazon Low Plateau (*Planalto Rebaixado da Amazônia Ocidental)* morpho-structural unit, with a terrain dissected by interfluvial plains. This morpho-structural unit dominates the majority of the Juma Sustainable Development Reserve. The second morpho-structural unit is the Cachimbo Ridges and Plateaus *(Serras e Chapadas do Cachimbo)*, which is found to the right of the Aripuanã from the mouth of the Juma river to the north of the Reserve (RADAMBRASIL, 1978). The third morpho-structural unit is the Southern Amazon Inter-plateau Depression (*Depressão Interplanáltica da Amazônia Meridional)*, which is found in the extreme northwest of the Juma Reserve. This part of the Reserve is characterized by a low-lying area where interfluvial flats are the predominant feature (RADAMBRASIL, 1978).

The Juma Reserve area is dominated by Allic Yellow Latosol (91.1% of its area), while the Allic Low Humic Gley soils (5.2% of its area) are found in the interfluvial plains of the Aripuanã River and its tributaries. Some patches of Hydromorphic Podzols of differing sizes are associated with some streams within the Reserve area (1.7% of its area). There are also Dystrophic Alluvial soils found at the northern edge of the Juma Reserve and in the Madeira River floodplain, but they represent only 0.1 percent of the total area of the Reserve (see Figure 03) (RADAMBRASIL, 1978).

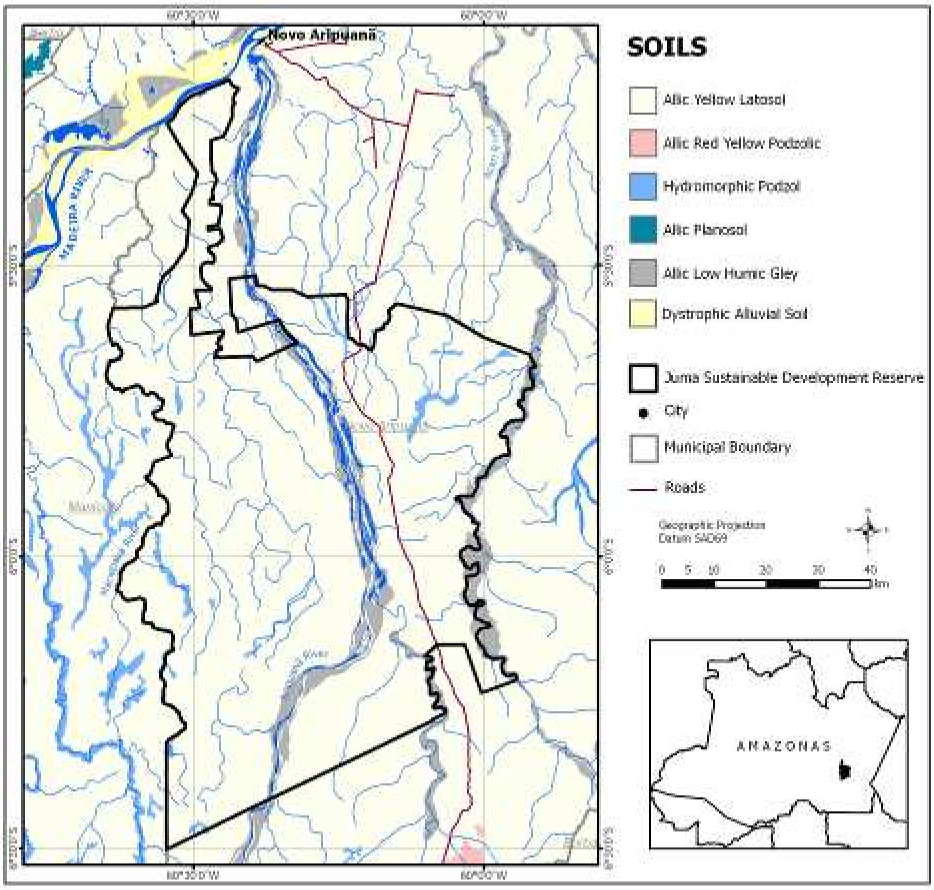

Figure 03. Soil Map for the Juma Sustainable Development Reserve RED Project

Climate

According to World Map of Köppen-Geiger Climate Classification, the climate of the region of Nova Aripuanã is equatorial (KOTTEK *et al*., 2006) (Figure 04). The average temperature is about 25º C with a minimum temperature of 21º C and a maximum temperature of 32º C. The average annual rainfall is about 2,000 mm with 70% of the region's precipitation being concentrated between the months of October and April. The region's average relative humidity is about 85%. Novo Aripuanã receives 2,000 hours of sun per year (SDS, 2007).

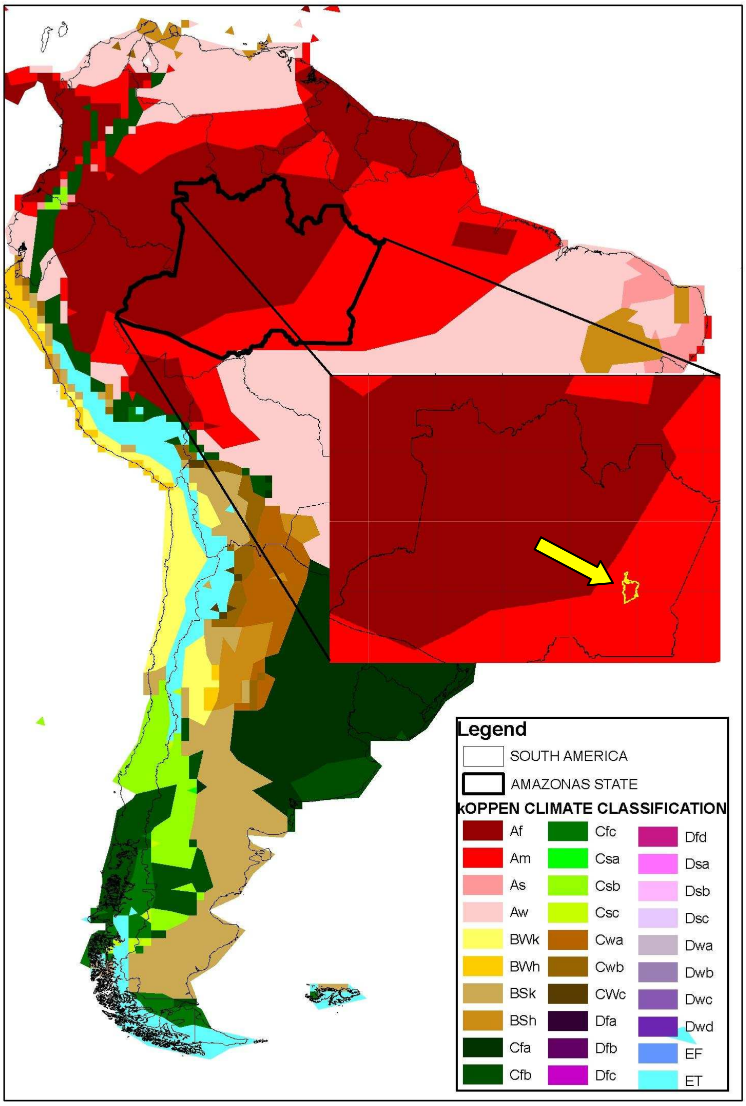

Figure 04 – Climate Classification at the Juma Reserve location (Am), according to the Köppen-Geiger Climate Classification

G1.2 – Describe the types and condition of vegetation at the project site:

The Juma Reserve RED Project is covered almost entirely by well-preserved tropical forest. According to the phyto-ecological definitions established by the RADAMBRASILProject (RADAMBRASIL, 1978) and VELOSO *et al.* (1991) (see item *G1.3*), there tthree major forest types in the project site, asdescribed below (see Figure 05)[4]:

Submontane Ombrophyllous Dense Forest – *Floresta Ombrófila Densa Submontana* (Ds)
Dense forests cover both the plateaus of the Precambrian platform and the dissected terrain in hillocks and hills. This is the dominant vegetative phyto-physiognomy in the southern region of the Juma Sustainable Development Reserve. In the plateaus, the forests have a uniform structure, with wide, tall trees (over 40 m), with or without palm trees and lianas. It is also characterized by a large number of emergent trees. This forest does not have an herbaceous stratum, but rather an intense secondary regeneration of tree species. On the hillocks and hills, the forest structure varies with the degree of dissection of the terrain. The presence of emergent trees decreases in proportion to the declivity of the terrain. **This vegetation type has an estimated average carbon stock of 135.77 tons of carbon per hectare (**MCT, 2006)**[5] to 184.71 tons of carbon per hectare** (NOGUEIRA *et al* 2008a,b, c)[6], varying according to the two main estimates existent in the literature.

Lowland Ombrophyllous Dense Forest – *Floresta Ombrófila Densa de Terras Baixas* (Db)
This forest type is the dominate type found in the northern area of the Juma Reserve, replacing Submontane Ombrophyllous Dense Forests as one moves north in the Reserve area. These forests have groupings of emerging trees at the highest interfluvial elevations. Significant densities of palm trees are found, which compete for light in the upper strata of the forest. **This vegetation type has an estimated average carbon stock of 139.49 tons of carbon per hectare (**MCT, 2006)**[7] to 184.31 tons of carbon per hectare** (NOGUEIRA *et al* 2008a,b, c)[8], varying according to the two main estimates existent in the literature.

Ombrophyllous Dense Alluvial Forest – *Floresta Ombrófila Densa Aluvial* (Da)
This type of arboreal forest is characteristically found along the banks of the Aripuanã River and part of the Acari River region along the eastern limit of the Juma Reserve. This forest type is found in areas that are subject to seasonal flooding, and is ecologically adapted to the associated intense variations in the water level. These forests benefit from the regular renewal of the soils from seasonal floods. It is not a climax environment. During the flood periods, a certain decrease in biological activity occurs, which can decline to the point of dormancy if the flooding season is abnormally extended. **This vegetation type has an estimated average carbon stock of 139.49 tons of carbon per hectare (**MCT, 2006)**[9] to 172.95 tons of carbon per hectare** (NOGUEIRA *et al* 2008a,b, c)[10], varying according to the two main estimates existent in the literature.

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[4] For detailed definitions of the vegetation types of the project region, please see RADAMBRASIL Project (1978), in the "Folha SB.20 Purus", in the vegetation section (pp. 375-387) and the sheets "Manicoré SB.20 X-D" (pp. 440-445) and "Rio Arauá SB.20 Z-B" (pp. 458-464). These definitions include details such as differentiation of Submontane dense forests on slopes or dissected terrains or interfluvial plains, etc. Additionally, some pictures of the vegetation types can be found in the same section (pp. 487-490).
[5] The presented values from MCT have already the addition off 21% for belowground biomass – explained on item G1.3
[6] A detailed description of the methodologies used to define the carbon stocks on the vegetation is presented in the Item G1.3
[7] The presented values from MCT have already the addition off 21% for belowground biomass – explained on item G1.3
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[9] The presented values from MCT have already the addition off 21% for belowground biomass – explained on item G1.3
[10] A detailed description of the methodologies used to define the carbon stocks on the vegetation is presented in the Item G1.3

Since the RADAMBRASIL classification was made for the scale of the entire Amazon Basin (5.4 million km^2), it was needed a “remote sensed” flyover to validate its classification for the project scale (4,2776 km2). The flyover was made with a GPS tracking system that collected points and was connected to a video camera attached below the plane, simultaneously sending images to a monitor where the project area was re-classified. During the flyover it was established that some areas were not in accordance with those presented on the RADAMBRASIL vegetation map[11].

Thus, the boundaries of the original vegetation classes from RADAMBRASIL were appropriately adjusted to the on-site conditions of the project. It was also decided to re-classify two of the vegetation classes to simplify the ex-ante carbon estimates. The **Submontane Ombrophyllous Dense Forest** and **Lowland Ombrophyllous Dense Forest** were grouped into a new class called **Dense Forest**. This grouping was made because no clear difference was detected in the vegetations during the flyover, and because the carbon stocks presented in the literature for the two vegetation classes, (submontane = 186.8 tC/ha; lowland = 184.3 tC/ha) are not significantly different. The corrected map is shown in Figure 05, and the methodology used to classify the vegetation is presented in Annex VI.

[11] Some vegetation classes were larger than those presented on the RADAMBRASIL vegetation map, and others were displaced from the exact point as mapped by remote sensing.

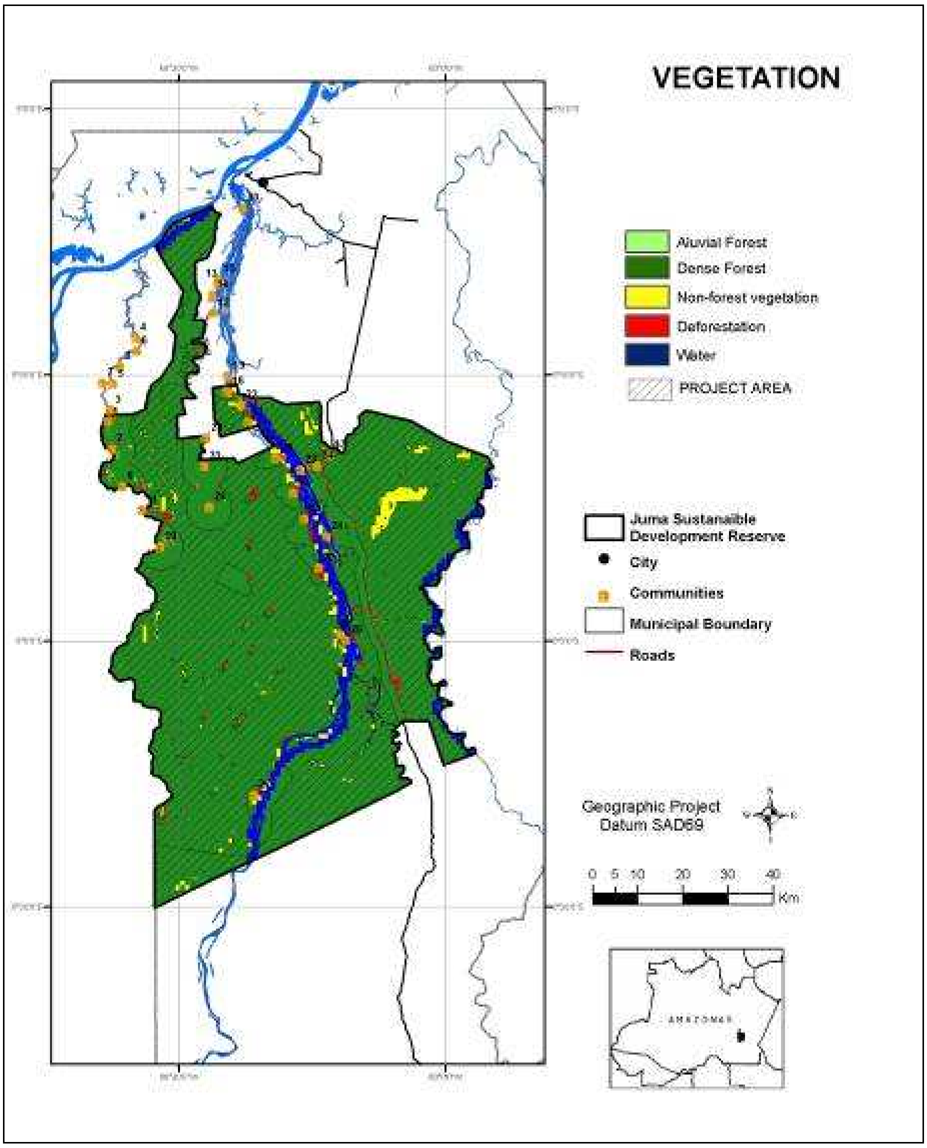


Figure 05 – The two types of vegetation found within the boundaries of the Juma Reserve RED Project

According to the most recent data available, the deforested areas within the Juma Reserve were limited to 6,493 hectares (1.1% of the Juma Reserve area) in June 2006 (INPE, 2008). The methodology used to quantify deforestation within the project area using the PRODES system is described in Annex VIII.

The patches of deforestation in the project area result basically from land clearing for small scale agriculture practiced by the local communities, and medium to large scale deforestation in areas illegally occupied by land grabbers and cattle ranchers along the sides of the road connecting Novo Aripuanã to Apuí (AM-174), which crosses the project area in a north to south direction (Figure 06).

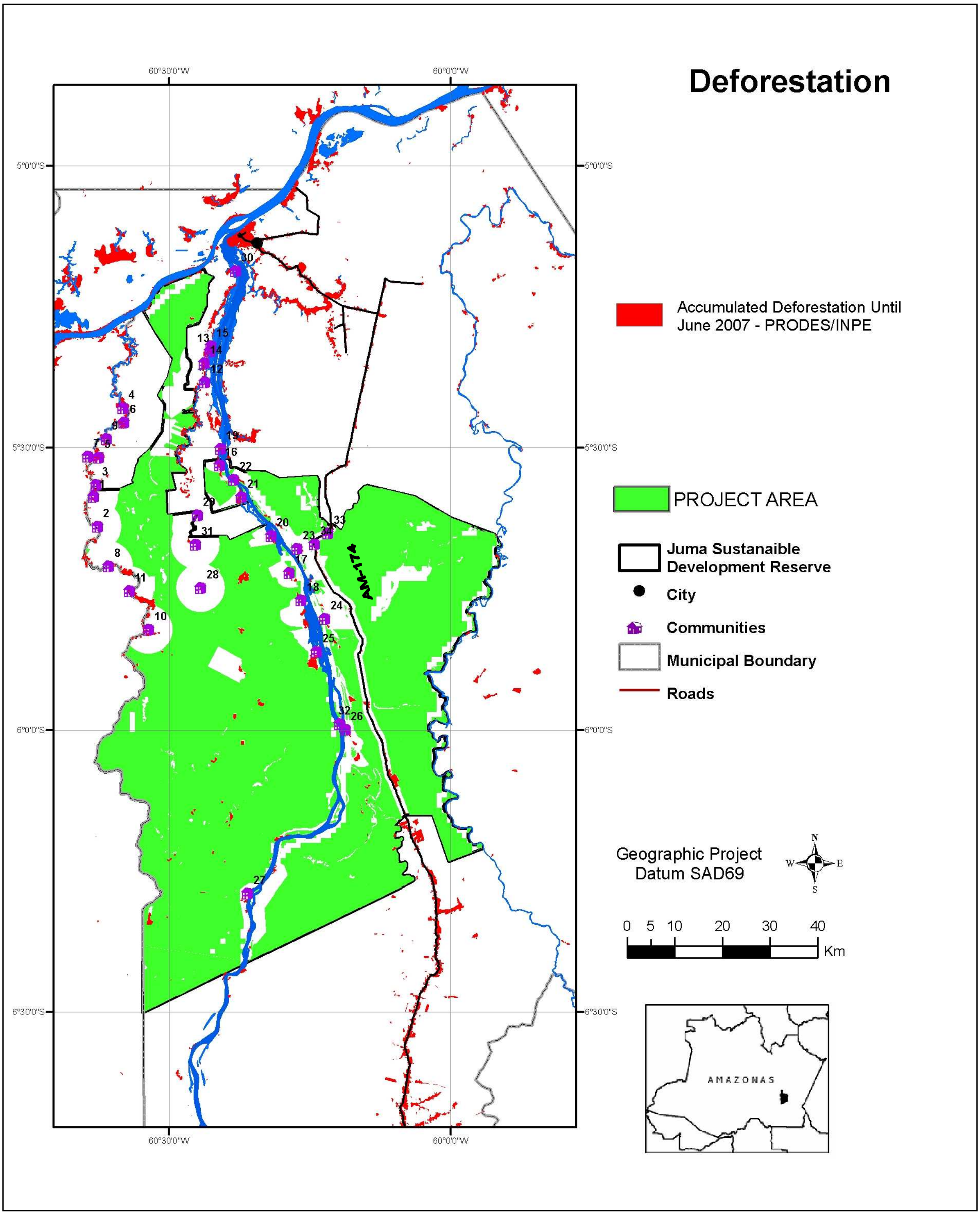


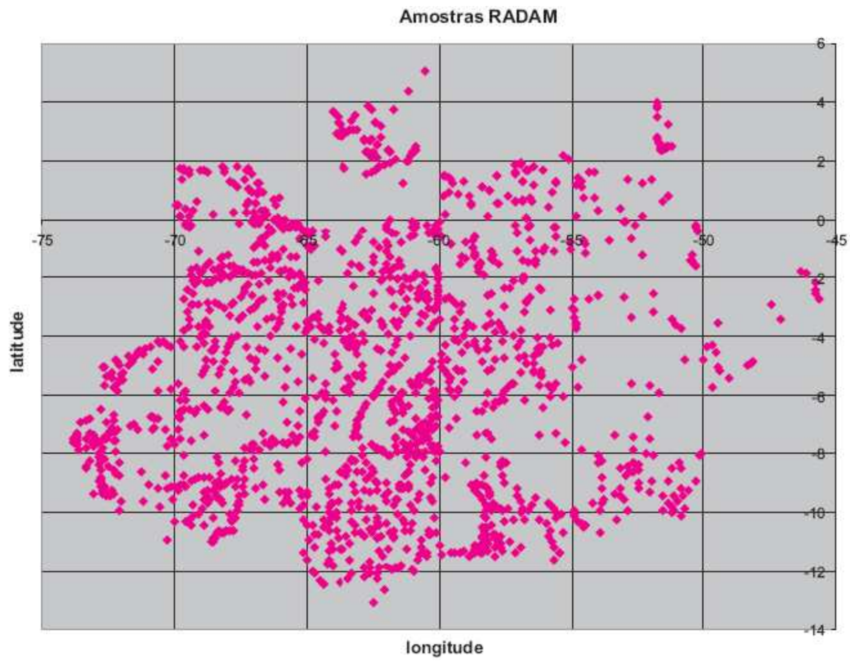
Figure 06 – Deforested areas observed in June, 2006 in the area of the Juma Reserve RED Project (Source: INPE, 2008).

Climate Information

G1.3 - Current carbon stocks at the project site(s), using methodologies from the Intergovernmental Panel on Climate Change's Good Practice Guidance (IPCC GPG) or other internationally approved methodologies (e.g. from the CDM Executive Board):

The sources used to define the carbon stocks in the vegetation classes of the project are derived from MCT (2006) and Nogueira *et al.* (2008), based on the RADAMBRASIL Project (1978).

The RADAMBRASIL Project was a great government program carried out between 1973 and 1983, which installed 2,719 sample plots in the Brazilian Legal Amazon for biomass inventories (Figure 07). Of these plots, 13 were located inside the Juma Project boundaries[12] (BRASIL, RADAMBRASIL, 1973-1983). The measurements that were taken in each plot to calculate the biomass of the different forest phyto-physiognomies included all trees with a Circumference at Chest Height (CCH) greater than 100 cm (i.e., a Diameter at Chest Height (DCH) greater than or equal to 31.83 cm).



Source:RADAMBRASIL (1973-1983)

Figure 07: Sampling points of the RADAMBRASIL in the Brazilian Amazon

The composition and structure of the forest inventories of the sampled plots, including those within and surrounding the Juma Reserve (white spots in Figure 08), are described in RADAMBRASIL (1978, pp. 397-413), which details (i) all the *taxa* at least up to *General* level; (ii) the bole volume per class of Circumference at Chest Height of trees over 100 cm; (iii) the frequency and abundance of each *taxon;* and, (iv) a phyto-sociological analysis. The detailed data of each sampled plot (red dots in Figure 1) can be found in Annex IV "Vegetation of the Folha 20.SB Purus" (761 pp.) of the RADAMBRASIL Project.

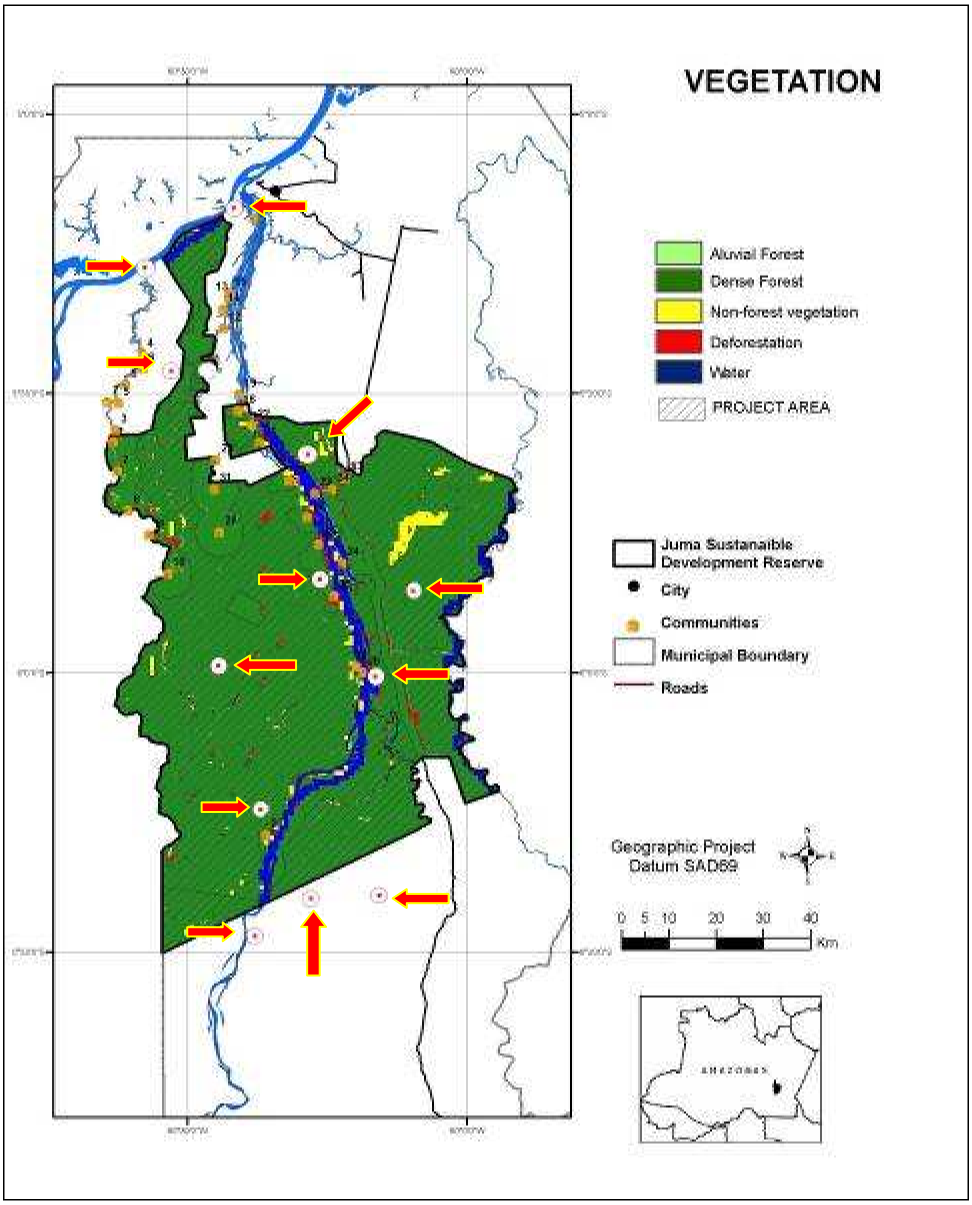


Figure 08. Juma Reserve, vegetation types white circles and red dots indicating the sampled plots of the inventory described in RADAMBRASIL (1978)[13]

Although there is consensus for using RADAMBRASIL phyto-physiognomy classification for the Amazon forests, there exist differing opinions about the estimates for the biomass stocks that should be used to calculate the total amount of carbon existing in the Brazilian Amazon. Until recently, the values provided by the First Brazilian Inventory of Anthropogenic Greenhouse Gases Emissions (*Primeiro Inventário Brasileiro de Emissões Antrópicas de Gases de Efeito Estufa*) (MCT, 2006) were considered the most reliable data.

However, since the publication of the Brazilian Inventory in 2006, the scientific community has made significant advances to improve the carbon stock estimates for biomass and for carbon in the Amazonian forest. Among this work, it is worth mentioning NOGUEIRA *et al.* (2005, 2006, 2007, 2008a,b, c), which inventoried 602 additional trees for Central Amazonia (Nogueira *et al.*, 2005)

[13] Sample units are presented on sheet “Manicoré SB.20 X-D”: A58, A59, A60, A61, A116, A117 and A127 (Figure 25, p.441), and on sheet “Rio Arauá SB.20 Z-B”: A122, A123, A129, A130, A131, A132 and A133 (Fig. 29, p.459).

and Southern Amazonia (Nogueira *et al.*, 2007), and in which details of the study area and correction procedures are described.

The estimates of Nogueira *et al.* (nd, p. 8) and MCT (2004, p. 23) both used the allometric equation from Higuchi *et al.* (1998) from the Central Amazon, to calculate bole biomass of tree datasets from the RADAMBRASIL Project (the trees inventoried had a circumference at chest height (CCH) greater than 100 cm, or 31.7 cm of diameter at chest height (DH)), as follows:

$5 < DBH \geq 20$ cm
ln(fresh mass) = -1.754 + 2.665 × ln(diameter)
DBH > 20 cm
ln(fresh mass) = -0.151 + 2.17 × ln(diameter)

However, the carbon stocks considered in the biomass estimates of Nogueira *et al.* (nd) combined allometric equations and inventoried wood volume in order to adjust the biomass estimates for different types of Amazonian forests. A new biomass equation was developed from trees harvested on relatively fertile soils in the Southern Amazon and new bole-volume equations were developed from trees in dense and open forests. These allometric relationships were used to assess uncertainties in previous estimates of wood volume and biomass.

In the case of the usual biomass model, based on inventoried wood volume, the study evaluated whether the factors currently used to add the bole volume of small trees (volume expansion factor) and the crown biomass (biomass expansion factor) are adequate for the biomass conversion. To assess the performance of the equations developed in the study as compared to previously published models, Nogueira and colleagues used the deviation (%) between the directly measured sum of the mass of the trees and the mass as estimated by each of the previous equations, both for sampled trees and as an extrapolation per hectare. Finally, all corrections were applied to generate a new biomass map for forests in the Brazilian Amazon from the RADAMBRASIL plots, and the biomass stocks by forest type were calculated for each of the nine states in the Brazilian Legal Amazon.

For the MCT (2006) biomass and carbon estimates, the sum of the carbon from all trees was divided by the area of the sample plot. Then, a correction was applied for the carbon content to include the trees with a DCH less than 31.7 cm, according to a Meira-Filho personal communication of a circumference histogram. For the below ground biomass, an expansion factor of 21% was then applied, as suggested by the authors.

Table 01 provides the different carbon stocks estimates according to the various published sources, and comparing with the default values for tropical forests provided by the IPCC GPG for LULUCF. The carbon pools considered for the project are the same used by the studies of MCT (2006) and Nogueira et al. (2008), as described in Table 01: (i) above ground live biomass, (ii) dead wood, (iii) litter, and (iv) belowground biomass.

Table 01. Comparison of the different carbon stocks for above and below ground biomass in the vegetation types found within the Juma Reserve (by author[14])

		Above Ground Biomass		Below Ground Biomass Tons of C/ha	Total Biomass Tons of C/ha**
Author	**Forest type**	**Live Biomass Tons of C/ha**	**Dead Biomass Tons of C/ ha***		
Nogueira *et al*	Ombrophyllous Dense Alluvial Forest	127,71	15,69	29,55	**172,95**
	Lowland Ombrophyllous Dense Forest	136,09	16,72	31,49	**184,30**
	Submontane Ombrophyllous Dense Forest	136,39	16,76	31,56	**184,71**
MCT	Ombrophyllous Dense Alluvial Forest	115,28	0,00	24,21	**139,49**
	Lowland Ombrophyllous Dense Forest	115,28	0,00	24,21	**139,49**
	Submontane Ombrophyllous Dense Forest	112,21	0,00	23,56	**135,77**
IPCC Default Value for Tropical Forests		**131,00**			

* Dead biomass includes both dead wood and litter

** Except Organic Soils Carbon

Although the IPCC can be considered the most conservative data among the three compared sources, these values underestimate the carbon stock values for the Amazon forests, as they were generated through an average of different tropical forests in many regions of the world. Thus, as Nogueira et al (2008) and MCT (2006) provide credible and "onsite specific" values for the existing types of vegetation in the project area, they were preferred rather than the IPCC default values. as a conservative approach, it was made a mean average from both sources to estimate the carbon stocks in the forest classes present in the project area.

As presented earlier (see item *G1.2*), the *Lowland and Submontane Dense Forest* classes were grouped into a single category of carbon density, defined only as "Dense Forest." This value was obtained by the arithmetic mean of both values (Lowland and Submontane carbon stocks), resulting in the final value per author. This procedure was done on both the Nogueira and the MCT values, as shown in Table 02.

[14] MCT didn't include the pools litter and dead wood since it followed the methodology guidance provided by IPCC (2000), which predicts only the consideration of aerial biomass for emissions due land use change.

Table 02 – Carbon stocks estimates by Nogueira et al (2008) and MCT (200$) for the vegetation classes inside the project boundaries

Author	Forest type	Above Ground Biomass Live Biomass Tons of C/ha	Above Ground Biomass Dead Biomass Tons of C/ha*	Below Ground Biomass Tons of C/ha	Total Biomass Tons of C/ha**
Nogueira *et al*	Alluvial Forest	127,71	15,69	29,55	**172,95**
	Dense Forest	136,24	16,74	31,52	**184,50**
MCT	Alluvial Forest	115,28	0,00	24,21	**139,49**
	Dense Forest	113,74	0,00	23,88	**137,62**

* Dead biomass includes both dead wood and litter
** Except Organic Soils Carbon

Afterwards, to define the final carbon stocks by vegetation types inside the Juma project boundaries, an arithmetic mean was calculated for each carbon estimate from the different authors. The values are shown in Table 03.

Table 03 – Carbon stocks estimated "ex-ante" by forest classes existent inside the Juma Project boundaries

Forest type	Above Ground Biomass Live Biomass Tons of C/ha	Above Ground Biomass Dead Biomass Tons of C/ ha*	Below Ground Biomass Tons of C/ha	Total Biomass Tons of C/ha**
Alluvial Forest	121,50	7,84	26,88	**156,22**
Dense Forest	124,99	8,37	27,70	**161,06**

* Dead biomass includes both dead wood and litter
** Except Organic Soils Carbon

It is important to mention that these values are "ex-ante" carbon estimates, and will be validated and adjusted "post-facto" through the forest inventories that will be carried out as part of the monitoring plan before the first project verification, as described in Annex VIII.

The calculation of the carbon stocks of the Juma Reserve by vegetation type inside the project boundaries is presented in Table 04:

Table 04 - Total Carbon Stocks at the Juma Reserve RED Project

Type of Forest	*Carbon Stocks (tC/ha)*	*Area(hectares)*	*Total (tons of C)*
Alluvial Forest	156,22	3,603	562,860.66
Dense Forest	161,06	469,074	75,549,058.44
TOTAL		***472,677***	***76,111,919.1***

Community Information

G1.4 - Description of communities located in and around the project area, including basic socioeconomic information (using appropriate methodologies such as the livelihoods framework).

According to the latest social inventory taken in July 2008, there is an estimated population of 339 families living in 35 communities within the Juma Reserve and its surrounding area (Figure 09).

The process for identifying communities occurred in two different ways: (i) during the study for the creation of the Juma Reserve, and (ii) during the process of registering families with the Bolsa Floresta Program.

From April 16-26, 2005, a field excursion to the Aripuanã River, in the Municipality of Novo Aripuanã, was carried out by a team of 12 technicians from different institutions (SDS, IPAAM, CI, ITEAM, INPA and UFAM), making biological and socio-economic diagnostics, providing an ethno-characterization of the landscape, mapping the natural resources, mapping archaeological sites and conducting a land information survey. Before this expedition, some preliminary data of fauna, flora and geomorphology were collected, as well as the location of the communities to direct the field studies. On this expedition, 48 questionnaires were administered in 11 communities, identifying problems related to health, transportation, education, infrastructure, employment and citizenship.

From June 12 - July 8, 2008 a second expedition was carried out, in which all the communities within the Juma Reserve were registered for the Bolsa Floresta Program (PBF) (see item *G3.2* for more details about the PBF). The communities living in the surroundings of the project area that are affected by its activities were also included in the Program. The Bolsa Floresta Program team travelled along the Aripuanã River, the Madeira River and the Mariepaua River, as well as the AM 174 road, which crosses the reserve, administering the socio-economic questionnaire to the families (the questionnaires are available at www.fas-amazonas.org)

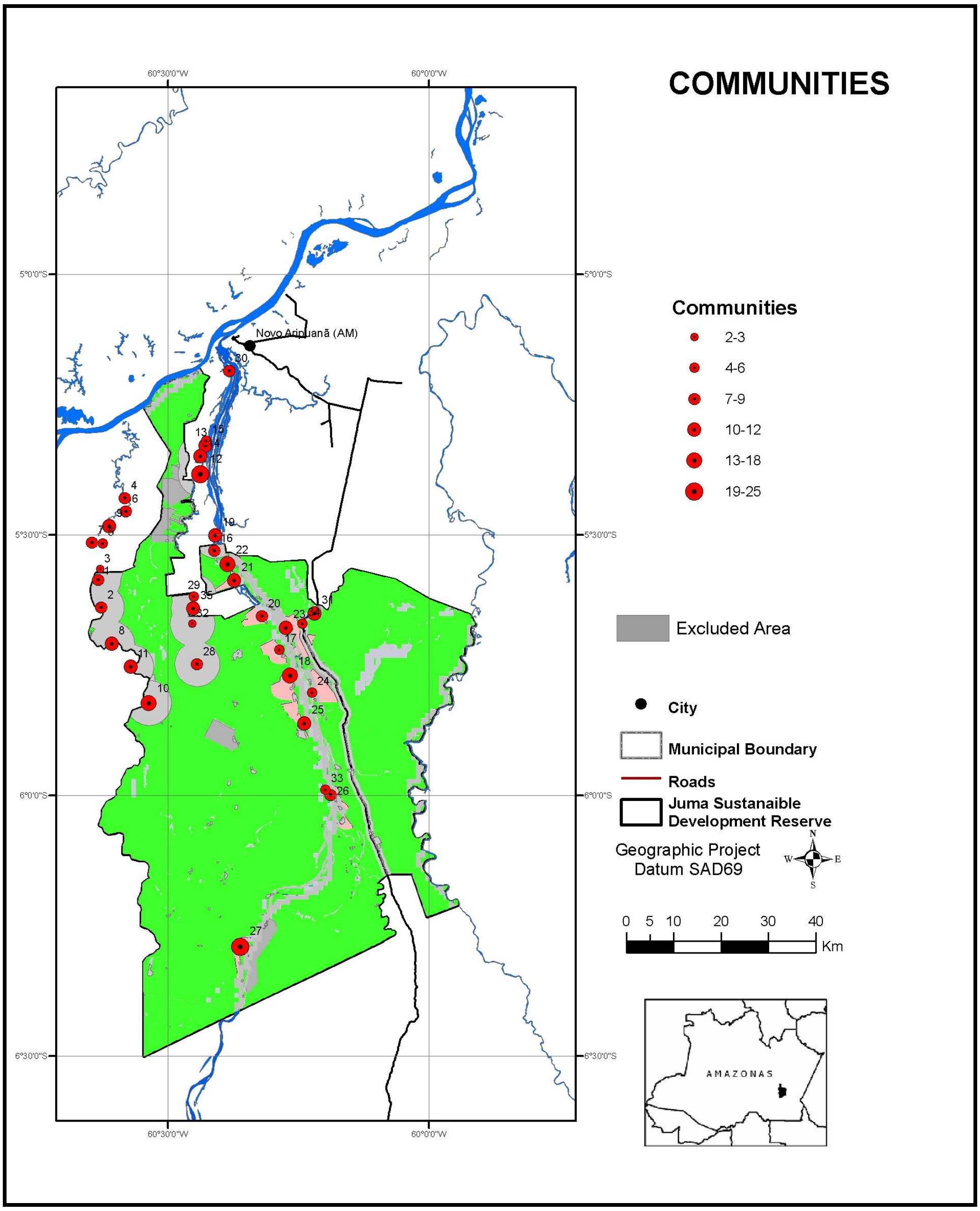


Figure 09 – Communities living inside and around the Juma Sustainable Development Reserve[15]

Housing, Sewage, Energy, Subsistence, Education and Health

The majority of the families living in the Juma Reserve do not have land titles or personal documentation. The houses and residences are generally made of wood with roofs made of palm thatch or asbestos panels. None of the communities has a basic sanitation system or trash collection. Organic trash is deposited naturally on the ground surrounding the residences and is incorporated into the soil. The non-organic trash is separated and burned. Families without a generator depend on kerosene for illumination.

All of the communities depend on subsistence agriculture (manioc and fruit production) and extractive activities, such as fruit collection, fishing and hunting to supplement their diets. Usually, subsistence practices are used when fishing and hunting, with fish providing the major source of

[15] The description of all the excluded areas can be found on item G3.3.

protein in the communities. Students of different levels compose the school classes, what makes the teacher's work more difficult, since she must teach all the students at the same time in the same classroom.

There is no organized system of health care provided by formally trained medics. Basic emergency assistance (first aid) is provided by community members and is based on traditional knowledge or training provided by the local municipality. The most common health problems and illnesses are malaria, diarrhea, verminosis, malnutrition, flu and hypertension. The treatment of more serious problems requires transportation to the hospital in the city of Novo Aripuanã in "*rabetas*" (wooden canoes with small outboard motors).

Economy, Income and Transport

In the preliminary study undertaken as part of the process for establishing the Juma Reserve, more than half of the families reported their income was below the average minimum wage in Brazil (R$ 200 to R$ 400, or US$ 118 and US$ 235, respectively). A limited number of family members reported having an income greater than three times the minimum wage (up to R$ 1200, or US$ 706)). The most important economic activities are the extraction and sale of Brazil nuts (*Bertholletia excelsa*), *copaíba* oil (*Copaifera landesdorffi*) and timber and the production of manioc flour (SDS, 2005). Some families have hen houses and raise chickens for domestic consumption and others raise sheep on a small scale (SDS, 2007). The communities are extremely dependent on the regularity of the regional boats that travel the length of the Aripuanã River selling, buying and exchanging goods. *Rabetas* are the normal mode of transport for short trips within and between local communities.

G1.5 - A description of current land use and land tenure at the project site.

Deforestation

According to the most recent data, as of June 2007, only 6,493 hectares of forest in the Juma Reserve (1.18% of the total area) had been cleared (INPE, 2008). About 98.82% of the forests in the Juma Reserve are still intact. The very small percentage of deforestation that does exist can be explained by small-scale agricultural production for domestic consumption (see section *G1.4*). Forest disturbance found along the Novo Aripuanã-Apuí road are attributable to the illegal extraction of timber by loggers from outside the Reserve (mainly along the road).

The project used a participatory process to identify and map the land use dynamics of the land directly managed by the traditional populations residing in the Juma Reserve. This activityhas already been started preliminarily and will be carried out continuously as a central part of the development process for the Reserve's management plan.

Specifically, these activities include:

- Specific modeling of the dynamics of land clearing for plantations within the reserve
- Specific modeling of the process of forest succession after the abandonment of agricultural fields

- Fine-scale zoning of the areas currently in use and determination of the impacts of the land use patterns on the carbon stocks of the area.

Private Properties

The preliminary evaluation of private lands within the Juma Reserve undertaken by the Amazonas Land Institute (*Instituto de Terras do Amazonas*, ITEAM) found that within the project site there are approximately twenty private land title claims in a total of 15,038 hectares (see Figure 10). A large number of these properties are not legally recognized because they do not have complete documentation or may have been acquired illegally and should be formally registered or appropriated by the state. A full analysis of the legality of the documentation behind these claims will be a high priority for the project once implementation begins.

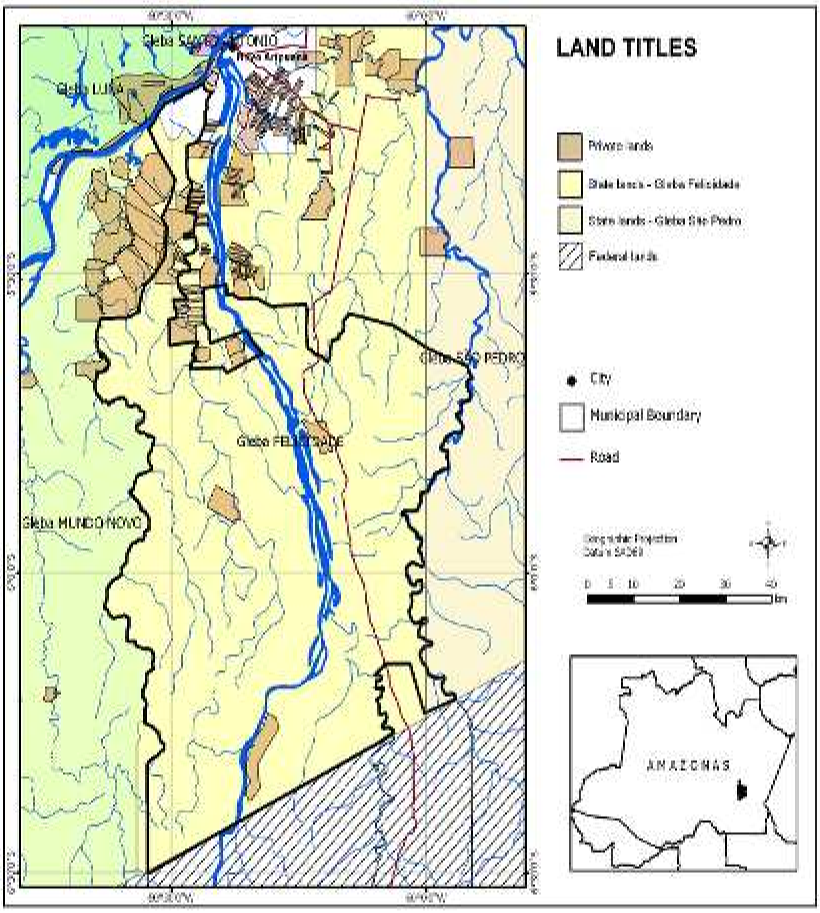


Figure 10 – Areas claimed by land titles in the region of the Juma Reserve

After the conclusion of the study, the measures related to the appropriate regulation of land titles will be determined, for example if these lands should be completely or partially expropriated or not, or if they should be exchanged for state-owned land outside of a conservation area.

As these private areas do not belong to the State of Amazonas, they are excluded from the project, and the carbon contained in their forests will not be accounted. However, ongoing activities in these areas can impact the project area inside the Reserve, and thus will receive special attention in the activities included in the monitoring plan.

Biodiversity Information

G1.6 - Description of current biodiversity in the project area and threats to that biodiversity, using appropriate methodologies (e.g., key species habitat analysis, connectivity analysis), substantiated with reference (evidence) where possible

The area where the Juma Sustainable Development Reserve was created has been identified as an extremely important area for biodiversity, especially for reptiles, amphibians and mammals. The region is also considered of high biodiversity importance due to its aquatic flora and fauna (ISA *et al*., 1999; CAPOBIANCO *et al*., 2001). The Juma Reserve region has been identified as one of the areas of greatest interest for biodiversity conservation in the Amazon (SDS, 2007), and one of the least studied areas in the Amazon (OREN & ALBUQUERQUE, 1991). One of the most relevant characteristics of the region of the Reserve is the high degree of species richness due to the high heterogeneity of habitats, being considered one of the world's richest regions in bird species diversity (COHN-HAFT *et al.*, 2007). In recent years, numerous new species have been described scientifically, with a high degree of endemism along the Aripuanã riverbanks and some patches of unique vegetation (SDS, 2007). Twenty-one species of primates have been catalogued in the region, which represents one of the areas with the highest primate diversity in the world (SDS, 2007). At least three new species of fish and three species of birds have been recently discovered in the region and more than one third of the bird species (430 birds) found in Brazil have been reported within the Juma Reserve's boundaries (COHN-HAFT *et al.*, 2007).

There is also a special part of the Juma Reserve, the riverbank of the Aripuanã River, which is described as a high value conservation region, where a series of new species was recently discovered and scientifically catalogued (van ROOSMALEN *et al*., 1998; van ROOSMALEN *et al.*, 2000; van ROOSMALEN *et al*., 2002; ROOSMALEN & van ROOSMALEN, 2003; van ROOSMALEN *et al.*, 2007).

The Aripuanã River has been identified as an important boundary for fauna, representing the limit of geographical distribution of some species, especially primates (SDS, 2007). For example, the wooly monkey (*Lagothrix* sp.), howler monkey (*Alouatta* sp.), white-fronted capuchin (*Cebus albifrons*), ashy-grey titi monkey (*Callicebus cinerascens*) and the red agouti (*Dasyprocta cristata*) occur exclusively on the right bank of the Aripuanã River, while the dwarf-saki monkey (*Callibella humilis*) and a distinct species of titi monkey (*Callicebus bernhardi*) are only found on the left bank (SDS, 2007).

These patterns coincide with those found for birds. There is a group representing sister species that reproduced, creating a new hybrid species, but that maintained the species or subspecies separated by the opposing banks of the Aripuanã River (COHN-HAFT *et al.*, 2007). This finding reinforces the theory that the river plays a role as a barrier to the dispersion of the species and a potential factor in the evolutionary diversification of the biota (WALLACE, 1852).

During the studies for the creation of the Juma Reserve, rapid inventories and diagnostics of the biodiversity were undertaken within the Reserve. The following items provide a summary of these studies. Logically, with the start of the project, these inventories will be expanded as part of the planned research program into the diverse ecosystems of the Reserve.

Birds

The bird survey was performed by COHN-HAFT *et al.* (2007) in the area where the Juma Reserve is located, both on the two sides of the Aripuanã River and on the western side of the Madeira River. They performed listening and visual surveys, fog net captures and playback vocalization. A total of 430 species were registered, and the authors reported that other secondary data and unpublished studies should increase the number to over 800 species for the region. Some of those species are certainly not described and endemic to that region.

Mammals

The mammal inventory was carried out using direct and indirect observation in the field (census, record of footprints, vocalization, scats, refuges, etc., in different environments, vegetation types and periods of the day), based on interviews with local hunters and on literature data. Seventeen (17) species of primates were found in some regions of the interfluvial region, and fourteen (14) species were identified in the project area.

Aquatic Mammals

Three species of aquatic mammals were recorded during the preliminary study for the creation of the Juma Reserve: *Sotalia fluviatilis* (gray river dolphin), *Inia geoffrensis* (red river dolphin) and a species of manatee (*Trichechus inungis)* that has been reported by local inhabitants to occur throughout the Reserve's rivers.

Fish

Fish inventories that were undertaken used different techniques (barrier nets, encirclement nets, dip nets, etc.) in small streams, main rivers and flooded forests, resulting in 43 species from 16 different families. The orders with the greatest number of species are the Characiforms (26 species) and Siluriforms (11 species). Interviews with local communities expand the list of fish to 96 morphotypes (SDS, 2007).

Chelonians and Crocodilians

During the preliminary studies for the creation of the Juma Reserve, local inhabitants mentioned that four different species of river turtle (*Podocnemis expansa*, *P. unifilis*, *P. sextuberculata* and *Callopsis punctularia*) occur frequently in greatly differing regions of the Juma Reserve (SDS, 2007). Local people have also mentioned that four species of crocodilians (*Melanosuchus niger*, *Caiman crocodilus*, *Paleosuchus trigonatus* and *P. palpebrosus*) occur in the region (SDS, 2007).

Flora

According to the Study for the Creation of the Juma Reserve, the diversity of vegetal species is also broad in the Reserve's area. The vegetation changes as the terrain changes, and depends on the proximity to the river. Forest inventories were performed to analyze and characterize the vegetal biodiversity on the Reserve. These studies show that the main families existing in the area are the *Chrysobalanaceae, Leguminosae, Sapotaceae, Moraceae, Burseraceae* and *Lecythidaceae*, which have many species with relevant potential for timber and non-timber products .The most abundant species found are the Sumaúma (*Ceiba petranda*), Açaí (*Euterpe spp*.), Buriti (*Mauritia flexuosa*), Angelim da mata (*Hymenolobium petraeum*), Angelim Pedra (*Dinizia excelsa*), Castanha do Brasil (*Bertholettia excelsa*), Abioranas (*Pouteria spp*) and Matamatá branco (*Eschweilera odora*). (SDS, 2005)

Threats to Regional Biodiversity

The major imminent threats to the natural ecosystems are illegal logging, mining, land grabbing for agriculture and cattle ranching, and overfishing. These threats have the potential to cause great damage to the integrity of the Juma Reserve, since the Federal Government recently announced its plan to pave the roads that will directly affect the project area (BRASIL, 2007) (see items *G2.1* and *B5.2*). Historically in the Brazilian Amazon, a sharp increase in deforestation follows the paving of roads, due to the illegal logging, mining and hunting that occur as a result of the new access to natural resources that the road provides (NEPSTAD *et al.,* 2001, 2002; LAURENCE *et al*., 2004; FEARNSIDE, 1987). The most important driver of deforestation will be the paving of BR-319 and BR-230. Due to the proximity of the highways to the Juma Reserve, the paving of these roads will cause an increase in deforestation in the area of the Aripuanã River. Proper vigilance and law enforcement can prevent the threat of deforestation from secondary roads. Therefore, these monitoring and enforcement activities are a priority for the Juma RED Project.

G1.7 – List of all IUCN Red List threatened species (which encompasses endangered and vulnerable species) and species on nationally recognized list (where applicable) found within the Project boundary.

The final list of threatened species found in the Juma Reserve was obtained in two steps. The first step was to identify in previous studies (such as Van Rosmalen, Cohn-Haft et *al*., the "Study for the Creation of the Reserve") all the species occurring in the Reserve area. Although some of these studies were not performed precisely within the project boundaries, they are in the same area between the Madeira and Tapajós Rivers. Thus, it is known that the species are distributed all across the region, which guarantees their occurrence also within the project area.

After identifying the species potentially present within the project boundaries, IUCN's and IBAMA's list of threatened species was searched, generating the list of all threatened species in Brazil and in the State of Amazonas. Then, these lists were compared to the list of species occurring in the project, combining the lists and generating the "IUCN and IBAMA list of threatened species inside the Juma RED Project." The list is presented in Table 05.

It is important to note that the lists include mostly mammal species, which was the main focus of the CEUC study. During the first year of the project, the project will conduct a detailed assessment of the other different groups of fauna and flora in the Reserve. In addition, the lists do not include some endemic and new species recently found in the Reserve and in the project region (see item *B1.3*), which would certainly become endangered in the "without project" scenario.

Table 05: List of IUCN list of threatened species found within the Juma Sustainable Development Reserve

GROUP/Order/Species	IUCN Category	IBAMA Category
MAMMALIA		
Carnivora		
Leopardus tigrinus	NT	Vulnerable
Leopardus wiedii	LC	Vulnerable
Panthera onca	NT	Vulnerable
Pteronura brasiliensis	EN	Vulnerable
Speotus venaticus	VU	Vulnerable
Primates		
Ateles belzebuth	VU	Vulnerable
Sirenia		
Trichechus inunguis	VU	Vulnerable
Xenarthra		
Myrmecophaga tridactyla	NT	Vulnerable
Priodontes maximus	VU	Vulnerable
AVES		
Falconiformes		
Harpia harpyja	NT	Not listed
FLORA		
Lecythidales		
Bertholletia excelsa	VU	Vulnerable
Laurales		
Aniba roseodora	EN	Endangered

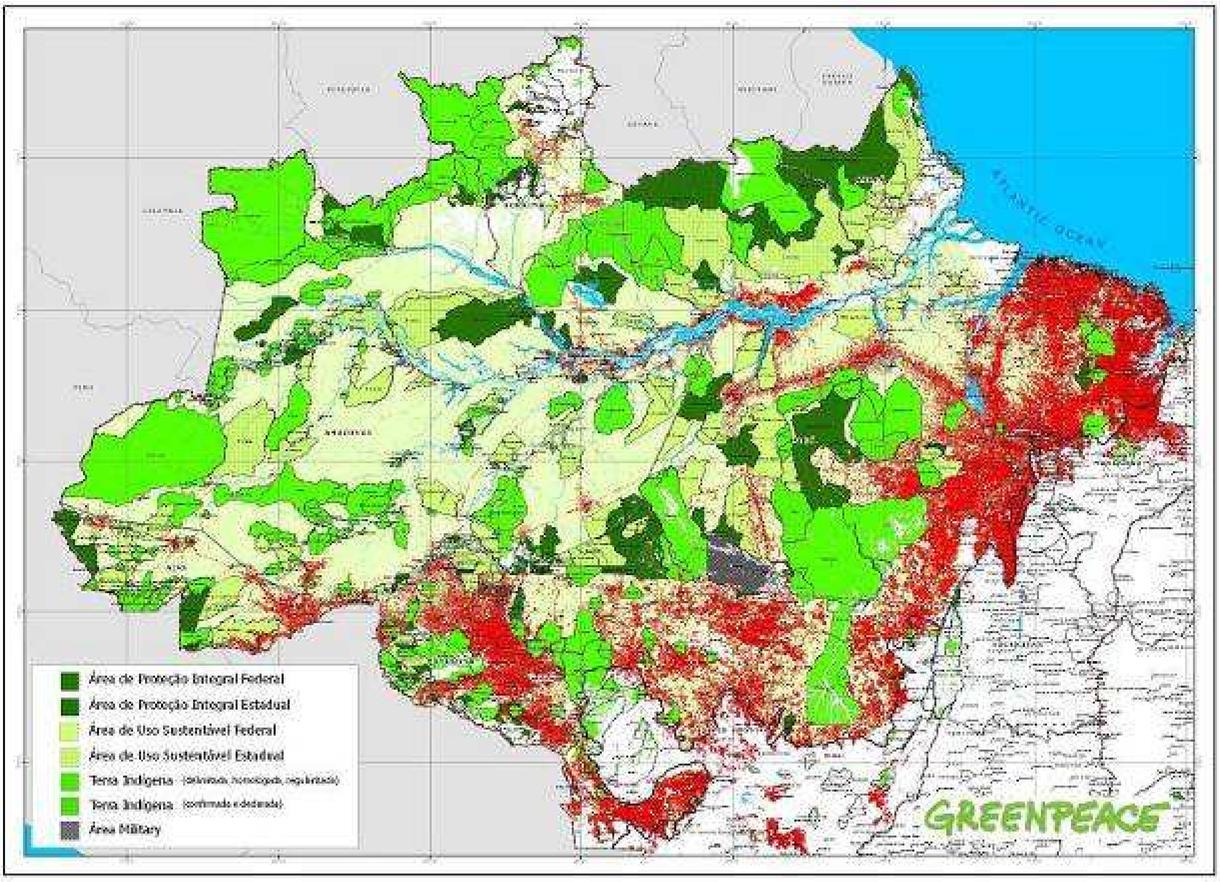
Source: IUCN, 2008[16], MMA, 2008[17]

[16] Available at: http://www.iucnredlist.org/info/categories_criteria2001#categories
[17] Available at: http://www.mma.gov.br/port/sbf/fauna/index.cfm

G2. Baseline Projections

G2.1 – Description of the most likely land-use scenario in the absence of the Project activity. Identify whether the scenario assumes that existing laws or regulations would have required that project activities be undertaken anyway:

The Brazilian Amazon is under severe deforestation pressure. It is estimated that 17% of the original forest cover has been destroyed, which represents 3.7% of the total area within the Brazilian Legal Amazon (INPE, 2008). Today, as in the past, 70% of the deforestation is still resulting from the conversion of the forest into extensive low profit pastures. Historically this deforestation has mainly occurred in the municipalities of Pará, Mato Grosso, Rondônia, Tocantins and Maranhão, which constitute the region of the frontier that is called the "Amazonian arc of deforestation" (FERREIRA *et al.*, 2005; FEARNSIDE *et al*., 2003) (Figure 09). Until now, the State of Amazonas has remained relatively conserved.



Source: Greenpeace, 2007[18]

Figure 11: Deforestation and Protected Areas in the Brazilian Amazon

However, the decline in forest cover and the lack of available land due to the dense population of the region within the "arc of deforestation" has been driving a visible tendency of migration towards the central Amazon region, principally the State of Amazonas. The increasing rates of agricultural and cattle production are the principal drivers of deforestation, as these activities are

[18] Deforestation data from 2006

heading towards areas with few human occupants in the State of Amazonas. The future scenario is very clear: if the infrastructure predicted for the State of Amazonas, such as the paving of highways, is implemented, and if the historic trends elsewhere in the Amazon continue, the state of Amazonas will rapidly be occupied by large expanses of pasture and agricultural fields, and millions of hectares of forest will disappear in the process. This projection is also reinforced by STICKLER *et al.* (2007), which affirm that 40% of all soils in tropical regions suitable for sugar cane, palm, pasture and soy plantation are located in the Amazon.

The most advanced simulation models indicate that in the coming decades the State of Amazonas will see a rapid increase in its deforestation rates. SimAmazonia I, a deforestation simulation model developed by a consortium of research institutions and published in *Nature*, indicates that in the coming decades the State of Amazonas could lose up to 30% of its forest cover by the year 2050 ("business as usual" scenario). This volume will emit more than 3.5 billion tons of CO_2 into the atmosphere[19].

According to the SimAmazonia I[20] model, the region located in the municipality of Novo Aripuanã is extremely vulnerable to deforestation. The paving of highways could cause the complete loss of large extensions of forest by the year 2050 under the conventional "business as usual" scenario. The lack of roads connecting Amazonas to other regions of Brazil is one of the major reasons for the State's low deforestation rates (STONE, 2007). However, the dynamics of an expanding deforestation frontier, a low supply of timber for exploitation, and the consolidation of agriculture and cattle production in other states in the Amazon increases migration and, consequently, the conversion of its forests. Year after year, the areas with historically high rates of deforestation are advancing towards the State of Amazonas.

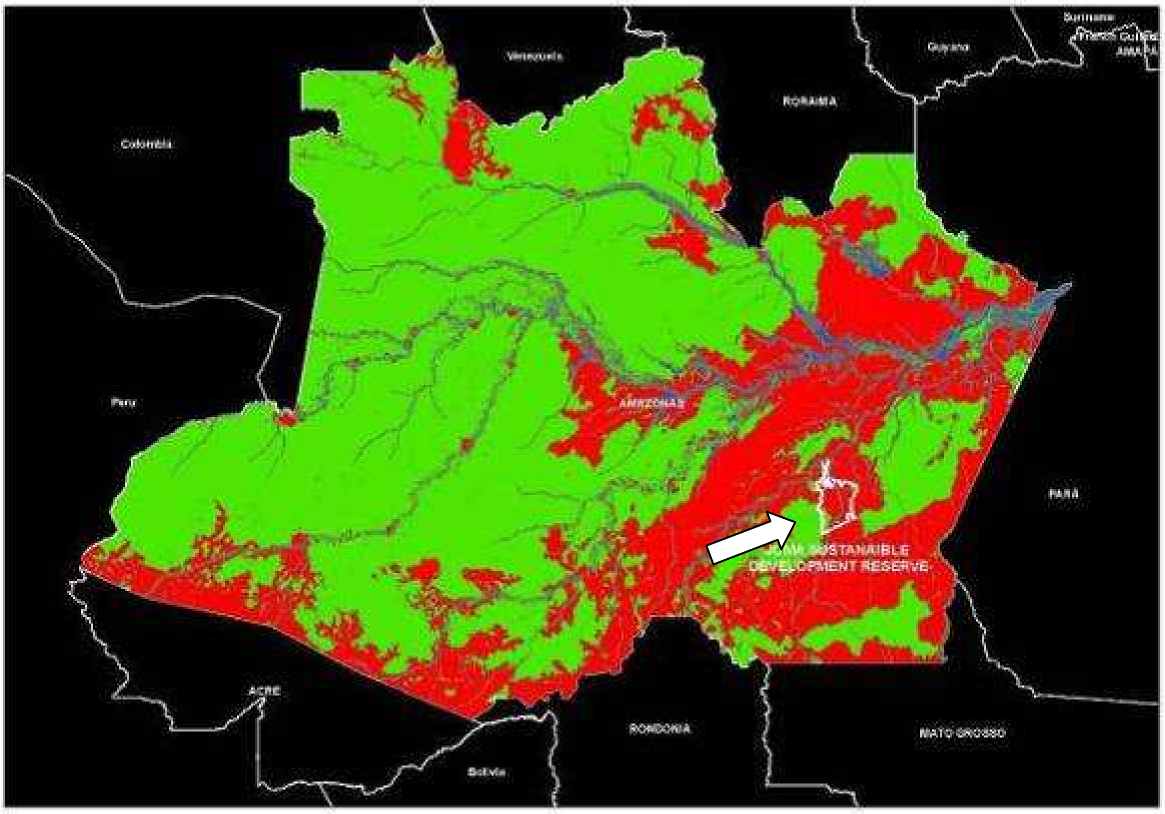
The projections of SimAmazonia I forecast eight scenarios for the entire Amazon in 2050. One of these scenarios, the baseline scenario or conventional "business as usual" (BAU), with low government intervention, projects deforestation trends across the Amazon basin, and is based on historical deforestation rates, adding in the effect of macroeconomic drivers such as the planned paving of roads, growth in cattle and agricultural production, population growth and similar factors. The other seven scenarios include an increase in governmental activity. These scenarios are more optimistic and consider the paving of roads as also leading to a gradual increase in the government's influence and law enforcement in the region.

In the "business as usual" scenario, the paving of roads follows a pre-determined program and the resulting deforestation effects are empirically estimated using data analyzed at the municipality level from PRODES (INPE, 2008b) (SOARES-FILHO *et al.*, 2006). Specifically, the southern region of Amazonas and the municipality of Novo Aripuanã, and the pavement of highways BR-230 (Trans-Amazonian Highway) and BR-319 (between Manaus and Porto Velho) will have a large role in determining the incursion of deforestation into the Juma RED project area.

[19] The volume of GHG emitted would be equivalent to the annual emissions of the entire European Union or China, and more than 4 times the annual emissions of Germany.

[20] Annex I shows a detailed description of the SimAmazonia I model, published in *Nature* by SOARES-FILHO *et al.* (2006). The model is also available for consultation at http://www.csr.ufmg.br/simamazonia

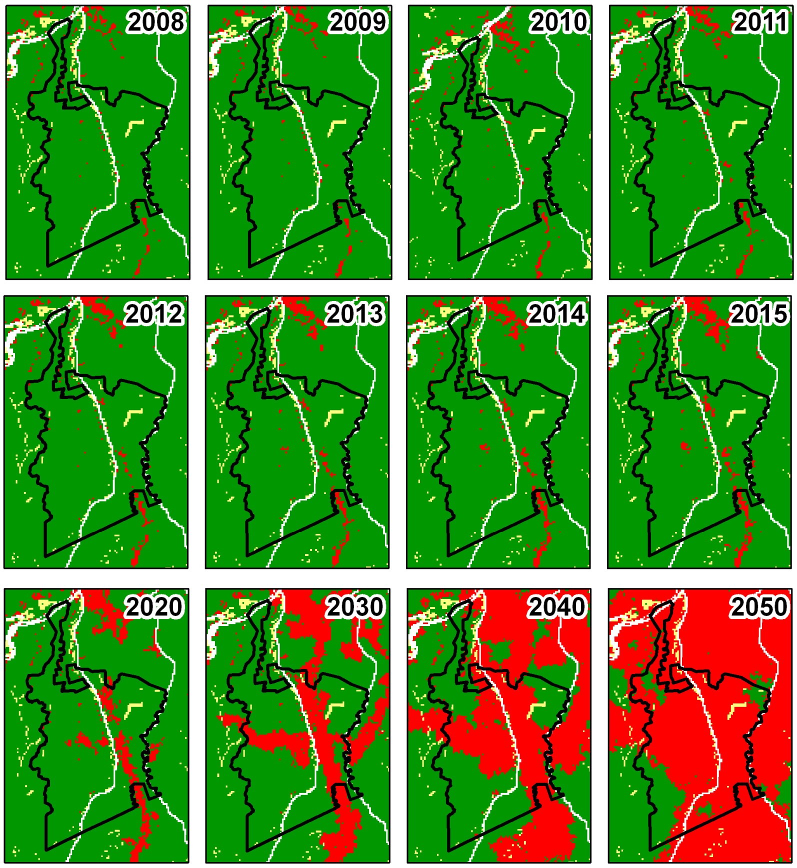
The Juma Reserve RED Project uses the baseline scenario of the simulation generated by SimAmazonia I as the reference scenario, extracting the Juma reserve area and providing the corresponding deforestation for each year up to 2050. Because the simulation in SOARES-FILHO *et al.* (2006) was produced before the Reserve's creation, the "business as usual" scenario is faithful to the reality of the Baseline scenario, since it does not reflect the impact of creating the Juma Reserve, as is described in Figure 12



Source: Map is based on data obtained from the model SimAmazonia I (SOARES-FILHO *et al.*, 2006)

Figure 12: Forecasted Deforestation in the Amazonas State by the year 2050 under the conventional "business as usual" (BAU) scenario

The SimAmazonia I projections indicate that the region where the Juma Reserve is located is highly vulnerable to deforestation. The simulations indicate that up to 62% (366,151 hectares) of the forest within the project area will be deforested by the year 2050 (Figures 12 and 13). The Annexes I and II present a detailed description and discussion of the functioning of the SimAmazonia I, and its applicability to the project conditions.



<u>Source</u>: Map is based on data obtained from the SimAmazonia I model (SOARES-FILHO *et al.*, 2006)

Figure 13: Forecasted deforestation the Juma RED Project Area under different scenarios for 2008 to 2050, compared to the conventional "business as usual" (BAU) scenario

G2.2 – Provide a projection of future carbon stock changes in the absence of the project, based on the land-use scenario described above. The timeframe for this analysis can be either the project lifetime or the project accounting period, whichever is more appropriate.

In the absence of the project, the most likely scenario for the Project area would be the deforestation of 62% of the Reserve (see Figure 10, section *G2.1*), resulting in the release of 210,885,604 tons of CO_2 (see table 07) into the atmosphere by 2050. This is the "business as usual" scenario forecasted by the SimAmazonia I model (SOARES-FILHO *et al.*, 2006). SOARES-FILHO *et al*. (2006), which considered as the carbon stock of the vegetation that replaces deforestation as of 15% of the total carbon stock of the original forest cover. This value of 15% is based on HOUGHTON *et al.* (2001), which was generated without considering empiric data collected from field measurements, and was justified assuming the uncertainties that exist in every estimate of carbon flux in the Amazon.

For the "ex ante" estimates of the carbon stock changes in the Project area, potential increases in the carbon stocks were considered with different land uses upon implementation of the Project. These stocks represent the vegetation landscape at equilibrium (based on many different land uses as describes Table 06) that replaces the forestand can be projected for the future in the brazilian Amazon (FEARNSIDE, 1996). It is worth highlighting that it is methodologically difficult to project the net committed emissions from deforestation on the baseline scenario for such a wide area and period as that of the Project. Due to the uncertainty of these estimates and the lack of detailed information about the future dynamics of occupation in these areas, the figures presented by FEARNSIDE (1996), considered as the most compatible, were used in a conservative way. These data are the ones that best approach the information needed for the Project.

To calculate these values, FEARNSIDE (1996) considers a “Markov Matrix” of annual transition probabilities to estimate the composition of the landscape and to project future trends, assuming that the ranchers’ behavior will not change (Table 06).

Table 06: Estimates of biomass weight on the replacing vegetation at equilibrium

Land use classes	Area (%)	Biomass (t ha^{-1} total)
Farmland	4.0	0.7
Productive pasture	43.8	10.7
Degraded pasture	5.2	8.0
Secondary forest derived from agriculture	2.0	35.6
Secondary forest derived from pasture	44.9	50.5
Weighted mean		28.5

Source: Adapted from FEARNSIDE (1996)

This estimate, in reality, can be considered as conservative, considering that the actual trend of agricultural systems in the Amazon is increasing population pressure and intensity on land use over time, resulting in a lower biomass average of the landscape compared to that at the time the study was developed. Thus, the use of the data from 1996 to 2008 reflects a conservative approach to estimating the net total carbon stocks in these classes.

As presented, 28.5 tons of biomass per hectare (dry matter, including belowground biomass and dead components) was adopted as the estimated average biomass maintenance value for different land use classes in the Brazilian Amazon. This is considered to be a conservative estimate based on different regions of the Amazon. According to the Amazonas Institute for Agriculture and Livestock Development (IDAM, 2006), in the municipality of Apuí, the closest and most developed municipality to the south of Novo Aripuanã, 88% of the “productive lands” are occupied by cattle farming, and thus would be a closer estimate for the final land use in the baseline scenario for the project area.

The biomass values used are also more than double those that form the basis of deforestation emissions estimates that are currently used by the IPCC. Although higher replacement landscape biomass decreases the net emissions from deforestation, these estimates still imply large net releases. In this way, to estimate the net emissions in comparison with the baseline scenario, a discount of 14.25 tons of C[21] was made, assuming that this is the average carbon stock remaining on the deforested land, considering the land use dynamics.

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[21] The average carbon content of the biomass of the vegetation in equilibrium used for this calculation was 0.5 tons of carbon per ton of biomass.

Thus, the resulting carbon stock per hectare, on each type of vegetation found within the Juma Reserve RED Project, on vegetation at equilibrium, after deforestation, is shown on the table below:

Table 07 – Carbon stocks balance on each category of land use change

***Category* Identifier**		**"From" *Class***	**"To" *Class***	**Average carbon density on the "from" class**	**Average *carbon density on the "to" class***	***Emission Factor* "from" - "to"**
ID	*Name*	*ID*	*ID*			
				Tons of C ha^{-1}	Tons of C ha^{-1}	Tons of C ha^{-1}
AFEq	AF to deforested area in equilibrium	AF	DVE	156,22	14,25	141,97
DFEq	DF to deforested area in equilibrium	DF	DVE	161,06	14,25	146,81

Table 04 shows the loss of area, and consequent carbon stock changes on each type of vegetation found within the Juma Reserve RED Project, year by year:

Table 08 – Baseline Carbon Stocks changes, year by year in the Juma Reserve in each type of vegetation

Project year		AFEq - Alluvial Forest to deforested area in equilibrium		DFEq - Dense Forest to deforested area in equilibrium		Total	
		*Carbon Density (tC/ha)**	141,97	*Carbon Density (tC/ha)**	146,81	*Sum of products*	
		Activity Data	*Activity Data x Carbon Density*	*Activity Data*	*Activity Data x Carbon Density*	*annual*	*cumulative*
Nr	yr	ha	tC	ha	tC	tC	tC
0	2006	0	0,0	0	0,0	0,0	0,0
1	2007	0	0,0	0	0,0	0,0	0,0
2	2008	0	0,0	0	0,0	0,0	0,0
3	2009	0	0,0	61	8.955,4	8.955,4	8.955,4
4	2010	0	0,0	7	1.027,7	1.027,7	9.983,1
5	2011	0	0,0	746	109.520,3	109.520,3	119.503,3
6	2012	0	0,0	158	23.196,0	23.196,0	142.699,3
7	2013	10	1.419,7	1.941	284.958,2	286.377,9	429.077,2
8	2014	7	993,8	988	145.048,3	146.042,1	575.119,3
9	2015	3	425,9	1.735	254.715,4	255.141,3	830.260,6
10	2016	5	709,9	2.138	313.879,8	314.589,6	1.144.850,2
11	2017	41	5.820,8	1.776	260.734,6	266.555,3	1.411.405,5
12	2018	62	8.802,1	3.471	509.577,5	518.379,7	1.929.785,2
13	2019	33	4.685,0	4.253	624.382,9	629.067,9	2.558.853,1
14	2020	102	14.480,9	6.057	889.228,2	903.709,1	3.462.562,2
15	2021	49	6.956,5	4.970	729.645,7	736.602,2	4.199.164,5
16	2022	69	9.795,9	7.629	1.120.013,5	1.129.809,4	5.328.973,9
17	2023	35	4.969,0	7.253	1.064.812,9	1.069.781,9	6.398.755,8
18	2024	55	7.808,4	7.201	1.057.178,8	1.064.987,2	7.463.742,9
19	2025	56	7.950,3	10.133	1.487.625,7	1.495.576,1	8.959.319,0
20	2026	103	14.622,9	7.446	1.093.147,3	1.107.770,2	10.067.089,1
21	2027	68	9.654,0	4.680	687.070,8	696.724,8	10.763.813,9
22	2028	49	6.956,5	5.956	874.400,4	881.356,9	11.645.170,8
23	2029	9	1.277,7	6.172	906.111,3	907.389,1	12.552.559,8
24	2030	95	13.487,2	16.571	2.432.788,5	2.446.275,7	14.998.835,5
25	2031	42	5.962,7	8.487	1.245.976,5	1.251.939,2	16.250.774,7
26	2032	32	4.543,0	9.404	1.380.601,2	1.385.144,3	17.635.919,0
27	2033	12	1.703,6	7.861	1.154.073,4	1.155.777,1	18.791.696,0
28	2034	0	0,0	0	0,0	0,0	18.791.696,0
29	2035	24	3.407,3	8.566	1.257.574,5	1.260.981,7	20.052.677,8
30	2036	133	18.882,0	16.322	2.396.232,8	2.415.114,8	22.467.792,6
31	2037	74	10.505,8	14.383	2.111.568,2	2.122.074,0	24.589.866,6
32	2038	78	11.073,7	15.218	2.234.154,6	2.245.228,2	26.835.094,9
33	2039	1	142,0	10.945	1.606.835,5	1.606.977,4	28.442.072,3
34	2040	18	2.555,5	8.490	1.246.416,9	1.248.972,4	29.691.044,6
35	2041	86	12.209,4	13.647	2.003.516,1	2.015.725,5	31.706.770,1
36	2042	68	9.654,0	13.070	1.918.806,7	1.928.460,7	33.635.230,8
37	2043	94	13.345,2	11.061	1.623.865,4	1.637.210,6	35.272.441,4
38	2044	97	13.771,1	10.960	1.609.037,6	1.622.808,7	36.895.250,1
39	2045	128	18.172,2	11.992	1.760.545,5	1.778.717,7	38.673.967,7
40	2046	136	19.307,9	14.892	2.186.294,5	2.205.602,4	40.879.570,2
41	2047	104	14.764,9	22.902	3.362.242,6	3.377.007,5	44.256.577,7
42	2048	88	12.493,4	18.552	2.723.619,1	2.736.112,5	46.992.690,2
43	2049	62	8.802,1	20.954	3.076.256,7	3.085.058,9	50.077.749,0
44	2050	75	10.647,8	24.900	3.655.569,0	3.666.216,8	53.743.965,8
TOTAL		**2.203 (a)**	**312.759,9**	**363.948 (b)**	**53.431.205,9**	**53.743.965,8**	
		Total Deforestation (a+b) = 366.151 ha					

*Number obtained by the original carbon stocks per hectare on each type of vegetation minus 14.25 tC/ha of the remaining carbon stock on the vegetation at equilibrium after deforestation

Year 10 – Baseline Revision

G.2.2a - If there is evidence that non-CO_2 greenhouse gas (GHG) emissions such as CH_4 or N_2O are more than 15% of the baseline GHG fluxes at the project site (in terms of CO_2 equivalents), they must be estimated.

Even though the non-CO_2 GHG emissions in the baseline of the Juma Reserve RED Project would not reach 15% of the total emissions, the percentage of CH_4 and N_2O emissions in forest slash and burn is significant. According to an update from Fearnside (2000) based on emission factors from Andreae & Merlet (2001) and the IPCC AR-4 GWP, an additional adjustment for trace-gas effects is necessary. The current number is 6.6 – 9.5% relative to the impact of CO_2 release alone. To be conservative, it will be considered the value of 6.6% (see item CL1.2)

G2.3 – Description of how the "without-project" scenario would affect local communities in the project area.

One of the impacts of the deforestation that would occur under the "without project" scenario is expected to be detrimental to the livelihoods of the communities of the Juma Sustainable Development Reserve. These communities are highly dependent on the quality of the natural ecosystems to meet their basic needs. The deforestation that is forecast to occur without the creation and implementation of the Juma Sustainable Development Reserve Project would significantly erode the resource base upon which these communities depend. For example, the deforestation would affect the following activities: timber extraction for building houses, non-timber forest products for domestic consumption and supplemental income (Brazil nuts, *copaiba* oil, etc.), and a decline in prey and fish populations for subsistence hunting and fishing (SDS, 2007). Therefore, this deforestation would not only result in the direct loss of forest products, but also the indirect loss of subsistence hunting and fishing, all of which are critical elements in the diet of the local people.

The process of deforestation also brings social conflicts associated with land grabbing, which often adversely affects existing forest communities. Since many of the Reserve's inhabitants do not have proper land title, the "without project" scenario could result in the expulsion of many inhabitants from their land. Many times "land grabbers" use force, or the threat thereof, to convince existing communities to abandon their lands (SCHMINK & WOOD, 1992). In the Amazon, the process of expulsion of the existing inhabitants by newcomers is well documented.

Moreover, without a major intervention by the Government of the State of Amazonas and FAS, no improvement in the current lack of healthcare, educational opportunities and economic activities within the communities is expected. The current conditions within the area favor the migration of its inhabitants to urban centers, such as Novo Aripuanã and Manaus. In Manaus, these migrants, with their limited education and technical skills, have little chance of improving their livelihoods in an urban economy where a large percentage of the available employment is in the industrial sector.

All investments made by the Government of Amazonas and FAS are part of the project scenario and were carried out as specific project activities.

G2.4 – Description of how the "without-project" land-use scenario would affect biodiversity in the project area.

The Juma Reserve is an area rich in biodiversity, with several endemic species, some of which were only recently discovered (see sections *G1.6* and *G1.7*). Habitat loss is identified as one of the principal causes of extinction of local species (see GRELLE *et al*., 1999; BROOKS *et al*., 2002). The forecasted loss of 65% of the original forest cover within the Juma Reserve would greatly diminish the Reserve's populations of flora and fauna, resulting in a devastating loss of local biodiversity, putting in danger of extinction those species whose distribution is restricted to the region. Endemic species, which have a restricted distribution, would be especially susceptible to the effects of deforestation. The reduction and fragmentation of their habitats would result in a significant loss of a many endemic species' original populations. The loss of genetic diversity resulting from this process of fragmentation accelerates the extinction of a species (FEARNSIDE, 2002).

Forest fragmentation produces an "edge effect," and the impact of deforestation extends for kilometers into the adjacent forest (LAURANCE *et al*., 2002). The "edge effect," which includes changes in humidity, light and temperature, alters the habitat, causing, among other, higher tree mortality and a reduction in animal species (LOVEJOY *et al.,* 1986; LAURANCE *et al.,* 2000; FERRAZ *et al.,* 2007).

Continuous forest fragmentation into small parcels of land signifies a cascade effect in those species most susceptible to loss from the associated biological interactions (OFFERMAN *et al*., 1995; LAURANCE & BIERREGAARD, 1997). Therefore, the "without project" scenario represents a real disaster for the area's biodiversity.

G2.5 – Description of how the "without-project" land-use scenario would affect water and soil resources.

The Juma Sustainable Development Reserve encompasses 589,612 hectares, located mostly in the region downstream from the Aripuanã River basin, with a complex network of rivers, streams, lakes, etc. If 75.4% of the area of the Aripuanã River basin were lost due to deforestation, as predicted in the "business as usual" scenario of the deforestation simulation model (SOARES-FILHO *et al*., 2006), it would result in a significant alteration of the water cycle dynamics of the region.

The impacts of deforestation on water cycling are different from those on biodiversity or carbon stocks in which ones the effects are more local and regional. Half of the water in the Amazon watershed comes from the melt runoff of the Andes and is recycled continuously through forest evapotranspiration of the forest. The other half of the water comes from the Atlantic Ocean in the form of vapor. (FEARNSIDE, 2002). Thus, the forest plays a fundamental role in maintaining the rains, since it contributes to the distribution of precipitation in the entire southeastern area of South America as well as Central and North America (FEARNSIDE, 2004). However, within the context of the Amazon, the felling of the forest is preceded by fire. The deforestation fires annihilate all of the above ground parts of the plants, kill trees and leave a layer of ash on the forest floor. By killing the upper parts of the vegetation, the fires interrupt the flow of water into the atmosphere through evapotranspiration (NEPSTAD *et al.,* 2005). Fire leaves the ground unprotected and, therefore, more susceptible to erosion. This also causes the deterioration of the layer of organic material, which is naturally concentrated in the upper layers of the soil and which is very important for the fertility of the soil and maintenance of microbiology (NEPSTAD, 2005).

Soil erosion, depletion and compaction are some of the direct local impacts of deforestation. Agricultural productivity declines as soil quality degrades. Even considering management practices, such as shifting cultivation and the continuous use of nutrient inputs, these production regimes will not be economically viable in regions located far away from urban markets or transportation systems (FEARNSIDE, 1997).

G3. Project Design and Goals

G3.1 – Provide a description of the scope of the project and a summary of the major climate, community and biodiversity goals.

The Juma Reserve RED Project aims to control deforestation and its GHG emissions in an area under great land use pressure in the State of Amazonas. Its implementation is part of a broad strategy, planned and initiated in 2003 by the Government of the State of Amazonas, to halt deforestation and to promote sustainable development, based on valuing the environmental services provided by its forests (BRAGA & VIANA *et al.*, 2003; AMAZONAS, 2002).

The project is characterized by the creation and implementation of a Protected Area in an area that would effectively be completely deforested in a "business as usual" scenario. Its effective creation and implementation was only possible due to the prospect of implementing a financial mechanism to generate carbon credits from the reduction of emissions from deforestation (RED), which has been planned by the Government of the State of Amazonas over the last several years. The resources to be obtained will allow the Government of Amazonas and its partners to effectively implement all the necessary actions to control and monitor the deforestation inside the project's boundaries, and to reinforce the law and improve the welfare of the traditional communities.

By 2050, the implementation of the Project's activities will result in containing the deforestation to about 329.483 hectares of tropical forest, which would emit 189.767.027,9 tons of CO_2 (Table 05, item *G2.2*) into the atmosphere in the expected baseline scenario of the area of the Juma Reserve. Generating social and environmental benefits in the Project area is a main part of the region's conservation strategy and of the generation of climate benefits.

The generation of carbon cre=dits originating from the reduction of carbon emissions from deforestation in comparison to a "business as usual" scenario will create the conditions to attract investors and bring to the State the resources to implement consistent, robust and sustainable policies for controlling and monitoring deforestation. The financial resources will be designated for implementing the family, social, associative and economic aspects of the Bolsa Floresta Program, and for reinforcing the initiatives focused on scientific research and biodiversity inventories of the Reserve.

The project will result in significant improvements in the quality of life of local communities. Local education and health care needs will be determined and solutions (schools, health clinics, professionals) will be identified. Additional economic activities for the region will be developed based on a socio-economic study that was conducted as part of the creation of the Reserve. Local household incomes will be increased by identifying, along with the community, their needs as they relate to equipment, training and development, as well as market opportunities for the sustainable use of natural resources.

G3.2 – Describe each major project activity (if more than one) and its relevance to achieving the project's goals.

The success of this project depends on activities and measures developed in two major areas:

1) The development and implementation of the Reserve and its Management Plan and;
2) The generation of funds from carbon credits through reducing greenhouse gas emissions from deforestation (RED)

The creation and implementation of the Juma Sustainable Development Reserve was the first step in realizing this project. This process began with several studies in the Project area conducted by different institutions (SDS, IPAAM, CI, ITEAM, INPA and UFAM) between April and May of 2005 with the goal of diagnosing biological and socio-economic aspects, the ethno-characterization of the landscape and the mapping of natural resources, archeological sites and land tenure surveys. Public consultation meetings followed these studies with local stakeholders and the publication of the Decree of the Creation of the Juma Sustainable Development Reserve in April 2006. For more detailed information on the project's start date and additionality, see Annex III.

The development and implementation of the Reserve Management Plan includes identifying demands and implementing all the necessary measures to promote the conservation of natural resources and biodiversity and to promote sustainable development within the limits of the Reserve. The actions and investments will be based on a Sustainability Matrix, which is a tool developed by SDS for community actions to plan the construction of the production chain, in order to verify economic losses and gains.

The Sustainability Matrix is a model that allows the communities to continually assess their own development process using a database created from a survey of the local residents. The main results expected from its implementation can be described as:

1. **Monitoring and Law enforcement:** It will combine improvements in the surveillance that is already performed by the communities with large investments in policing the Protected Areas, as shared by the management agencies (State Secretariat of the Environment and Sustainable Development of Amazonas- SDS / State Center for Protected Areas - CEUC), the environmental agencies (Amazonas State Institute for Environmental Protection - IPAAM) and the land agencies (Amazonas Land Institute - ITEAM). In addition to these actions, one monitoring base and four communication bases positioned at strategic points within the Juma Reserve will be constructed and continuous monitoring activities with advanced remote sensing techniques will be implemented. The cost of monitoring and surveillance operations in remote areas such as the Juma Reserve is extremely high because access is possible only through helicopters and small planes. In this sense, the mechanism of RED brings the necessary resources to overcome the great deficiency in the State's monitoring abilities;

2. **Income Generation through Sustainable Business:** Various activities will be simultaneously implemented, including community organization activities to support entrepreneurship to increase the capacity to manage forest products, promotion and support of forest management, research and development of new technologies for product innovation and the development of markets for sustainable products and services, among others, thereby optimizing the entire forest production chain for the project's communities;

3. **Community Development, Education and Scientific Research:** Three schools will be constructed to educate, train and communicate scientific information to local communities, in addition to providing training opportunities for specialized professionals, such as biologists, forestry engineers and educators, among others. A program will be developed in public schools involving the training of teachers with emphasis on the use and production of materials suitable to the local reality. Among these materials are highlighted the teacher books from the series "Education for Sustainability," "Climate Change, a Concern for All," and "Sustainable Forest Management for Wood Production in the State of Amazonas" developed by the Government of the State of Amazonas through the State Secretariat of the Environment and Sustainable Development of Amazonas (SDS) with the support of the Amazonas Sustainable Foundation (FAS). Community involvement can only be achieved through the existence of active organizations with solid foundations, as they are essentially required to strengthen community activities and associations and provide social improvements for the group of local residents; and,

4. **Direct Payment for Environmental Services (Bolsa Floresta Program):** Communities will receive direct benefits for their contributions to conservation, such as access to clean water through the Pro-Chuva program, healthcare through health agent training and medical assistance, and productive activities for other improvements in their quality of life. A share of the Project's financial resources will be allocated to direct payments for environmental services to traditional communities that live in the Juma Reserve through the establishment of the Bolsa Floresta Program components: i) Bolsa Floresta Family; ii) Bolsa Floresta Social; iii) Bolsa Floresta Association; and iv) Bolsa Floresta Sustainable Income Generation. These programs deliver concrete and direct benefits to some of the most marginalized and vulnerable local populations, who are dependent on the forest for their survival.

   The project implementers will provide investors and donors with a guarantee that it will be executed and completed in compliance with all of the relevant legal, governmental and regulatory structures. The project was designed through a transparent process involving participatory workshops and political consultations in order to guarantee the involvement and commitment of all the local stakeholders.

The systematic generation of resources resulting from the RED carbon credits depends on the implementation of actions to curb deforestation and a program to monitor carbon emissions, as well as the signing of contracts with financial partners and the transfer of resources to a management endowment fund. The creation of this endowment fund establishes a stable long-term mechanism that can guarantee the longstanding application of the necessary resources to supply the maintenance needs of the Reserve.

Table 09 presents a list of the major activities to be performed during the project planning and implementation, as well as their dates, relevancy and responsible institutions and costs. All investments made by the Government of Amazonas and FAS are part of the project scenario and were carried out as specific project activities. When investments are made by both parts for the same activity, FAS pays the operational costs and Government of Amazonas pays the staff costs.

The implementation of the project didn't conduced to any diversion of funds from the regular budget that were destined to the other environmental programs and protected areas already existing in the State of Amazonas *See table 09, p 43; and table 02 of the additionality test - p. 151, where the annual budget is increased as the newly protected areas were created.*

Table 09. Project events and their relevance for the project goals

Event	Description	Relevancy	Responsible Institution	Date	FAS Cost (US$)*	Government Cost (US$)*
Study for creating the Juma Sustainable Development Reserve	Biodiversity, socio-economic and natural resource studies of the area	Deepen knowledge of the project area in order to create the Reserve	SDS/IPAAM	Mar 26, 2005	-	29,412
Public Consultation Meeting	Discussion on the creation of the Reserve and choice of name "RDS do Juma" in the Municipality of Novo Aripuanã	Disseminate information to some of the main stakeholders of the project and collect information and gain support	SDS/IPAAM, SDS/SEAPE	Mar 15, 2006	-	17,647
Meeting with the City Council	Discuss the creation of the Reserve	Disseminate information to some of the main stakeholders of the project and collect information and gain support	SDS/IPAAM, SDS/SEAPE	Mar 15, 2006	-	11,765
Creation of Juma Sustainable Development Reserve	Publication of the Decree in the Official Gazette	Reduce the main drivers of deforestation (illegal logging and illegal land grabbing), delimitation of the initial area of the project	Government of the State of Amazonas	Jul 03, 2006	-	29
Approval of the Amazonas Sustainable Foundation (FAS) and appointment of its first president	Meeting to vote on and approve the by-laws of the Foundation	Approval and creation of the organization which manages the project	Government of the State of Amazonas, Bank of Bradesco and FAS President	Dec 20, 2007	-	17,647

Event	Description	Relevancy	Responsible Institution	Date	FAS Cost (US$)*	Government Cost (US$)*
Project Design Document Elaboration	Development and design of the RED Juma Project	Detailing and design of the project and the carbon credit generation mechanism in a formal document	FAS/ IDESAM	Jan - Sep, 2008	167,647	-
Partnership with Marriott International	Establishment of agreement for purchase of the RED credits	Mechanism necessary for the financial sustainability of the project	Government of the State of Amazonas and Marriot International	Apr 7, 2008	-	29,412
Land Tenure Analysis	Definition and regularization of land titles inside the Reserve	Define and exclude private areas from the project area	ITEAM	Jun – Dec 2008	-	14,706
Land Tenure Analysis	Operational costs for definition and regularization of land titles inside the Reserve	Define and exclude private areas from the project area	FAS	Jun – Dec 2008	11,764	-
Community Meeting	Elect the Council Representative and the First and Second Substitutes	Definition needed to proceed with the activities	CEUC	Jun 18, 2008	-	1,765
Community Meeting	Operational costs to elect the Council Representative and the First and Second Substitutes	Definition needed to proceed with the activities	FAS	Jun 18, 2008	17,647	-
Bolsa Floresta on-site visits and social mobilization in Juma Reserve	Field activities in Juma Reserve	First Bolsa Floresta community activities, family registration	FAS	Jun 19–26, 2008	17,647	-

Event	Description	Relevancy	Responsible Institution	Date	FAS Cost (US$)*	Government Cost (US$)*
Bolsa Floresta workshop in Juma Reserve	Meeting with the community members to introduce the Bolsa Floresta Program	Community participation in the project	FAS	Jun 12 – Jul 02, 2008	20,588	-
Community Meeting	Locate 3 schools to be implemented by the Juma RED Project	Determine the community's needs and priorities to proceed with the project activities	CEUC	Jun 28, 2008	-	5,882
Community Meeting	Locate 3 schools to be implemented by the Juma RED Project	Determine the community's needs and priorities to proceed with the project activities	FAS	Jun 28, 2008	5,882	-
Chief of the Reserve costs	Monthly payments for the Chief of the Reserve	Control governmental activities within the Reserve	CEUC	Jan 2008 – Dec 2011	-	155,645
Juma Reserve Management Council creation	Meetings with the community representatives to form the team and design the activities to be done by them	The council will be an important member of the project. It will help with decision making, as an information resource and in achieving the project goals	CEUC	Jul - Nov 2008	-	11,765
Juma Reserve Management Council creation	Operational costs for meetings with the community representatives to form the team and design the activities to be done by them	The council will be an important member of the project. It will help with decision making, as an information resource and in achieving the project goals	FAS	Jul - Nov 2008	11,765	-
Bolsa Floresta Associação workshop in Juma Reserve	Organization of the Bolsa Floresta Association in the communitis	Community participation in the project	FAS	Aug 29 - Oct 23, 2008	11,765	-

Event	Description	Relevancy	Responsible Institution	Date	FAS Cost (US$)*	Government Cost (US$)*
Carbon monitoring	Monitoring of carbon dynamics in the project area	Key information for project implementation and carbon monitoring	INPA	Start in Feb 2009	141,176**	-
Deforestation monitoring	Monitoring of deforestation through satellite images	Key information for project implementation and deforestation monitoring	FAS	Start in Feb 2009	125,765**	-
Law enforcement activities	Construction and equipment of one monitoring base	Reduce illegal activities inside the project area	FAS	Start in Mar 2009	276,471**	-
Law enforcement activities	Operation of monitoring activities	Reduce illegal activities inside the project area	IPAAM	Start in Mar 2009	-	73,529**
Pro-Chuva Program	Implementation of rain water collecting system	Provide access to clean and treated water	CEUC	Feb 2009	70,588	-
Construction of the schools in the Juma Reserve	Construction of 3 schools in the Reserve	Provide education to all school age community members	FAS	Jan 2009	317,647	-
Capacity building	Capacity building	Enhance capacity and promote opportunity	CEUC			
Construction of communication base	Construction of 3 external and 3 internal communication bases	Improvement of community's communication	FAS	Jun 2009	88,235	-

*Exchange rate US$ 1 = R$ 1.7

** from 2008 to 2011

G3.3 – Provide a map identifying the project location, where the major project activities will occur, and geo-referenced boundaries of the project site(s).

The Juma Reserve RED Project includes all of the Juma Reserve (Figure 14), which is located in the municipality of Novo Aripuanã, in the southern region of the State of Amazonas.[22] (see item *G1.1*).

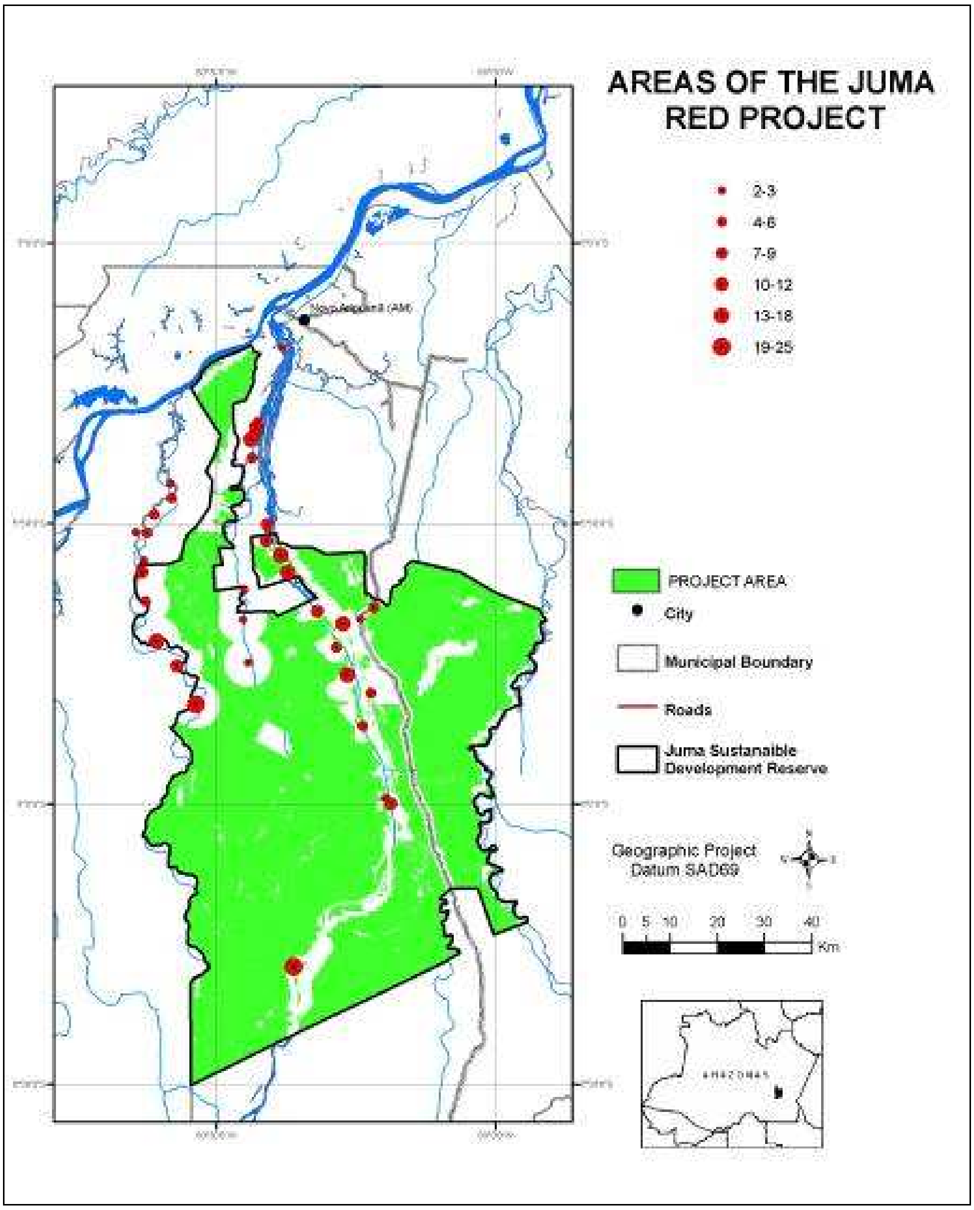

Figure 14 – Location of the crediting area of the Juma Reserve RED Project

For the purpose of the reductions in greenhouse gas emissions that result from the implementation of the project, the Juma Reserve was divided into two areas:

1. **Carbon Credit Area of the RED Project:** the entire forest area that would be deforested under the baseline scenario and in which the carbon stocks are fully known at the baseline and at the start of project implementation (Figure14).

[22] Annex II provides the geographic coordinates of the Juma Reserve.

2. **Excluded Areas of the RED project (Figure 15 and Table 10):** characterized by areas that would be deforested under the baseline scenario, but due to different and particular situations of previous land use, forest cover and land tenure, will not be included as areas eligible for RED crediting, as described below:

   - ***Deforested areas**:* areas that have already been deforested before the beginning of the Project. The data for the image classification was obtained from PRODES (INPE, 2008).

   - ***Titled lands**:* areas that have title registry, claims or that are in the process of land tenure normalization (see item *G.5*), according to the Amazonas Land Institute (*Instituto de Terras do Amazonas* - ITEAM), which is the official state organization dealing with land tenure issues, and which provided the GIS shape-files necessary for the classification.

   - ***Areas under influence of the Apuí – Novo Aripuanã highway (AM-174)**:* areas with forest cover, but which have potentially undergone any kind of disturbance, such as selective logging, deforested areas in regeneration, etc. To delimitate these areas, the most distant area with deforestation along the road was identified on PRODES's Image Classification and then a buffer was established for both sides of the road. This was also checked with the GIS flyover in 2008.

   - ***Community use areas**:* areas currently under use by the communities or that will be potentially used in the future for small-scale agriculture, logging, forest management and other uses that can potentially affect the carbon stocks inside the Reserve. The source of this data is SDS (2006); it was collected through a community participative mapping process for the Studies for the Creation of the Juma Reserve[23].

   - ***Non-Forest areas:*** Natural areas on which vegetation is not classified as forest; not reaching the Brazilian definition of forest
     a. A single minimum tree crown cover value of 30 percent
     b. A single minimum land area value of one (01) hectare
     c. A single minimum tree height value of five (05) meters

[23] For the communities where was not possible to estimate the use are, it was estimated from the participative mapping performed during the Study for the Creation of the Reserve, considering the number of families in the community.

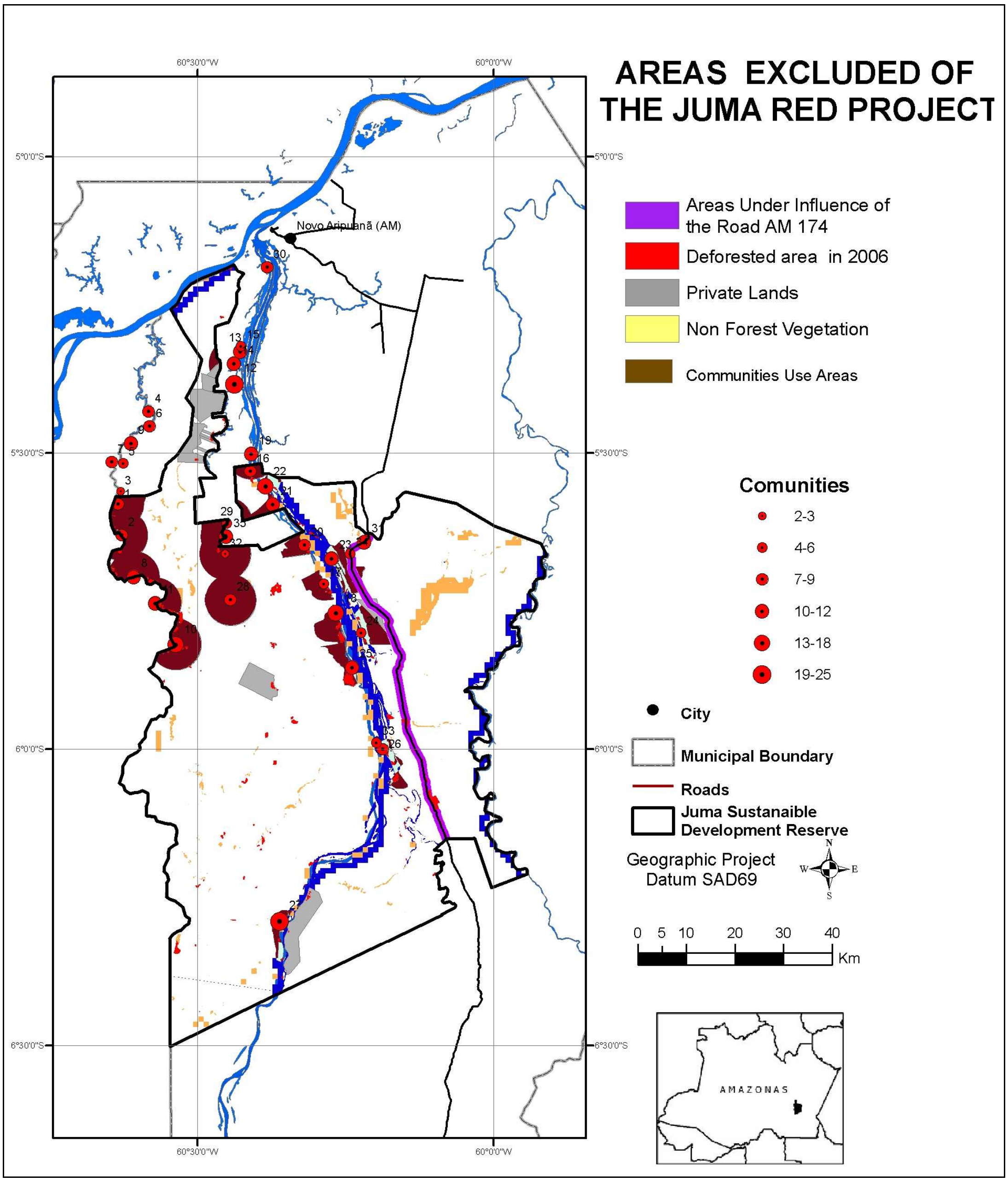

Figure 15: Location of the excluded areas of the Juma Reserve RED Project

Table 10 – Description of the Juma Reserve RED Project's excluded areas

Excluded Area	Hectares
Deforestation	6,493
Non-forest vegetation	15,647
Highway AM-174	9,778
Communities Use Area	38,480
Private Properties	15,038
Water	31,499
Total	**116,935**

The sources of the respective data layers used are presented below on Table 11:

Table 11 – Source of the data layers used to define the project excluded areas

Data Layer	Source	Reference
Boundaries of the Reserve	SDS (2005)	Study for the Creation of the Reserve
Private Land Titles	ITEAM (Personal Communication, 2006)	Database for private lands and titles in the State of Amazonas
Communities	FAS (2008)	Field Survey for the Bolsa Floresta Program
Communities use area	SDS (2005)	Study for the Creation of the Reserve
Road AM -174	IBGE (2008)	www.ibge.gov.br
Areas Under Influence of the Road AM-174	IDESAM (2008)	Juma PDD
Deforestation	PRODES (INPE) + Image Classification	www.obt.inpe.br/prodes

G3.4 – Provide a timeframe for the project's duration. Describe the rationale used for determining the Project lifetime. If the accounting period for carbon credits differs from the project lifetime, explain.

The Juma RED Project crediting period lasts until 2050, which is the date when the selling of carbon credits ends. However, the main role of the project is to improve the livelihoods of the communities, in addition to strengthening their production capacity, improving their health and education, and providing them with the necessary tools to allow them to generate their income from the sustainable use of natural resources. For this reason, even though the project specific activities end in 2050, it is expected that the project activities will be at an advanced level of implementation that makes the project activities self-sustainable in the long term.

The starting date of the Juma RED project is the day the Reserve was created (July 3, 2006).as well as the project crediting period:

Start of the crediting period: July 3, 2006
Justification: The crediting period starts on the same date that the Project starts. This date was defined as the first action of the Project, which corresponds to the creation date of the Reserve.

End date for the crediting period: January 2050.
Justification: This is the end date for the baseline projections used in calculating the carbon stocks and dynamics (i.e., the end date for the SimAmazonia I, SOARES-FILHO *et al.*, 2006). This end date also corresponds to the date when, according to the Fourth IPCC AWR, the world must have reduced its GHG emissions by 50% if it is to avoid dangerous climate changes (IPCC, 2003).

For the purposes of assessing additionality, the starting date of the REDD project activity is 2003 – when the ZFV Program was launched**.** However, as for defining the project crediting period, the starting date of the project is the date of creation of the Juma Reserve (2006), when the project boundaries went clearly delimited and the Juma RED Project started to be implemented "on the ground". For additionality issues, please check to the "Additionality Test", on Annex III.

Throughout the crediting period there will be periodic certifications performed by an accredited CCB certifying organization. These certifications will verify that the carbon remaining in the Reserve is in keeping with the values expected at the start of the project. These certifications will be performed one year after obtaining the initial validation and every two years thereafter. For example, if the validation is obtained in 2008, the periodic certifications will be undertaken as follows:

Table 12 – Schedule of the periodic certifications within the Juma RED Project crediting period

Certification No.	Year
01	2009
02	2011
03	2013
04	2015
05	2017
06	2019
07	2021
08	2023
09	2025
10	2027
11	2029

Certification No.	Year
12	2031
13	2033
14	2035
15	2037
16	2039
17	2041
18	2043
19	2045
20	2047
21	2049
22	2050

G3.5 – Identify likely risks to climate, community and biodiversity benefits during the project lifetime. Outline measures that the project plans to undertake to mitigate these risks.

The major risks identified are divided into long- and short-term risks.

Table 13: Risks to the Juma Sustainable Development Reserve Project and Risk Mitigation Plan

Type	Risk Category	Risk	Consequences	Mitigation
Climate	Short Term	Increase in deforestation rate	• risks for forests, biodiversity, community and climate; • Project carbon accounting will be decreased, affecting the project funding structure • investors can lose interest in the project, risking contracts	•introduce early capacity building and training for local environmental agents. •Increase of deforestation monitoring and control activities •maintain 10% of carbon stocks in the project area as a buffer (see Item CL 1.1)
Climate	Long term	Extreme natural events (such as heavy droughts, fires, etc.)	• forests are more susceptible to fires, many forest species are vulnerable to increases in temperature and decreases in humidity and other changes in microclimatic conditions	•.invest in scientific research of forest dynamics •monitor local climate features, hydrological and forest dynamics, and biodiversity • keep 10% of carbon stocks as non-permanent buffer in the project area •keep a portfolio of other projects that reduce emissions from deforestation as reserve “buffer”
Community	Short term	Diseases affecting the population	• e.g., a malaria outbreak can cause people in the communities to leave the area	•invest in prevention (health clinics, health agents, medicine, mosquito nets, mosquito control)

One risk that can be considered is that deforestation continues to occur in spite of all the efforts of the project and the measures taken to decrease deforestation. As a means of addressing this, the project is committed to decreasing deforestation by 90%. If it is verified that the project succeeds in reducing 100% of the emissions predicted under the baseline, this will be credited during the periodic certifications.

G3.6 – Document and defend how local stakeholders have been or will be defined.

The Juma Reserve RED Project was created to serve different demands. Local communities identified the creation of the Reserve as a way to protect their forests and to improve their welfare and quality of life. Throughout the process of creating the Juma Sustainable Development Reserve, there was participation by all types of local residents, involved in many lines of work (fishermen, extractivists, farmers, ranchers, etc.). The process also included informal community associations (mothers, professors, artisans, etc).

On March 15, 2006, two public hearings were held, one being in Novo Aripuanã city. These meetings brought together the community leaders and major local stakeholders, with representatives from City Hall, the City Council, local churches, and local civil society organizations in attendance, to express their interest in the Project’s implementation. Inhabitants from all communities within the Reserve were interviewed to obtain their perspectives on the social, economic and environmental context of the Reserve, most being favorable to the project's implementation, and thus a better understanding and knowledge of the direct stakeholders of the project was obtained.

The use of participatory methods in all of these meetings, workshops and public hearings throughout the Reserve creation process was very important to increase the understanding on the level of community organization and to communicate the *modus operandi* to the local communities. This is an important input for establishing the dynamics and process for developing the Reserve's management plan.Table 14 shows a list of all the stakeholders identified and consulted.

Table 14. ***Stakeholders within the Project area***

Institution/Community	Name	Function	Relationship to the project
CEUC	Roberson Alencar de Souza	Chief of Reserve	Coordinate CEUC activities in the Reserve
Novo Aripuanã Municipality	Geramilton de Menezes Weckner	Mayor	Cooperation, support and information dissemination
	Raimundo Lopes de Albuquerque Sobrinho	Vice Mayor	
	Sr. Emerson França	Ex- Mayor	
	Neto Carvalho	Councillor	
Novo Aripuanã representative	Antônio Ramiro Benito	Priest	Information Dissemination
Barraquinha Community	Geraldo Ramos	President	These communities are inside the Reserve, they take part in decisions, receive the benefits of the project, and contribute to the planning and results.
Cacaia Community	Danilo	President	
Limão Community	Marco Antônio	Reference	
	Gérson Albuquerque	Teacher	
Nova Jerusalém Community	Doracy Corrêa	President / Health Agent	
	Marcinho	Teacher	
Livramento Community	Dorival Almeida Valente	President	
	Nilson	Teacher	
São José Brasão Community	José Almeida Queiroz	President	
	Perivaldo Almeida	Teacher	
Repartimento Community	Jorge Moraes	President	
	Zilda Moraes	Teacher	
	José Antonio Almeida	Health Agent	
Santo Antônio Community	Hélio Costa	President	
	Valdeci Marques Rodrigues	Teacher	
	Damião Pereira	Health Agent	
Boa Frente Community	Eolinélson Souza Passos	President	
	Raimundo Carvalho	Teacher	
	Deodato Alves da Silva	Health Agent	
Santo Antônio Capintuba Community	Manuelito Valente Oliveira	President	
	Manuel Júlio Passos	Teacher	
Novo Oriente Community	Inireu Ferreira Vieira	President	

Santa Maria Community	Gabriel Filho	President / Health Agent	
	Afraim Couto	Teacher	
Tucunaré Community	Melquisedek Fonseca Melo	President	
	Marivaldo Passos de Souza	Teacher	
	Detinho Leonardo Vieira	Health Agent	
Severino Community	Cleude Braga	Leader	
	Grimaude Gomes	Teacher	
Flechal Community	Aldemir Costa Ramos	President / Teacher	
	Aderbal Oliveira Quadro	Vice President	
	Manoel Válber de Carvalho	Health Agent	
São José Cipotuba Community	Valeriano Magalhães da Silva	President	
	Roberval Pereira	Teacher	
Paraíso Community	Manuel Corrêa da Silva	President	
	Eudes da Silva	Vice President	
Community Santana do Aruzinho	Sebastião Carvalho	Reference	
	José Vagner Reis Alho	President	
	Ademar Serrão	Vice President	
	Claudiana Pimenta	Teacher	
	Alias Bastos	Health Agent	
Santa Rosa Community	Sebastião de Souza Parente	President	These communities are outside the Reserve, but use natural resources. They also take part in decisions, receive the benefits of the project and contribute with the planning and results.
São Félix Community	Arnaldo da Silva Valeste	President	
	Pedro Valente	Health agent	
	Benedito (Bento)	Teacher	
São Francisco Community	Lucindo Almeida Valente	Teacher	
	Helolita Ribeiro	Teacher	
Alvorada Community	Amadeu Gonçalves	President	
	Conceição	Teacher	
Vila São Domingos Community	José Rodrigues da Rocha	President	
	Lázaro Corrêa das Chaves	Health Agent	
	Marcio Albuquerque	Teacher	
Abelha Community	João Paz Brasão	President	
	Lázaro Corrêa das Chaves	Health Agent	
Amorim Community	Joaquim Pereira	President / Teacher	
	Raimundo Parente	Health Agent	
Nova Olinda Community	Valdison Marlons Silva	President	
	Genildo Ramos Amazonas	Teacher	
	Damião Pereira	Health Agent	
São Marcos (Caracurú) Community	Arnaldo Ferreira	Reference	
	Benedito Reis de Souza	Teacher	
Santo Antônio Community	Hélio Costa	President	
	Valdeci Marques Rodrigues	Teacher	
	Damião Pereira	Health Agent	
Boa Frente Community	Eolinélson Souza Passos	President	
	Raimundo Carvalho	Teacher	
	Deodato Alves da Silva	Health Agent	
Santo Antônio Capintuba	Manuelito Valente Oliveira	President	

Community	Manuel Júlio Passos	Teacher	
Novo Oriente Community	Inireu Ferreira Vieira	President	
Santa Maria Community	Gabriel Filho	President / Health Agent	
	Afraim Couto	Teacher	
Tucunaré Community	Melquisedek Fonseca Melo	President	
	Marivaldo Passos de Souza	Teacher	
	Detinho Leonardo Vieira	Health Agent	
Severino Community	Cleude Braga	Leader	
	Grimaude Gomes	Teacher	
Flechal Community	Aldemir Costa Ramos	President / Teacher	
	Aderbal Oliveira Quadro	Vice President	
	Manoel Válber de Carvalho	Health Agent	
São José Cipotuba Community	Valeriano Magalhães da Silva	President	
	Roberval Pereira	Teacher	
Paraíso Community	Manuel Corrêa da Silva	President	
	Eudes da Silva	Vice President	
Boca do Juma Community	Francisco Colares	Leader	
Cumã Community	Alvina Martins	Teacher	
São Francisco Community	Osmar Nonato da Silva	Vice President	
	Francisco Nascimento Dias	Health Agent	
	Dermival Souza (Pelé)	President	

G3.7- Demonstrate transparency by: making all project documentation publicly accessible at, or near, the project site; only withholding information when the need for confidentiality is clearly justified; informing local stakeholders how they can access the project documentation; and making key project documents available in local or regional languages, where applicable.

The local communities and stakeholders will be involved in the development and implementation of the Reserve's management plan, and in the management decisions regarding the Juma RED Project through its Deliberative Council (*Conselho Deliberativo).*[24]

All of the project activities as well as the technical and administrative processes will consistently be made publically available at the project's operational bases located inside the Juma Reserve and in the Novo Aripuanã City office. All efforts will be made to inform the communities and other stakeholders that they can access project information and comment on and influence its management. These documents will also be made available through the Amazonas Sustainable Foundation (*Fundação Amazonas Sustentável* – FAS) website (www.fas-amazonas.org).

[24] The Deliberative Council is in charge of deliberating on the running of the protected area, and has the right to speak and vote on foreseen activities. The people who live inside the protected area make up 50% of it, and the other 50% consists of institutions acting in the PA, being either from the government or not. Included among its main roles are approving the budget for the PA, following up and approving the management plan, and reporting on actions that may have significant impact inside and around the area, among others.

The Project field coordinator will always be available for receiving comments and grievances and for clarifying any doubts related to the project implementation, according to the project management procedures (explained in *CM1.3a*), forwarding any requests for information or conflicts to the Project Coordinators. The community members will also be informed about this open forum with the field coordinator for directing any doubts or queries related to the project.

G4. Management Capacity

G4.1 – Document the management team's experience implementing land management projects. If relevant experience is lacking, the proponents must demonstrate how other organizations will be partnered with to support the project.

The implementing institution and partner organizations involved in the Juma RED Project are described below and in Table 15, in addition to the type of contract linking these institutions.

The mission of the **Amazonas Sustainable Foundation (FAS)** is to promote the sustainable development in Amazonas' Protected Areas, focusing on environmental conservation and improving the quality of life of traditional populations. FAS actions are focused on reducing deforestation, eradicating poverty, supporting social organizations, improving social indicators and generating income based on sustainable activities within Amazonas' Protected Areas. FAS seeks to approach companies and institutions that are interested in collaborating on sustainable development and management of protected areas in Amazonas. For that, FAS offers its partners opportunities to support actions of socio-environmental responsibility within protected areas. FAS also works to develop a market for environmental services and products, applying the resources achieved for implementing the Amazonas Protected Areas.

The carbon credits belong to FAS as a result of the environmental services management, a right legally transferred to FAS through Law n° 3135 and the Decree n° 27.600 (AMAZONAS, 2008c). Article 6 of the Climate Changes Law (AMAZONAS, 2007b) authorized the participation of the Executive Power in a sole non-profit Private Foundation whose purpose and objective are the development and administration of Climate Change, Environmental Conservation, and Sustainable Development, as well as the management of environmental services and products. Through Decree n° 27.600, dated April 30, the Government of the State of Amazonas donates to FAS, as stipulated in Article 7 of Law n° 3135, the amount of R$ 20 million, and it is authorized to participate with the purpose of encouraging the actions necessary for achieving the Foundation's institutional objectives, under the provisions of Article 6 of the Law.

The State Secretariat of the Environment and Sustainable Development of Amazonas – SDS coordinates the creation and establishment of new Protected Areas and implements and coordinates them through the State Center for Protected Areas *(Centro Estadual de Unidades de Conservação, CEUC)* and the State Center on Climate Change (CECLIMA).

- **The State Center for Protected Areas – CEUC** is responsible for the creation of more than 20 Protected Areas over the last 5 years, increasing the area in state-level Protected Areas in Amazonas by more than 10 million hectares. CEUC works closely with local communities, organizations and key stakeholders to implement these Protected Areas. The CEUC team has developed a series of procedures for the consistent implementation of Protected Areas in the State of Amazonas, such as the process for the development of management plans for these areas (AMAZONAS, 2006a). CEUC has also developed indicators to verify the effectiveness of the implementation of the Protected Areas (AMAZONAS, 2006b). The center has also developed a series of programs, which are part of the process of implementing and monitoring Protected Areas, such as ProBUC, the Biodiversity and Natural Resource Use Monitoring Program in State Protected Areas of Amazonas (AMAZONAS, 2008b).

- **The State Center on Climate Change – CECLIMA** coordinates the development and implementation of Amazonas state policies and programs related to climate change, and will supervise all the project activities.

The teams of CEUC and CECLIMA have been working on the development of public policies for conservation and climate change for the State of Amazonas for many years. Its members have experience in fund-raising, partnership development (e.g. World Bank, Moore Foundation, Blue Moon Foundation, GTZ, Conservation International and the World Wildlife Fund, among others). The CEUC and CECLIMA teams have extensive experience with educational and cultural exchange programs, capacity building, public policy and strategic planning, all of which will be critical to the success of this project.

The Institute for Conservation and Sustainable Development of Amazonas – IDESAM *(Instituto de Conservação e Desenvolvimento Sustentável do Amazonas*) has been involved in climate initiatives with the Government of the State of Amazonas since its creation in 2004, and the work has a strong focus on conservation and climate change in the Amazon. IDESAM's contribution to the development of this project concept was critical; the institute is responsible for the development of the Carbon Accounting Methodology and the Project Design Document (PDD). IDESAM's representatives have been participating in Conferences of Parties of the UNFCCC, as well as in events on climate/forest-related issues in Brazil and abroad.

Table 15. Implementing institutions and partner organizations involved in the Juma RED Project implementation

<table>
<tr><th>Project Activities</th><th>Agency/Institution</th><th>Function</th><th>Type of contract</th></tr>
<tr><td rowspan="11">Project implementation, Bolsa Floresta Program implementation and management, Financial-Technical cooperation agreement and Community Meeting</td><td rowspan="11">Amazonas Sustainable Foundation (FAS)</td><td>Project Manager</td><td rowspan="4">Direct contract</td></tr>
<tr><td>Project Assistant</td></tr>
<tr><td>Field Coordinator</td></tr>
<tr><td>Field Assistant</td></tr>
<tr><td>Bolsa Floresta team (20)</td><td rowspan="5">Staff working part time on the Project</td></tr>
<tr><td>Technical team (2)</td></tr>
<tr><td>Administration team (5)</td></tr>
<tr><td>Legal Counsel</td></tr>
<tr><td>GIS / Satellite monitoring</td></tr>
<tr><td>Environmental Agents (10)</td><td rowspan="2">Direct internship</td></tr>
<tr><td>Health Agents (10)</td></tr>
<tr><td rowspan="6">Study for creation of Juma Sustainable Reserve, Public Consultation Meeting</td><td rowspan="6">Amazonas State Institute for Environmental Protection (IPAAM / SDS)</td><td>Forest Guards (2)</td><td>Cooperation Agreement</td></tr>
<tr><td>Forestry engineer</td><td rowspan="5">Staff working part time on the Project</td></tr>
<tr><td>Environmental engineer</td></tr>
<tr><td>Ethnomapping technician</td></tr>
<tr><td>Biologist</td></tr>
<tr><td>Socio-economic technician</td></tr>
</table>

Project Activities	Agency/Institution	Function	Type of contract
Creation of Juma Reserve, Meeting with the City Council, ProBUC monitoring Program implementation Community Meetings,	State Center for Protected Areas (CEUC / SDS)	Head of Juma Reserve	Direct contract
		ProBUC monitors (community members) (39)	
		CEUC Coordinator	Staff working part time on the Project
		ProBUC Coordinator	
		Social mobilizer I	
		Social mobilizer II	
Management plan Assistance	State Center on Climate Change (CECLIMA / SDS)	Coordinator	Staff working part time on the Project
		Sub Coordinator	
		Project Coordinator	
Carbon Accounting Methodology and Project Design Document development	Institute for Conservation and Sustainable Development of Amazonas (IDESAM)	Executive Secretary and Coordinator of the Climate Change Program and Environmental Services Program	Direct contract
		Researcher of the Climate Change Program	
		Carbon Dynamics Independent Consultant	Temporary contract
		GIS Independent Consultant	
		Translator	
		Consultant	
Management plan Assistance	State Secretariat of Planning and Economic Development (SEPLAN/AM)	State Secretary	Staff working part time on the Project
		Executive Secretary	
Carbon Monitoring	National Institute for Amazon Research (INPA) / Tropical Forest Department	Head researcher	Staff working part time on the Project
		Assistant researcher	
Deliberation on the Reserve’s programs and activities, and approval of annual operational investment plans	Reserve Management Council	The council is being created (includes community representatives, local stakeholders, governmental and non-governmental institutions)	No formal contract with the project

As discussed earlier in section *G4.1*, IDESAM has significant experience working on conservation and climate change issues. The Institute will be supported by a Scientific Committee comprising a group of experienced scientists who will assist in developing and refining this PDD and the carbon methodology for this project. This group is made up of the following members:

1. General Coordination of the Juma Reserve RED Project:

Amazonas Sustainable Foundation (FAS)

- Prof. VirgilioViana, General Director
- JoãoTezza, Technical-Scientific Director
- Gabriel Ribenboim, Project Manager
- Vanylton Santos, Legal Counsel
- Raquel Luna Viggiani, Project Assistant

State Secretariat of the Environment and Sustainable Development of Amazonas (SDS/AM)

- Marina Thereza Campos – General Coordinator of the State Center on Climate Change (CECLIMA/AM)
- Domingos Macedo – General Coordinator for the State Center for Protected Areas (CEUC/AM)
- Francisco Higuchi – Coordinator of Climate Research and Monitoring (CECLIMA/AM)
- Rodrigo Freire – Coordinator of Special Projects (CECLIMA/AM)

***State Secretariat of Planning and Economic Development of Amazonas (SEPLAN/AM*)**

- Denis Minev, State Secretary of Planning and Economic Development
- Marcelo Lima, Executive Secretary

2. Coordination of the Baseline and Monitoring Methodology and Development of the Project Design Document (PDD):

Institute for Conservation and Sustainable Development of Amazonas (IDESAM)

- Mariano Colini Cenamo – Executive Secretary and Coordinator of the Climate Change and Environmental Services Program
- Mariana Nogueira Pavan – Researcher of the Climate Change Program
- Gabriel Cardoso Carrero (Independent Consultant)
- Rômulo Fernandes Batista (Independent Consultant)
- Matthew D. Quinlan (Translator and Independent Consultant)
- Marina Gavaldão (Independent Consultant)

3. Scientific Committee / Reviewers

- Prof. Britaldo Soares-Filho – Federal University of Minas Gerais (UFMG)
- Carlos Rittl – Independent Consultant
- Prof. Lucio Pedroni - *Centro Agronómico Tropical de Investigación y Enseñanza* (CATIE/Member of the UNFCCC Executive Committee)
- Prof. Niro Higuchi – National Institute for Amazon Research (INPA/IPCC)
- Prof. Paulo Moutinho – Institute for Environmental Research in the Amazon (IPAM)
- Prof. Philip Fearnside – National Institute for Amazonian Research (INPA/IPCC)
- Dr. Werner Grau Neto – Pinheiro Neto Advogados
- Prof. Virgilio Viana – Amazonas Sustainable Foundation (FAS)

G4.2 – Demonstrate that management qualifications are suitable for the scale of the project.

FAS, CEUC, CECLIMA and IDESAM are making an experienced team available to implement the Juma RED Project. The FAS local team dedicated to the Juma RED Project consists of two classes:

- FAS permanent staff that is fully qualified and dedicated exclusively to the Juma Project (Project Coordinator, Project Assistant, Field Coordinator and Field Assistant) and;

- FAS multispectral and multidisciplinary permanent technical staff who subsidizes the implementation of the objectives, goals and controls. This team is composed of 49 professionals and serves several projects from FAS, aiming at the Bolsa Floresta Program (social area, construction area, health area, GIS area, partnership area).

The CEUC team for the Juma Project is composed of 10 professionals forming a capable team to coordinate the activities assigned to them in the project. The whole team participated in some crucial activities of the project, such as biodiversity monitoring.

The CECLIMA team is composed by 7 people fully qualified to develop their role within the project. The two coordinators acted directly in designing it, bringing technical knowledge and experience that is critical to the success of the project.

IDESAM's team is dedicated to the project and composed of 6 experienced professionals, capable of developing the required work to formulate the carbon methodology for a project of this scale with quality.

SEPLAN's upper management team is involved in this project. Their capacity and experience provide important support to the development of the management plan.

G4.3 – Document key technical skills that will be required to successfully implement the project and identify members of the management team or project partners who possess the appropriate skills.

Table 16 below shows that the personal technical skills of the team members are appropriate to successfully implement the Juma RED Project.

Table 16. Functions and professional skills of project team.

Agency/Institution	Function	Name	Qualifications
Amazonas Sustainable Foundation (FAS)	Project Manager	Gabriel Ribenboim	Biologist and Management Skills
	Project Assistant	Raquel Luna	Bachelor in Business
	Field Coordinator	Undefined	Forest Engineer
	Field Assistant	Undefined	Trained by FAS
	Bolsa Floresta team	Coordinator	Management Skills
		Field workers (20)	Trained by FAS
	Administration team	Luiz Villares, Director	Master in International Management
		Cirlene Elias de Oliveira	Accounting Technician
		Alynne Esteve de Lima	Bachelor in Business
		Armando Sérgio Santos	Architect
		José Coelho de Sousa	Construction Technician
	Technical team	JoãoTezza	Economist
		Benjamim Maia	Technical Skills
	Legal Counsel	Vanylton Santos	Bachelor in Law
	GIS / Satellite monitoring	Rafael Valente	GIS Technician
	Environmental Agents	Agents (10)	Program Training
	Health Agents	Agents (10)	Program Training
IDESAM	Carbon Methodology and Project Design Document development	Mariano Cenamo	Forest Engineer
		Mariana Pavan	Forest Engineer
		Gabriel Carrero	Biologist
		Rômulo Batista	Biologist
		Matthew D. Quinlan	Master of Forestry and Master of Business Administration
		Marina Gavaldão	Forest Engineer
INPA- Tropical Forest Department	Carbon monitoring research	Dr. Niro Higuchi	PhD. in Dendrometry and Forestry Inventory
		Adriano J. N. Lima	Master in Dendrometry and Forestry Inventory
State Secretariat of the Environment and Sustainable Development of Amazonas (SDS), Amazonas State Institute for Environmental Protection of (IPAAM)	Management team and Carbon monitoring fieldworkers	Alexsandra Santiago	Forestry Engineer
		Carlos Eduardo Marinelli	Environment Engineer
		Filipe Mosqueira	Ethnomapping Technician
		Paula Soares Pinheiro	Biologist
		Yasmine Costa	Socio-economic Technician

Agency/Institution	Function	Name	Qualifications
State Center for Protected Areas (CEUC)	CEUC Coordinator	Domingos Savio Macedo	Master in Forestry Sciences
	Head of Juma Reserve	Roberson Alencar de Souza	Forestry Technician
	ProBUC monitors (community members) Monitoring biodiversity	1. Census monitors (19) 3. Fishing monitor (2) 4. Boat monitor (2) 5. Fauna monitor (12) 6. Road monitor (2)	ProBUC Training
	ProBUC coordinator	Henrique Carlos	Master in Ecology, Conservation and Wildlife management
State Center on Climate Change (CECLIMA)	Coordinator	Marina Campos	PhD in Forestry and Environmental Studies
	Sub Coordinator	Luís Henrique Piva	Bachelor in Economic Sciences and Law
Management Council for the Juma Reserve	Management assistance, decision making	Community representatives, local stakeholders, governmental and non-governmental institutions (number to be defined)	Be informed of the project's actions
State Secretariat of Planning and Economic Development (SEPLAN)	Management plan assistance	Denis Minev	State Secretary
		Marcelo Lima	Executive Secretary

G4.4 – Document the financial health of the implementing organization(s).

The Amazonas Sustainable Foundation (FAS) is responsible for the general coordination of the project and for insuring contracts with private investors. FAS was created in partnership with the Government of the State of Amazonas to trade the environmental services provided by the State's protected areas and to invest all of these funds in the implementation of the protected areas. The Foundation's initial endowment fund is R$ 40 million (about US$ 23 million), invested to generate funds for its activities. This endowment was created with donations from the Government of the State of Amazonas and private investors, who will provide additional funds for the operation of the Foundation.

The Government of the State of Amazonas intends to expand its conservation policies, and create and implement new Protected Areas. The number of these areas, and the area of land they contain, is reaching the point where new funding strategies are required if Amazonas is to increase the number of Protected Areas within the State System. This is especially critical while the State Government is aiming at successful results in raising the welfare of the people living in Protected Areas, as well as at in implementing plans and activities to promote effective conservation and sustainable development. The financial sustainability of the Protected Areas is essential for the long-term success of the State's conservation policies. Generating resources from the marketing and selling of environmental services, such as carbon stocks, has emerged as a central strategy in the effort to make these areas financially sustainable. The implementation of the Juma RED Project will be a milestone for the State Government's efforts to promote the financial sustainability of the Protected Areas within the State.

The execution of this project relies primarily on the financial benefits of carbon, which will be generated with the implementation of a RED mechanism of the same magnitude as the Amazonas State Policy on Climate Change (PEMC-AM). Exclusively for the Juma Reserve RED Project, is being implemented a partnertship with Marriott International (MI). This partnership aims to develop a RED mechanism to "compensate" the emissions generated by its guests, all around the world.

The practical details of this mechanism are still being negotiated; however, all the estimates indicate that, with its utilization, it will be possible to generate all the financial resources necessary to effectively implement the RED Project for the Juma Reserve, generating all the expected social, economic and environmental benefits. As an advance for executing initial project activities, Marriott International will make an initial deposit of US$ 2 million (approximately R$ 3.4 million) and FAS will contribute US$ 294,117 (R$ 500,000), to be spent from 2008 to 2011. In addition, the Government of the State of Amazonas already disbursed US$ 105,471 from 2005 to 2007 develop the project. By the end of 2008 to 2011, the Government of Amazonas will disburse US$ 469,175 for project activities. For more details, see Annex XII.

All investments made by the Government of Amazonas and FAS are part of the project scenario and were carried out as specific project activities. When investments are made by both parts for the same activity, FAS pays the operational costs and Government of Amazonas pays the governmental staff costs.

G5. Land Tenure

G5.1 – Guarantee that the project will not encroach uninvited on private property, community property, or government property.

As described in section *G1.1*, there are 15.038 hectares of land being claimed as private property within the Project area (see Figure 2, section *G1.1*). Even though the Juma Reserve permits private areas inside its boundaries, it was verified during the socio-environmental survey prior to the Reserve creation that there are no people living within these private lands. Furthermore, a full analysis of the documents related to these land claims will permit the State Government to determine which of these title claims are legal - and should be recognized - and which are not. This analysis will include a detailed review of the relevant documents at the Amazonas Land Institute – ITEAM, the National Institute for Colonization and Land Reform – INCRA, and registry offices in the municipalities of Novo Aripuanã and Manicoré.

Once this analysis is complete, the State Government will make a decision to proceed or not with total or partial expropriation of the legal private properties. Consideration will be given to the feasibility of exchanging the legal land titles for state-owned land outside the protected areas. In those cases where expropriation does occur, whether partial or complete, appropriate measures will be taken to provide compensation. Those areas with land title claims are not being included in the Project's crediting areas.

G5.2 – Guarantee that the project does not require the relocation of people, and that any relocation is 100 % voluntary and fundamentally helps resolve land tenure problems in the area.

According to the definition set forth by the State System for Protected Areas – SEUC (Sistema Estadual de Unidades de Conservação), a Sustainable Development Reserve (RDS) is a natural area inhabited by traditional communities, the existence of which is based on the sustainable use of natural resources. None of these communities was displaced during the creation of the Juma Reserve. As stated in the previous item concerning the existence of private titles inside the Reserve, there are no people living on the associated lands. For this reason, there is no risk of displacement of people, even considering the private areas (not included in the project and not considered part of the Reserve).

The principal objective of the RDS category of protected area is to preserve nature while simultaneously ensuring the conditions and tools necessary for the reproduction and improvement in the livelihoods and natural resource management practices of traditional communities. Therefore, the government consulted the traditional populations living within the Juma Reserve and they played a key role in the decision to declare it a protected area.

G5.3 – Describe potential "in-migration" of people from surrounding areas, if relevant, and explain how the project will respond.

The chance of in-migrations of external populations to the Reserve is very small, considering that this is not a very common practice, and that such migration into established protected areas is prohibited – unless it is approved by the Reserve's Council. The communities have their own rules to deal with this kind of situation, although there are no legal references to this process. Usually, a new person can only move in to the Reserve when invited by someone else, and then spends about 6 months on "obsrevation," which also requires authorization by the Council.

These situations and the necessary measures to address them are also foreseen in the Reserve's Monitoring Plan, which will monitor annual migration at the project's boundaries. Another measure to control these migrations are the Bolsa Floresta Program rules, which determine that only people who have been living in the Reserve for at least 2 years can participate into the program.

G6. Legal Status

G6.1 – Guarantee that no laws will be broken by the project.

The Juma Reserve RED Project observes the **informative principles** of environmental protection, conservation and recovery specified in the Rio-92 Declaration, as well as the principles and rules set out in the Biodiversity Convention and in the United Nations Framework Convention on Climate Change (UNFCCC). The principle of protector-receiver, a recently created doctrine mechanism, was also adopted for conceiving the project from its legal viewpoint and permits feasibility of the Project as well as incentives such as Reduction of Emissions by Deforestation– (RED), which is now being debated and formulated within the ambit of discussions under the UNFCCC.

The elements dealt with in the Project, which ascribe**s** an economic value to make protection and maintenance of the Amazon feasible, are, in most cases, classically intangible, and their protection is the objective of society worldwide. In the Rio-92 Declaration, international protection has been attributed to them as being underlying principles (especially those of prevention, precaution, participation, transparency and information), and they are afforded specific protection under the UNFCCC and the Biodiversity Convention (for the former, economic mechanisms have already been established with their resulting markets, methodologies and rules, while for the latter the mechanisms to develop economic valuation models are still at an initial stage).

Within the domestic arena, the Project observes the principles established in the Federal Constitution, both in the main section of article 225 (since it contributes towards achievement of an ecologically well-balanced environment) and in article 224, paragraph 1 (I) and (III) of the Federal Constitution (to the extent that it contributes to conservation and restoration of the essential ecological processes while supporting the preservation of attributes that justify protection of the specially-protected territorial space named **Juma** RDS).

Additionally, the Project falls under the principles established by the National Environmental Policy - Law N**º**. 6938 of August 31, 1981, which declares (article 2) to have as its objectives the conservation, improvement and recovery of environmental quality that is conducive to life, having among its principles the protection of ecosystems with the conservation of relevant areas (article 2, IV) and the protection of areas threatened by degradation (item IX).

The Juma RED Project was created under the auspices of the Amazonas State Policy on Climate Change (PEMC-AM, Law 3135 of June 2007 – available at www.fas-amazonas.org) and its implementation will occur in accordance with existing legal requirements, including those related to the operation of a mechanism for financial compensation for environmental services based on the Reduction of Emissions from Avoided Deforestation (AMAZONAS, 2007b).

The Governor of the State of Amazonas signed Decree nº. 26.010, which created the Juma Sustainable Development Reserve on July 3, 2006 (AMAZONAS, 2006). Its implementation will follow the rules of the State System of Protected Areas (*Sistema Estadual de Unidades de Conservação*, SEUC) (ASSEMBLÉIA LEGISLATIVA DO ESTADO DO AMAZONAS, 2007), as well as the rules established by the National System of Protected Areas (*Sistema Nacional de Unidades de Conservação*, SNUC) as set forth in Federal Law n^{o}, 9,985 of July 18, 2000.

According to the SEUC law, the effectiveness of the Juma Reserve must follow directives set forth in the Management Plan – a document that must be developed by a technically competent team coordinated by the State Center for Protected Areas (*Centro Estadual de Unidades de Conservação*, CEUC), and has been approved by the Reserve Deliberative Council (*Conselho Deliberativo da Reserva*).

The Reserve Council is a judicial body for the management of a protected area that is constituted by law and has the final authority over decisions made regarding the Reserve. The Reserve Council comprises all the relevant local institutions and actors in the area of the Reserve, including representatives of the communities located within the reserve, municipal governments around the Reserve, government agencies and the local business community, among others, with the presidency of the Council occupied by the State Center for Protected Areas (*Centro Estadual de Unidades de Conservação*, CEUC)).

During the process of creating the Juma RED Project, a process of consultation was undertaken to consult all of the relevant legal institutions in the project area. The entities consulted included the State Secretariat of the Environment and Sustainable Development of Amazonas (SDS), the State Secretariat for Planning and Economic Development (SEPLAN), The State Public Prosecutor (*Ministério Público Estadual*, MPE) and other entities within the Government for the State of Amazonas. In addition to these consultations, an independent legal analysis was commissioned to determine if there were any potential conflicts between the State Legislation (PEMC-AM and SEUC), and other State and Federal rules and regulations. The conclusion of this analysis determined that there was no conflict between the Juma RED Project and the relevant State and Federal regulations (LOPES, 2007). The fact that the project is being proposed in partnership with the Government of the State of Amazonas provides a guarantee and obligation to comply with the law.

G6.2 – Document that the project has, or expects to secure, approval from the appropriate authorities.

The appropriate institutions that must be involved in the approval of the activities proposed by the Juma RED Project are:

Agency/Institution	Function
State Secretariat of the Environment and Sustainable Development of Amazonas (SDS)	Design and implementation of public policies for the environment and sustainable development
Amazonas State Institute for Environmental Protection of (IPAAM)	Monitoring and Law enforcement
State Center for Protected Areas (CEUC)	Implementation and administration of the Reserves and related programs
State Center on Climate Change (CECLIMA)	Implementation of public policies and programs for climate change, development of mechanisms for payment of environmental services to guarantee financial sustainability of the Reserve, and monitoring of the dynamics of the carbon cycle within the scope of this project
Amazonas Land Institute (ITEAM)	Implementation of land titling activities in populated areas of Amazonas
Juma SDR Deliberative Council (*Conselho Deliberativo da RDS do Juma*)	Take part on decisions and contribute with planning and results

All of the institutions mentioned above represent those necessary to approve and develop the project in a manner consistent with the regulations under which the project must operate. In addition to these institutions, there are other federal agencies that could be invited to assist in a consultative and voluntary manner in the implementation of the Juma RED Project (Table 03).

Agency/Institution	Function
Ministry of the Environment (MMA)	Formulate national environmental policies
Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA)	Undertake the inspection and licensing of national land
National Institute for Colonization and Land Reform (INCRA)	Undertake activities related to regularizing land and populated areas

The Juma Reserve Council is now at an advanced stage of the creation process. All the members are already defined, and the only pending item is the legal formalization and publication in the official diary. This is planned to occur in approximately January 2009. After the formalization of the Council, they will be consulted on every planned activity action, and their approval is needed. In the meantime, every action to be taken as part of the Juma Project is submitted for approval by the CEUC (State Center for Protected Areas), which performs a formal consultation with the Reserve leadership, as well as public consultations for approval.

G7. Adaptive Management for Sustainability

G7.1 – Demonstrate how management actions and monitoring programs are designed to generate reliable feedback that is used to improve project outcomes.

The project will use different sources to periodically collect reliable information as a technical support tool for decision making, to facilitate the adaptive management of the project.

The Bolsa Floresta Program provides its own social monitoring. The efforts in the social area will be based mainly on the Sustainability Matrix (see item CM1.1 for more details on the Matrix's use) , which is used as a control for several key factors of community development. These surveys will be conducted annually, directly with the communities, in order to have continuous feedback evaluation.

The Environmental Monitoring Program will be performed by comparing the data raised periodically and the initial conditions of the Reserve, which will be mapped and identified in the document "Marco Zero" (Zero Milestone), through satellite images and field studies. The land use area monitoring will be done with remote sensing methods, using images of medium resolution, generated in partnership with CEUC. Associated with this, the Environmental Monitoring Program aims to involve the communities in mapping the threatened areas, identifying the risks and threats to which these areas are subjected. The large scale monitoring will be done through satellite images made available by the National Institute for Space Research - INPE (PRODES).

There is also a monitoring tool created by CEUC in order to ensure that the efforts of biodiversity conservation and sustainable use of the natural resources are being effective inside state PAs. The information is collected with a form that covers 14 different key themes for evaluation, and completed by technicians connected directly (local team) or indirectly (institutional managers and co-managers) to the Juma Reserve implementation (AMAZONAS, 2008).

Information on biodiversity and natural resource use by traditional populations will be collected through the ProBUC (see item B1.1) biodiversity monitoring program, coordinated by CEUC (AMAZONAS, 2008).

All of this reliable data that is collected and documented will be used as a technical support tool for decision making in order to improve project outcomes, and to adapt the project according to the actual needs and reality. These decisions will be made during the annual Executive Committee meeting to review the Activity Plan. On these occasions, the design of the Monitoring Plan will be analyzed according to its efficiency in generating reliable feedback and all the necessary information. This process will occur as illustrated in the Figure 16. If any changes in the Monitoring Plan or management actions are identified, a corrective action will be designed and, if needed, discussed with the Juma Reserve Deliberative Council.

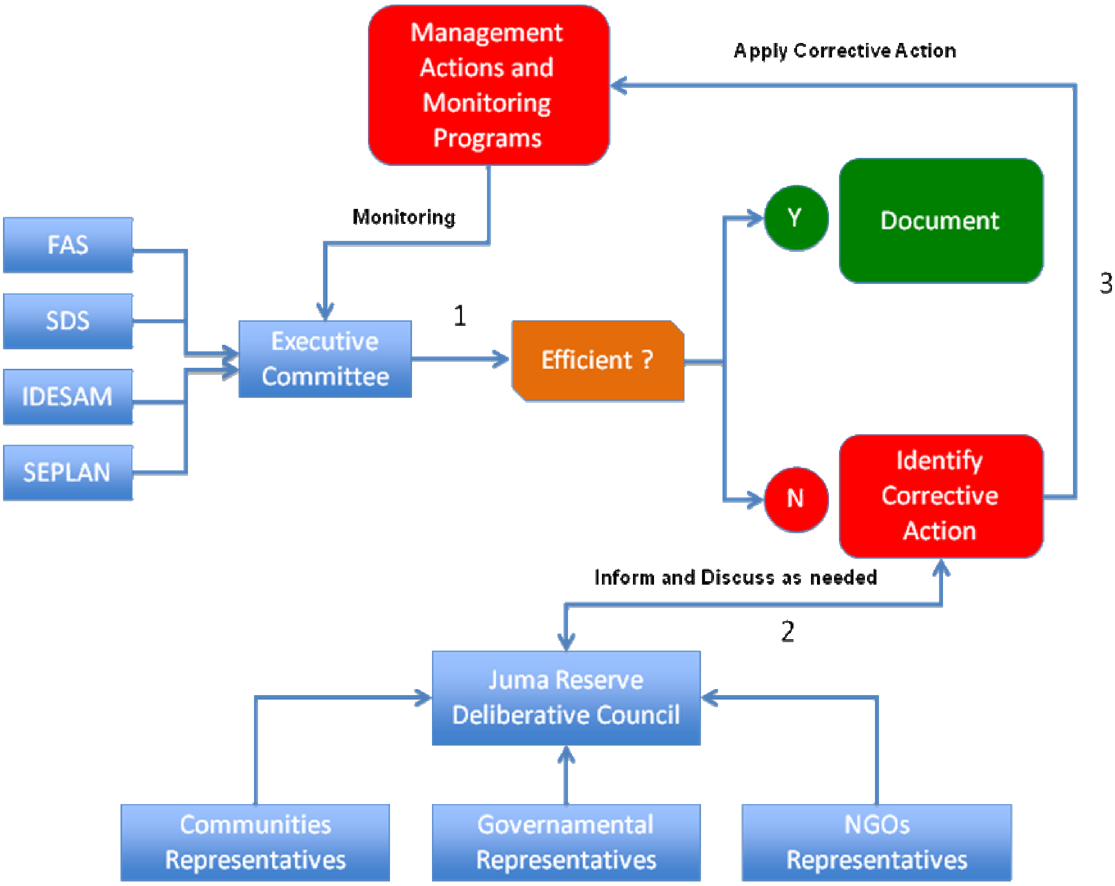

Figure 16: Process for verifying the efficiency of management actions and monitoring programs

G7.2- Have a management plan for documenting decisions, actions and outcomes and for sharing this information with others within the project team, so experience is passed on, rather than being lost when individuals leave the project.

In order to avoid the loss of information, FAS will adopt a project implementation process in which annual reports will be prepared by every monitoring program and any corrective actions (i.e., to resolve conflicts or apply suggestions) taken by the team will be documented immediately following the execution. Every member of the project will be aware of how to document the actions taken in the project and how to forward it to the Project Coordinator, who will keep track of this information and use it when necessary.

All these documents can be consulted at any time by anyone, if necessary. The most relevant information will be released to everyone involved in the project implementation during the project meetings or by mail.

G7.3 - Demonstrate that the project design is sufficiently flexible to accommodate potential changes and that the project has a defined process in place to adjust project activities as needed.

The State Secretariat of Environment and Sustainable Development of Amazonas created and implemented a process to develop a "Script for Elaborating Management Plans for State Protected Areas " (AMAZONAS, 2006b), which will be applied by FAS to the Juma RED Project. This script is a basic, adaptive reference, not a definite prescription, since there is no universally accepted approach for developing management plans. In the majority of cases, the planning tools must be adapted to the situation in question in which they are applied.

The Project adopts an adaptive management approach that is a structured and interactive process for decision making in the face of uncertainty. The objective is to reduce uncertainty over time through systematic monitoring. This system is useful in the definition of the operational objectives that serve to measure the project success, the effectiveness of the extension work and the project's contribution to positive change. The system allows lessons learned to be integrated into the project and into the manner in which the Management team operates. The improvement in the quality of the project will be obtained using an adaptive management approach. The model will serve as a hypothesis of the ecosystem and the operation of the communities will be generated. During the project implementation, the observed results and the expected results will be compared, indicating if the hypothesis was correct. If a hypothesis is proven incorrect, it will be possible to use a new analysis model to identify necessary changes.

The FAS plan for using the RED resources in Juma Reserve will follow the Management Plan developed by CEUC in a participatory process of planning and management.

The operational plan developed by the project's executive team to guide the activities to be performed is flexible and adaptive. Its initial content will be revised annually by the Executive Committee, and will be adapted according to the needs and necessary changes identified, as explained in *G7.1*. This information will be collected through the monitoring programs and the Reserve Council meetings, and other needs will be identified by the project's executive council.

G7.4 - Demonstrate an early commitment to the long-term sustainability of project benefits once initial project funding expires, including, e.g., a new project, securing payments for ecosystem services, promoting micro-enterprises, and establishing alliances to continue sustainable land management.

Through a mechanism of payments for environmental services, the project seeks to provide value for forest conservation. Considering that the Project aims at preventing emissions of at least 189,7 million tons of CO_2 into the atmosphere, the project will prevent the emission of more than 2,9 million tons of CO_2 over the first 10 years,. Given these benefits, there is a considerable potential for long-term project sustainability. Based on the current contract signed by the Government of Amazonas, FAS, and Marriot International (MI), MI will purchase the RED credits generated by the Juma Project at a price not less than US$ 1 per ton of CO_2. Therefore, considering only the minimum price of US$ 1, the Juma RED Project is expected to generate more than US$ 29 million in the first 10 years; and more than US$ 189 million by 2050 through the sale of RED carbon credits generated in the crediting areas. The base price for the initial carbon credits will be negotiated, to guarantee the financial sustainability that the project requires to achieve its environmental and social objectives.

An endowment fund will be created to guarantee the Project sustainability. Endowment funds are received from a donor with the restriction that the principal is not expendable. The FAS Administrative Board is in charge of approving the Investment Objective and Policy, which drive the portfolio decisions.

The investment objective is to preserve the real value (or purchasing power) of the endowment pool of assets and the annual support provided by these assets for an infinite period. The endowment pool investment policy embraces the total return concept. The following formula summarizes the factors involved in the endowment pool investment program:

Real asset growth rate	(=)	Total investment return	(-)	Inflation Rate (or purchasing power loss)	(-)	Fund taxes and fees

The above formula results in an average spending rate, which is allocated to payments for the Bolsa Floresta Program and the other project programs. The purpose of the spending rate formula is to provide a stable income stream that keeps pace with inflation and does not degrade the real value of the endowed amount invested over time. The spending formula and spending rate for the endowment is determined by FAS management and approved by the Administrative Board each year.

It is worth noting that the expected resources from the RED financial mechanism have not yet been generated; the investor partners involved in the implementation of the Juma RED Project, through partnerships with FAS, will guarantee the financial support necessary for the effective implementation of the project's planned activities related to forest conservation and sustainable development.

The initial invested fund will be partiality used (see Annex XI) for community capacity building to generate income through sustainable business. Ecological activities already performed by community members will be amplified and improved in quality and efficiency, allowing the generation of income.

Community organization and business training will be combined to improve the local capacity in forest management and forest product extraction. Research and development of new technologies will allow for innovation in the quality and types of products local communities produce. Furthermore, market development activities will be undertaken to improve market access. This combination should enhance the production of forest products from the local communities involved in the project.

G8. Knowledge Dissemination

G8.1 – Describe how the relevant or applicable lessons learned will be documented.

All the activities developed by FAS and SDS/CEUC related to the Protected Areas in the State of Amazonas are documented through written reports, including activities such as awareness raising, expeditions for inventories, community meetings, training workshops, zoning workshops, management planning workshops and land use mapping workshops. This documentation method will also be applied to all the activities to be implemented within the scope of the Juma RED Project. All of these reports will be made available on the Internet on both the SDS and FAS websites.

G8.2 – Describe how this information will be disseminated in order to encourage replication of successful practices. Examples include undertaking and disseminating research that has wide-reaching applications, holding training workshops for community members from other locations, promoting "farmer to farmer" knowledge-transfer activities, linking to regional databases and working with interested academic, corporate, governmental or non-governmental organizations to replicate successful project activities.

The dissemination of general information provided by the project will be achieved through the participation of team members in scientific and general events, both nationally and internationally, related to environmental conservation, climate, and sustainable development. The team will also publish articles in scientific journals and in the popular media. Furthermore, the project will develop a series of pamphlets, brochures and reports to document and disseminate the lessons learned by the project inside and outside the project boundaries. Other dissemination activities include making presentations at schools, universities and promotional events. The team will also be involved in exchange programs in which communities and local stakeholders participate, allowing the successful replication of project activities elsewhere.

The Bolsa Floresta Program will promote internal workshops to exchange technical information and experiences among the communities within the Reserve boundaries and also among communities in other Protected Areas.

The documentation and reporting of the project activities and lessons learned through prior experience in other Protected Areas in the State of Amazonas will be the basis for the continual improvement of the processes and methods that will be applied in the management of this project and others that will be created in the future. The exchange of experiences with similar initiatives will also be important for improving the concepts, processes and methods used.

The project's knowledge dissemination to the community has already begun, with activities such as workshops for introducing the project and discussing climate change issues and brochures with an overview of its activities and concept.

IV. CLIMATE SECTION

CL1. Net Positive Climate Impacts

CL1.1 – Estimate the net change in carbon stocks due to the project activities. The net change is equal to carbon stock changes with the project minus carbon stock changes without the project (G2). Alternatively, any methodology approved by the CDM Executive Board may be used. Define and defend assumptions about how project activities will alter carbon stocks over the duration of the project or the project accounting period.

The reference scenario in the absence of the Juma Reserve RED Project is based on the future deforestation projected by the spatial simulation model SimAmazonia I (SOARES-FILHO, 2006). There exists a consensus among the scientific community that this is the best available model for forecasting future deforestation in the Amazon.

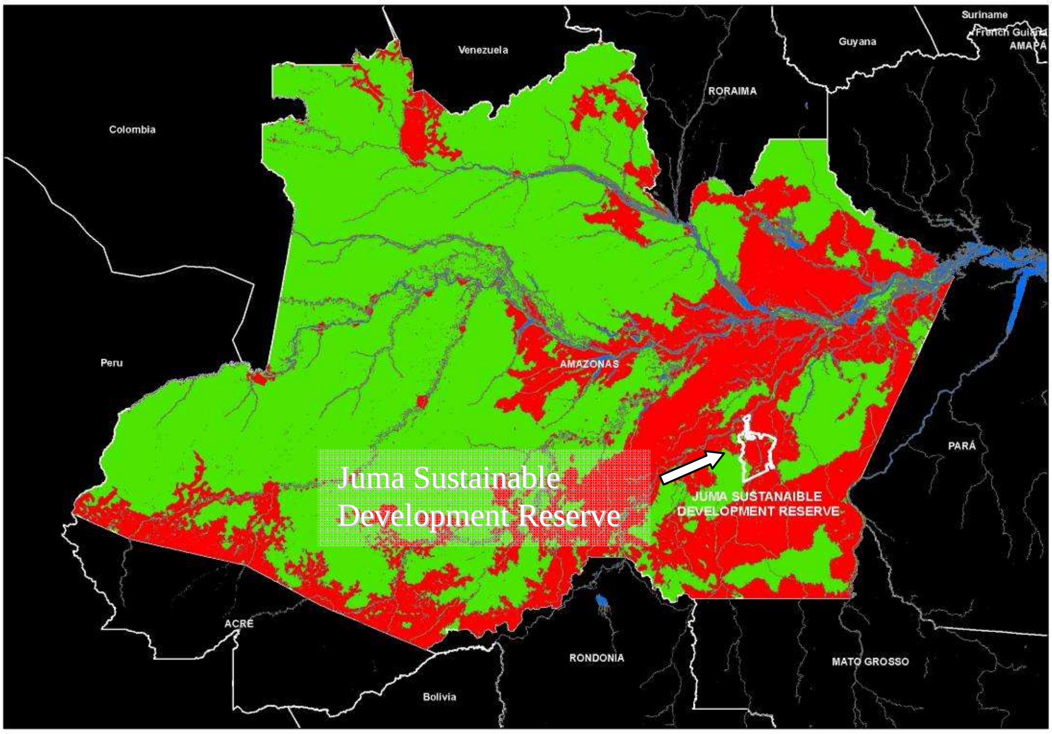

Figure 17: Projected Deforestation for the State of Amazonas by 2050 under the "business as usual" scenario

For an *"ex-ante"* estimation of the carbon stocks of the project, the values for the carbon stocks presented in NOGUEIRA (2008) were used (see section *G1.3*). The project assumes that these values are the most precise values available for use. However, for the purpose of comparison, the emissions/reduction values were also calculated using the IPCC default carbon stock values for the carbon stocks of tropical forests (IPCC, 2003). Table 09 provides the reductions in emissions from deforestation that are expected to result from the implementation of the Juma RED project.

As an illustration, the equation below presents the logic to calculate the quantity of reduced CO_2 emissions expected with the implementation of the Project. The methodology used by the IPCC GPG (2003) assumes that the net emissions are equal to the changes on the carbon stocks on the existing biomass between two different points in time. The logic used in the Project is the same used by the MCT (2006) methodology used for the first Brazilian National GHG Inventory), and is explained in details during the section Cl 1.1. Thus, this formula can be summarized as:

$$\mathbf{C_{RED} = C_{baseline} - C_{project} - C_{leakage}}$$

Where:

C_{RED} = Net Reduced Emissions from Deforestation
$C_{baseline}$ = CO_2e emission in the baseline
$C_{project}$ = CO_2e emission in the project scenario
$C_{leakage}$ = CO_2e emission in consequent from leakage

The $C_{baseline}$ is the emissions resulting from the activity data per hectare multiplied by the remaining carbon stocks on each vegetation type after deforestation (original carbon stocks minus 14.25 tC/ha – vegetation at equilibrium) plus 6.6% of the impact of CO_2 release alone, for non-CO_2 emissions (item CL1.2).

The $C_{project}$ is the deforestation measured by PRODES, for the years 2006 and 2007. For the consequent years, it accounts for 10% of the total deforestation that would happen in the absence of the project, as explained ahead in this same item.

The $C_{leakage}$ are the emissions happening outside of the project boundaries that are attributable to the project. As explained ahead, it will be considered as zero.

The values presented above are the sum of emissions of CO_2 and CO_2e. The formula used to calculate the non-CO_2 emissions provenient from forest fires, according to Fearnside (1996) is:

RED (Net Reduced Emissions from Deforestation)

$$C_{redCO2e} = 0,066 * C_{red}$$

Where:
Cred = CO_2 net reduced emissions from deforestation

In the baseline:

$$C_{baselineCO2e} = 0,066 * C_{baseline}$$

Where:
Cbaseline = CO_2 emissions in the absence of the project

In the project:

$$C_{projectCO2e} = 0,066 * C_{project}$$

Where:
$C_{project}$ = CO_2 emissions in the project scenario

The result of this formula is the amount of CO_2e emissions that were avoided by the project (in tC/ha).

Ex Post Calculations

The calculation of *ex post* net anthropogenic GHG emission reductions is similar to the e*x ante* calculation with the only difference that the *ex ante* projected emissions for the project scenario and leakage are replaced with the *ex post* emissions calculated from measured data. In case it is verified differences in the *post facto* adjusted carbon baseline (due *ex post* improvements of carbon stocks data, factoring-out of the impact of natural disturbances, etc.) the *ex ante* estimated *baseline* will be replaced by a *post facto baseline*, as describes:

$$C_{REDD} = C_{BASELINE} - C_{ACTUAL} - C_{LEAKAGE}$$

Where:

C_{REDD}	=	*ex post* net anthropogenic greenhouse gas emission reduction; tonnes CO_2e
$C_{BASELINE}$	=	*ex ante* (or *post facto*) baseline greenhouse gas emission within the project area; tonnes CO_2e
C_{ACTUAL}	=	*ex post* actual greenhouse gas emission within the project area; tonnes CO_2e
$C_{LEAKAGE}$	=	*ex post* leakage greenhouse gas emission within the leakage belt area; tonnes CO_2e

T***able 17: Annual reducing emissions from deforestation for the crediting area, for the Juma Reserve RED Project, from 2006 to 2050, according to the deforestation simulation model SimAmazonia I (SOARES-FILHO et al., 2006)***

Project year		$C_{BASELINE}$				$C_{ACTUAL**}$				C_{RED}			
		Carbon stocks		non CO_2 GHG*		*Carbon stocks*		non CO_2 GHG*		*Carbon stocks*		non CO_2 GHG*	
		annual	Cum	annual	cum	annual	cum	annual	cum	annual	cum	annual	cum
Nr	yr	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
0	2006	0,00	0,00	0,00	0,00	28.157,65***	28.157,65	1.858,41	1.858,41	-28.157,65	-28.157,65	-1.858,41	-1.858,41
1	2007	0,00	0,00	0,00	0,00	0,00	28.157,65	0,00	1.858,41	0,00	-28.157,65	0,00	-1.858,41
2	2008	0,00	0,00	0,00	0,00	0,00	28.157,65	0,00	1.858,41	0,00	-28.157,65	0,00	-1.858,41
3	2009	32.964,40	32.964,40	2.175,65	2.175,65	3.296,44	31.454,09	217,57	2.075,97	29.667,96	1.510,31	1.958,09	99,68
4	2010	3.782,80	36.747,20	249,66	2.425,32	378,28	31.832,37	24,97	2.100,94	3.404,52	4.914,83	224,70	324,38
5	2011	403.138,40	439.885,60	26.607,13	29.032,45	40.313,84	72.146,21	2.660,71	4.761,65	362.824,56	367.739,39	23.946,42	24.270,80
6	2012	85.383,20	525.268,80	5.635,29	34.667,74	8.538,32	80.684,53	563,53	5.325,18	76.844,88	444.584,27	5.071,76	29.342,56
7	2013	1.054.142,90	1.579.411,70	69.573,43	104.241,17	105.414,29	186.098,82	6.957,34	12.282,52	948.728,61	1.393.312,88	62.616,09	91.958,65
8	2014	537.573,75	2.116.985,45	35.479,87	139.721,04	53.757,38	239.856,20	3.547,99	15.830,51	483.816,38	1.877.129,25	31.931,88	123.890,53
9	2015	939.161,95	3.056.147,40	61.984,69	201.705,73	93.916,20	333.772,39	6.198,47	22.028,98	845.245,76	2.722.375,01	55.786,22	179.676,75
10	2016	1.157.988,45	4.214.135,85	76.427,24	278.132,97	115.798,85	449.571,24	7.642,72	29.671,70	1.042.189,61	3.764.564,61	68.784,51	248.461,26
11	2017	981.179,05	5.195.314,90	64.757,82	342.890,78	98.117,91	547.689,14	6.475,78	36.147,48	883.061,15	4.647.625,76	58.282,04	306.743,30
12	2018	1.908.132,70	7.103.447,60	125.936,76	468.827,54	190.813,27	738.502,41	12.593,68	48.741,16	1.717.319,43	6.364.945,19	113.343,08	420.086,38
13	2019	2.315.568,65	9.419.016,25	152.827,53	621.655,07	231.556,87	970.059,28	15.282,75	64.023,91	2.084.011,79	8.448.956,97	137.544,78	557.631,16
14	2020	3.326.513,10	12.745.529,35	219.549,86	841.204,94	332.651,31	1.302.710,59	21.954,99	85.978,90	2.993.861,79	11.442.818,76	197.594,88	755.226,04
15	2021	2.711.397,85	15.456.927,20	178.952,26	1.020.157,20	271.139,79	1.573.850,37	17.895,23	103.874,12	2.440.258,07	13.883.076,83	161.057,03	916.283,07
16	2022	4.158.774,45	19.615.701,65	274.479,11	1.294.636,31	415.877,45	1.989.727,82	27.447,91	131.322,04	3.742.897,01	17.625.973,83	247.031,20	1.163.314,27
17	2023	3.937.813,95	23.553.515,60	259.895,72	1.554.532,03	393.781,40	2.383.509,21	25.989,57	157.311,61	3.544.032,56	21.170.006,39	233.906,15	1.397.220,42
18	2024	3.920.166,15	27.473.681,75	258.730,97	1.813.263,00	392.016,62	2.775.525,83	25.873,10	183.184,70	3.528.149,54	24.698.155,92	232.857,87	1.630.078,29
19	2025	5.505.141,60	32.978.823,35	363.339,35	2.176.602,34	550.514,16	3.326.039,99	36.333,93	219.518,64	4.954.627,44	29.652.783,36	327.005,41	1.957.083,70
20	2026	4.077.651,35	37.056.474,70	269.124,99	2.445.727,33	407.765,14	3.733.805,12	26.912,50	246.431,14	3.669.886,22	33.322.669,58	242.212,49	2.199.296,19
21	2027	2.564.612,20	39.621.086,90	169.264,41	2.614.991,74	256.461,22	3.990.266,34	16.926,44	263.357,58	2.308.150,98	35.630.820,56	152.337,96	2.351.634,16
22	2028	3.244.232,25	42.865.319,15	214.119,33	2.829.111,06	324.423,23	4.314.689,57	21.411,93	284.769,51	2.919.809,03	38.550.629,58	192.707,40	2.544.341,55
23	2029	3.340.052,65	46.205.371,80	220.443,47	3.049.554,54	334.005,27	4.648.694,83	22.044,35	306.813,86	3.006.047,39	41.556.676,97	198.399,13	2.742.740,68
24	2030	9.004.620,15	55.209.991,95	594.304,93	3.643.859,47	900.462,02	5.549.156,85	59.430,49	366.244,35	8.104.158,14	49.660.835,10	534.874,44	3.277.615,12
25	2031	4.608.326,10	59.818.318,05	304.149,52	3.948.008,99	460.832,61	6.009.989,46	30.414,95	396.659,30	4.147.493,49	53.808.328,59	273.734,57	3.551.349,69
26	2032	5.098.646,40	64.916.964,45	336.510,66	4.284.519,65	509.864,64	6.519.854,10	33.651,07	430.310,37	4.588.781,76	58.397.110,35	302.859,60	3.854.209,28
27	2033	4.254.356,20	69.171.320,65	280.787,51	4.565.307,16	425.435,62	6.945.289,72	28.078,75	458.389,12	3.828.920,58	62.226.030,93	252.708,76	4.106.918,04

Project year		$C_{BASELINE}$				$C_{ACTUAL**}$				C_{RED}			
		Carbon stocks		**non CO_2 GHG***		***Carbon stocks***		**non CO_2 GHG***		***Carbon stocks***		**non CO_2 GHG***	
		annual	Cum	annual	cum	annual	cum	annual	cum	annual	cum	annual	cum
Nr		tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
28	2034	0,00	69.171.320,65	0,00	4.565.307,16	0,00	6.945.289,72	0,00	458.389,12	0,00	62.226.030,93	0,00	4.106.918,04
29	2035	4.641.610,00	73.812.930,65	306.346,26	4.871.653,42	464.161,00	7.409.450,72	30.634,63	489.023,75	4.177.449,00	66.403.479,93	275.711,63	4.382.629,68
30	2036	8.889.921,25	82.702.851,90	586.734,80	5.458.388,23	888.992,13	8.298.442,84	58.673,48	547.697,23	8.000.929,13	74.404.409,06	528.061,32	4.910.691,00
31	2037	7.811.249,30	90.514.101,20	515.542,45	5.973.930,68	781.124,93	9.079.567,77	51.554,25	599.251,47	7.030.124,37	81.434.533,43	463.988,21	5.374.679,21
32	2038	8.264.573,90	98.778.675,10	545.461,88	6.519.392,56	826.457,39	9.906.025,16	54.546,19	653.797,66	7.438.116,51	88.872.649,94	490.915,69	5.865.594,90
33	2039	5.915.200,65	104.693.875,75	390.403,24	6.909.795,80	591.520,07	10.497.545,23	39.040,32	692.837,99	5.323.680,59	94.196.330,52	351.362,92	6.216.957,81
34	2040	4.597.403,70	109.291.279,45	303.428,64	7.213.224,44	459.740,37	10.957.285,60	30.342,86	723.180,85	4.137.663,33	98.333.993,85	273.085,78	6.490.043,59
35	2041	7.419.786,70	116.711.066,15	489.705,92	7.702.930,37	741.978,67	11.699.264,27	48.970,59	772.151,44	6.677.808,03	105.011.801,88	440.735,33	6.930.778,92
36	2042	7.098.568,20	123.809.634,35	468.505,50	8.171.435,87	709.856,82	12.409.121,09	46.850,55	819.001,99	6.388.711,38	111.400.513,26	421.654,95	7.352.433,88
37	2043	6.026.493,50	129.836.127,85	397.748,57	8.569.184,44	602.649,35	13.011.770,44	39.774,86	858.776,85	5.423.844,15	116.824.357,41	357.973,71	7.710.407,59
38	2044	5.973.481,05	135.809.608,90	394.249,75	8.963.434,19	597.348,11	13.609.118,54	39.424,97	898.201,82	5.376.132,95	122.200.490,36	354.824,77	8.065.232,36
39	2045	6.547.376,00	142.356.984,90	432.126,82	9.395.561,00	654.737,60	14.263.856,14	43.212,68	941.414,51	5.892.638,40	128.093.128,76	388.914,13	8.454.146,50
40	2046	8.118.717,20	150.475.702,10	535.835,34	9.931.396,34	811.871,72	15.075.727,86	53.583,53	994.998,04	7.306.845,48	135.399.974,24	482.251,80	8.936.398,30
41	2047	12.430.596,40	162.906.298,50	820.419,36	10.751.815,70	1.243.059,64	16.318.787,50	82.041,94	1.077.039,98	11.187.536,76	146.587.511,00	738.377,43	9.674.775,73
42	2048	10.071.494,00	172.977.792,50	664.718,60	11.416.534,31	1.007.149,40	17.325.936,90	66.471,86	1.143.511,84	9.064.344,60	155.651.855,60	598.246,74	10.273.022,47
43	2049	11.355.945,90	184.333.738,40	749.492,43	12.166.026,73	1.135.594,59	18.461.531,49	74.949,24	1.218.461,08	10.220.351,31	165.872.206,91	674.543,19	10.947.565,66
44	2050	13.495.158,75	197.828.897,15	890.680,48	13.056.707,21	1.349.515,88	19.811.047,37	89.068,05	1.307.529,13	12.145.642,88	178.017.849,78	801.612,43	11.749.178,09
Partial TOTAL		**197.828.897,15**		**13.056.707,21**		**19.811.047,37**		**1.307.529,13**		**178.017.849,78**		**11.749.178,09**	
TOTAL		**210.885.604,4**				**21.118.576,5**				**189.767.027,9**			

*According to Fearnside, to obtain the CO_2e value is needed additional adjustment for trace-gas effects of 6.6% relative to the impact of CO2 release alone (Fearnside, 1996)

**The Cactual is the deforestation that is predicted to happen within the Reserve in spite of the project activities. This project deforestation rate is adopted as 10% of the total deforestation predicted by the SimAmazonia model.

*** Verified emissions from deforestation occurred in 2006, that were identified and measured by PRODES/INPE in 2007 (21 ha of alluvial forest and 32 ha of dense forest).

Year 10 – End of the first crediting period; first baseline revision

These numbers were generated based on the deforestation predictions made by the SimAmazonia model. The model is able to predict the quantity and location of the deforestation inside the Juma Reserve. The explanation of how the deforestation quantity was assessed is described in Annex I. However, adopting a conservative approach and assuring the benefits of the project, the project commits to reduce 90% of the ongoing deforestation. In this way, the other 10% can be kept as "security carbon," in case small areas of deforestation occur inside the Reserve.

The corresponding emissions and stocks are subject to change on two occasions:

1. After the first verification period and the new vegetation carbon stocks are defined;
2. In 2016, ten years after the start of the project, when the baseline will be revised.

Even though the baseline estimation is considered robust and conservative (CAR 09), there are uncertainties that can affect the carbon credits generation. As a measure to deal with the model uncertainties the baseline will be re-validated at the end of each "baseline assessing period" (10 years). At this time, if the baseline deforestation is verified as different than predicted (based on parameters defined by the model, as described in Annex XIII), the emission reductions for the previous period shall be recalculated.

If baseline deforestation is verified as lower than the originally predicted**,** the project **shall discount the respective amount of VERs from the next "baseline assessing period". If baseline deforestation is verified as higher** than the originally predicted, the project **will be able to issue the respective amount of VERs** for this period.

The other GHG emissions sources, and their respective inclusion/exclusion and the reasons to do so are presented on the table below:

Table 18. Sources and GHG included or excluded within the boundary of the proposed RED project activity

Sources	Gas	Included/ excluded	Justification / Explanation of choice
Biomass burning	CO_2	Included	Counted as *carbon stock* change
	CH_4	Included	Counted as *non-CO_2* emissions
	N_2O	Excluded	Not a significant source
Combustion of fossil fuels by vehicles	CO_2	Excluded	Excluded as a conservative approach *
	CH_4	Excluded	Not a significant source and excluded as a conservative approach *
	N_2O	Excluded	Not a significant source and excluded as a conservative approach*
Use of fertilizers	CO_2	Excluded	Not a significant source and excluded as a conservative approach*
	CH_4	Excluded	Not a significant source
	N_2O	Excluded	Not a significant source
Livestock emissions	CO_2	Excluded	Not a significant source and excluded as a conservative approach*
	CH_4	Excluded	Not a significant source and excluded as a conservative approach*
	N_2O	Excluded	Not a significant source and excluded as a conservative approach*

* These data were not included considering the difficulty in measuring these emissions on the baseline. So, both as a conservative measure and to avoid imprecision on the calculations, these data were not included.

Therefore, the cumulative amount of greenhouse gases that would be released in the crediting areas under the "business as usual" (i.e., without the implementation of the project) scenario for 2006 to 2050 would be **of approximately 210, 885, 604 tons of CO_2**.

CL1.2 – Factor in the non-CO_2 gases CH_4 and N_2O to the net change calculations (above) if they are likely to account for more than 15% (in terms of CO_2 equivalents) of the project's overall GHG impact.

Carbon dioxide is the principal greenhouse gas emitted when a tropical forest is deforested (HOUGHTON, 2005). Other gases such as methane (CH_4) and nitrous oxide N_2O are also emitted during deforestation, but in significantly lower quantities than CO_2 (FEARNSIDE, 2002). When compared to CO_2, the methane and nitrous oxide emissions from deforestation account for significant less of the total potential of global warming effect from deforestation (HOUGHTON, 2005).

As said on the item G2.2, the current number used to estimate the fluxes of non-CO2 GHG, and considering that all the deforestation would be made on the "slash and burn" system, the accounting is 6.6 – 9.5% relative to the impact of CO2 release alone. For conservativeness reasons, will be used the 6.6% (FEARNSIDE, 2000 and ANDREAE et al, 2001).

CL1.3 – Demonstrate that the net climate impact of the project (including changes in carbon stocks, and non-CO_2 gases where appropriate) will give a positive result in terms of overall GHG benefits delivered.

The development of this Project will allow the Government of the State of Amazonas to implement appropriate measures to halt the threat of deforestation in the Juma Sustainable Development Reserve and the surrounding area. In comparison to the "business-as-usual" (i.e. the scenario in which the Juma Reserve is not created), the Juma RED Project will prevent more than **189 million tons of CO_2** from being released into the atmosphere.

If we compare the "with project" scenario with the baseline, it is clear to prove that the net benefits will be positive. The business-as-usual scenario on the baseline is the loss of more than 60% of the Reserve, while the with-project scenario, these areas would be conserved and the forest will be preserved.

The benefits from the conservation of these areas are further explained on this document, not only the climate benefits but also those for the biodiversity and the community.

Table 19 – Net Climate Benefits with the Juma Reserve RED Project

Area	Situation without the project	Program/Activity	Net Benefits	Indicators	Budget US$	Institution
Deforestation monitoring	No deforestation control within the Reserve area	Creation of one surveillance base equipped with boat and vehicle, construction of 3 communication base and implementation of Environmental Monitoring Program (Satellite field monitoring and capacity building)	Increase in control of deforestation	Controlled deforestation in the Reserve area	574.588	FAS
Carbon monitoring activities	No control or measure of carbon dynamics within the project area	Implementation of carbon monitoring program through permanent plots	Carbon Dynamics under control	Implementation and monitoring of permanent plots	141.176	INPA
Climate Change Awareness	Small or no knowledge about climate change and its implications by the communitarians	Workshops and material to increase awareness	Higher environmental consciousness	Workshops presented and materials developed	79.412	FAS

CL2. Offsite Climate Impacts ("Leakage")

CL2.1 – Estimate potential offsite decreases in carbon stocks (increases in emissions or decreases in sequestration) due to project activities.

It is not expected that the implementation of project activities will generate any offsite decreases in carbon stocks. In fact, the project implementation is expected to additionally reduce deforestation outside the project boundaries, as compared to the baseline scenario. Recent studies on deforestation dynamics indicate that the single measure of creating a Protected Area promotes reduction of deforestation in the surrounding areas. This effect was observed in the great majority of the protected areas created in the Brazilian Amazon, and the offsite "reduction of deforestation" that was generated varied from 1 to 3% of the size of the PA (IPAM, 2008). For this reason, we consider that the implementation of the Juma RED Project will not result in negative leakage, but rather a "positive leakage" since there will be a reduction in deforestation rates outside of the Reserve.

The project activities to be carried out on the offsite project area will directly address the drivers and dynamics of deforestation in the region, as illegal logging and grazing, land grabbing, mining etc, that could be considered as a leakage effect from the project implementation – even though they cannot be attributable to the project activities (i.e. will occur anyway).

These activities will directly address the drivers and dynamics of deforestation in the region, particularly in the "Juma Reserve Surrounding Zone." The Reserve's "surrounding zone" will be an area defined as a strip of lands surrounding the Reserve with specific geographical delimitation and in which land use will be subject to specific terms and conditions, established by law (as envisioned in SEUC, 2007).

The physical boundaries of the "surrounding zone" will be determined as part of the Reserve's management plan (see item *CM5.1*) during the initial years of the project implementation. Usually this area is defined as at least a 10 km buffer surrounding the Reserve's perimeter (i.e., in the Juma Reserve the zone would be of at least 494,318 ha).

The entire surrounding area will be monitored as part of the project's monitoring plan. Migrations from the communities inside the Juma Reserve to other forest areas, in addition to immigrations, will be monitored by the Bolsa Floresta Program annual activities.

As a mitigation measure to guarantee that the offsite carbon stocks will not decrease, the project **will commit to an investment of at least 10% of the annual budget generated through the sales of RED credits**.

CL2.2 – Document how negative offsite impacts resulting from project activities will be mitigated and estimate the extent to which such impacts will be reduced. Estimate the extent to which the negative offsite impacts will be reduced adequately.

As mentioned in item *CL2.1*, negative impacts outside the project area due to project activities are not expected. Actually, the project should have a positive impact on the areas adjacent to the Juma Reserve due to the significant reduction in deforestation that is associated with an actively managed protected area. If areas around the Reserve of Juma are deforested, this deforestation will be quickly identified and addressed by the project's monitoring and surveillance activities.

CL2.3 - Subtract any likely project-related unmitigated negative offsite climate impacts from the climate benefits being claimed by the project. The total net effect, equal to the net increase in onsite carbon stocks (calculated in the third indicator in CL1) minus negative offsite climate impacts, must be positive.

As mentioned in *CL2.1* and *CL2.2*, no negative impacts to the offsite carbon stocks are expected. Should deforestation occur in the area adjacent to the Reserve, it will be quickly identified by the Project's monitoring and surveillance activities and immediate measures will be put in place to control the situation. If this occurs, any negative offsite impacts directly attributed to the project will be accounted for in the overall carbon balance of project, and may also be compensated by the credits put in the 10% buffer account.

CL3. Climate Impact Monitoring

CL3.1a - Describe the initial plan for how carbon pools and non-CO_2 GHGs to be monitored will be selected.

For the reservoirs of CO_2, the project will use the most recent data and images from INPE/PRODES to conduct an analysis of the real deforestation rate. The SimAmazonia I model establishes the scenario (i.e., the "business as usual" scenario) that will be compared to what is actually happening on the ground. To follow the deforestation and the carbon dynamic it will be necessary to (i) monitor by satellite and (ii) perform *in loco* monitoring. This site-level monitoring of the carbon stocks will involve both local communities and researchers. The overall monitoring strategy comprises the following four components:

a) **Monitoring by satellite by the National Institute for Space Research (INPE).** INPE has developed the most advanced deforestation monitoring system in the world (with a resolution of 812 m^2). INPE makes its images available to the public, and, through the use of this system, FAS, in addition to any interested citizen, is able to monitor deforestation using the data available on the INPE website. (http://www.obt.inpe.br/prodes/index.html)

b) **Monitoring of the carbon dynamic and forest carbon stocks.** A partnership between FAS/SDS and the National Institute for Amazon Research (*Instituto Nacional de Pesquisa da Amazônia*, INPA) will be established. This partnership will involve the development of analytical studies to quantify the carbon flux and carbon stocks of the different reservoirs of biomass in the forest, including aboveground and belowground biomass, leaf litter, fine woody debris, coarse wood debris and soil carbon. Dr. Niro Higuchi's team will be responsible for the development of this work. Dr. Niro Higuchi is a member of the IPCC and a participant in the Coordination of Tropical Silvicultural Research (*Coordenação de Pesquisas em Silvicultura Tropical,* CPST - INPA). Higuchi's team comprises professionals with extensive experience in tools for measuring forest inventories, carbon stocks and carbon dynamics.

c) **Participatory Monitoring "in loco" (SDS-ProBUC/IPAAM):** SDS developed the Biodiversity and Natural Resource Use Monitoring Program in State Protected Areas of Amazonas (ProBUC) (SDS, 2006). ProBUC is a system for monitoring natural resources and biodiversity that is being implemented in the State protected areas. The premise of this program is to involve local communities in monitoring as a way to increase local conservation awareness and to make monitoring more efficient. It also serves to give local communities a sense of responsibility for maintaining the integrity of local ecosystems upon which their livelihoods depend. This program will be implemented in the Juma Reserve starting in 2009.

d) **Surveillance Program**: The surveillance program aims to involve the communities in mapping the threatened areas, identifying the risks which they are exposed to and identifying which risks are the most aggressive. Then, control measures will be implemented by the managing institution to guarantee the control and protection of these areas, with the support of the Amazonas State Institute for Environmental Protection (*Instituto de Proteção Ambiental do Estado do Amazonas* – IPAAM).

All the carbon credits generated by the Juma Reserve RED Project belong to FAS (item *G4.1*), and afterwards will be sold to Marriott International. This relationship of carbon rights will remain the same through the end of the project, so it is not necessary to monitor this variable. The legal documents that state the right of FAS over the carbon credits is presented in Annex XV.

CL.3.1b - State if the corresponding measurements and the sampling strategy (including monitoring frequency) are defined in the monitoring plan.

The carbon stocks monitoring plan is already defined and will be conducted by Higuchi's team. The monitoring frequency will be every two years and the sampling strategy, as well as the methodology used to measure and estimate the forest's carbon stocks, are described in Annex XIII.

CL.3.1c - Show that all potential pools are included (aboveground biomass, litter, dead wood, belowground biomass and soil carbon). Pools to be monitored must include any pools expected to decrease as a result of project activities.

The carbon pools considered in the estimates from NOGUEIRA (nd) and MCT (2006) and used to estimate the carbon stocks in the different phyto-physiognomies found on the reserve are fully described in item *G1.3*, and the strategy to monitor them is presented in Annex XIII.

CL.3.1d - If relevant non-CO_2 gases are monitored, describe if they account for more than 15% of the project's net climate impact expressed in terms of CO_2 equivalents.

The non-CO2 gases will be monitored as deforestation. The dynamics of deforestation in the Amazon is almost entirely by "slash-and-burn". So, the monitoring of non-CO2 will use the same methodology as the CO2 emission monitoring.

CL4. Adapting to Climate Change and Climate Variability

CL4.1- Identify likely regional climate change and climate variability impacts, using available studies.

On a larger scale, El Niño-type events are expected to become more frequent, which could lead to a long-term drying out and disappearance of the Amazon rainforest. The resulting release of carbon into the atmosphere could potentially alter the global carbon balance (WATSON *et al*., 1997). This could in turn become a positive environmental feedback mechanism, which scientists fear may trigger further global warming. If the 2ºC temperature rise threshold is reached and if continued droughts lead to large-scale dieback within the Amazon's forests, the carbon released from the associated forest decomposition will accelerate climate change and could lead to the extinction of countless plant and animal species (NEPSTAD *et al*., 2004).

Some of the climate change scenarios from IPCC indicate that temperature in the Amazon region could increase from between 3 to 8 degrees Celsius (see MARENGO, 2007), which could lead to:

- a decrease of between 5 and 20% of the rainfall in the Amazon and in southern Brazil;
- a higher frequency of dry spells in the eastern Amazon region and intense rainfall events in western Amazonia;
- potential loss of natural ecosystems, tropical forests and biodiversity;
- more favorable conditions for the spread of forest fires;
- reduction in the water levels of rivers affecting transportation and commerce in the Amazon;
- reduction in hydroelectric generation due to lower water levels;

Although the possible long-term impacts of climate change on the Juma Sustainable Development Reserve could result in net losses of carbon stocks into the atmosphere, it is expected that, even in the worst-case scenario (i.e., the scenario with the highest emissions), the majority of the forests in the Juma Reserve will be maintained until the end of this project (2050). Furthermore, the implementation of this Project will prevent the release of a large amount of carbon into the atmosphere since it is expected to contain the deforestation trend forecast in the baseline scenario (i.e., the "without project" or "business as usual" scenario). This will assist in reducing the contribution of the Amazon's deforestation to global warming.

CL4.2 - Demonstrate that the project has anticipated such potential impacts and that appropriate measures will be taken to minimize these negative impacts.

It is difficult to foresee all possible impacts of climate change on the ecosystems of the Juma Reserve. The best management practice to mitigate the effects of severe climate and global warming is the implementation of measures for monitoring carbon, biodiversity, the environment, and climate within the Sustainable Development Reserve.

CECLIMA is developing risk management programs for climate change with the goal of establishing a network of organizations to monitor climate and extreme climate events. As part of this effort, CECLIMA is conducting scientific studies of the issue to serve as the basis for a strategy to adapt to and mitigate the consequences of extreme weather events, such as intense droughts and flooding, which in the short, medium and long-term could be intensified in the State of Amazonas.

This effort will be critical for the management of protected areas in the State of Amazonas. The Juma Reserve will receive all the necessary support from resources of the Juma RED Project, which will allow the Reserve to serve as a model for the state's overall monitoring programs. The possible risks to the new benefits from the Juma RED Project and the actions proposed to mitigate them are listed in the table below (Table 20).

Table 20: List of risks and mitigation responses

Benefits	*Risks*	*Implications and Consequences*	*Management / Mitigation*
Climate	Deforestation rate in the Reserve is higher than forecast	The quantity of CO_2 conserved in the Reserve is less that the quantity calculated	- 10% of the total quantity of the carbon stocks will be maintained as a "buffer" to insure that the quantity of carbon conserved is always greater than the committed amount. - Participatory monitoring programs are implemented in the Reserve - Area used by communities is not included in the total quantity of carbon conserved.
	Severe natural events (e.g., droughts, fires, etc.)	Increased CO_2 emissions.	- Long-term monitoring of the climate - Establish mitigation strategies for the control and support of the communities - Maintain 10% of the carbon stocks in the project area as a buffer.
	Long-term Climate Change –events like El Niño and global warming	Increase in the temperature and decrease in humidity and other changes in the local microclimate.	- Invest in scientific research of the forest dynamics; - Monitor the climatic characteristics, hydrology and forest dynamics, and biodiversity. - Disseminate information to scientists and government officials - Maintain 10% of the carbon stocks in the project area as a reserve. - Maintain a portfolio of other RED projects similar to that in the Juma Reserve
Biodiversity	(a) Loss and degradation of habitats from deforestation	Loss of biodiversity of forest species that could result in a simplification of the ecosystems and, consequently, the carbon stocks that the forest contains.	(1) Implement ProBUC ; (2) Establish buffer zones where the carbon stock is not included; (3) Use a monitoring methodology that includes verification of the impact on biodiversity
Community	(a) Increase in deforestation	The communities could lose their resources and therefore cause the impoverishment of these populations	(1) Local participation in the development of the Reserve's management plan (2) Training of environmental defense agents
	(b)Appropriations	A loss of areas that could be counted in the carbon stock, and dislocation of populations to other areas within the Project site that should be conserved.	(1) Land title reform will be undertaken before the project is implemented. (2) The areas in the communities and those areas with title claims are excluded from the carbon credit accounting.

CL5. Carbon Benefits Withheld from Regulatory Markets

CL5.1 - Demonstrate that at least 10% of the total carbon benefits generated by the project into regulated GHG markets will not be sold. Projects can sell these carbon benefits in a voluntary market or retire them.

The carbon credits benefits from this Project will be entirely destinated to the voluntary carbon market of emissions compensation, which is being developed in partnership with Marriott International. Thus, no credits will be negotiated on any other market, that may have pre-defined rules about the use of these credits.

Yet, will be created specific reserves to guarantee the final delivery of the RED credits that will be used on the partnership with Marriott International. These reserves will keep on hold most part of the carbon credits during the crediting periods, making these credits available as the carbon credit certificates are emitted for the subsequent periods.

This way, will be created a non-permanence buffer, as an “Investment Risk Management Strategy”. This buffer will be dimensioned based on the Risk Assessment of the Voluntary Carbon Standard – VCS, that through a range of questions, rate the level of risk among low, medium and high. By applying this Risk Assessment specifically for the Juma Project, the final value obtained for the buffer was 10%, which are applied to the final reduced emissions generated by the project and are presented below on Table 21 . The definition of this buffer is presented in annex IV.

Table 21 – VCS Investment Risk / Non-Permanence Buffer of 10%, applied on the total reduced emissions expected to be generated by the project

C_{RED}				Buffer
Carbon stocks		**non CO2 GHG***		***10% - VCS Investment Risk / Non-Permanence***
annual tCO2e	cum tCO2e	annual tCO2e	cum tCO2e	
0,00	0,00	0,00	0,00	0,00
-28.157,65	-28.157,65	-1.858,41	-1.858,41	-3.001,61
0,00	-28.157,65	0,00	-1.858,41	0,00
29.667,96	1.510,31	1.958,09	99,68	3.162,60
3.404,52	4.914,83	224,70	324,38	362,92
362.824,56	367.739,39	23.946,42	24.270,80	38.677,10
76.844,88	444.584,27	5.071,76	29.342,56	8.191,66
948.728,61	1.393.312,88	62.616,09	91.958,65	101.134,47
483.816,38	1.877.129,25	31.931,88	123.890,53	51.574,83
845.245,76	2.722.375,01	55.786,22	179.676,75	90.103,20
1.042.189,61	3.764.564,61	68.784,51	248.461,26	111.097,41
883.061,15	4.647.625,76	58.282,04	306.743,30	94.134,32
1.717.319,43	6.364.945,19	113.343,08	420.086,38	183.066,25
2.084.011,79	8.448.956,97	137.544,78	557.631,16	222.155,66
2.993.861,79	11.442.818,76	197.594,88	755.226,04	319.145,67
2.440.258,07	13.883.076,83	161.057,03	916.283,07	260.131,51
3.742.897,01	17.625.973,83	247.031,20	1.163.314,27	398.992,82
3.544.032,56	21.170.006,39	233.906,15	1.397.220,42	377.793,87
3.528.149,54	24.698.155,92	232.857,87	1.630.078,29	376.100,74
4.954.627,44	29.652.783,36	327.005,41	1.957.083,70	528.163,29
3.669.886,22	33.322.669,58	242.212,49	2.199.296,19	391.209,87
2.308.150,98	35.630.820,56	152.337,96	2.351.634,16	246.048,89
2.919.809,03	38.550.629,58	192.707,40	2.544.341,55	311.251,64
3.006.047,39	41.556.676,97	198.399,13	2.742.740,68	320.444,65
8.104.158,14	49.660.835,10	534.874,44	3.277.615,12	863.903,26
4.147.493,49	53.808.328,59	273.734,57	3.551.349,69	442.122,81
4.588.781,76	58.397.110,35	302.859,60	3.854.209,28	489.164,14
3.828.920,58	62.226.030,93	252.708,76	4.106.918,04	408.162,93
0,00	62.226.030,93	0,00	4.106.918,04	0,00
4.177.449,00	66.403.479,93	275.711,63	4.382.629,68	445.316,06
8.000.929,13	74.404.409,06	528.061,32	4.910.691,00	852.899,04
7.030.124,37	81.434.533,43	463.988,21	5.374.679,21	749.411,26
7.438.116,51	88.872.649,94	490.915,69	5.865.594,90	792.903,22
5.323.680,59	94.196.330,52	351.362,92	6.216.957,81	567.504,35
4.137.663,33	98.333.993,85	273.085,78	6.490.043,59	441.074,91
6.677.808,03	105.011.801,88	440.735,33	6.930.778,92	711.854,34
6.388.711,38	111.400.513,26	421.654,95	7.352.433,88	681.036,63
5.423.844,15	116.824.357,41	357.973,71	7.710.407,59	578.181,79
5.376.132,95	122.200.490,36	354.824,77	8.065.232,36	573.095,77
5.892.638,40	128.093.128,76	388.914,13	8.454.146,50	628.155,25
7.306.845,48	135.399.974,24	482.251,80	8.936.398,30	778.909,73
11.187.536,76	146.587.511,00	738.377,43	9.674.775,73	1.192.591,42
9.064.344,60	155.651.855,60	598.246,74	10.273.022,47	966.259,13
10.220.351,31	165.872.206,91	674.543,19	10.947.565,66	1.089.489,45
12.145.642,88	178.017.849,78	801.612,43	11.749.178,09	1.294.725,53
178.017.849,78		11.749.178,09		**18.976.702,79**
189.767.027,9				

V. COMMUNITY SECTION

CM1. Net Positive Community Impacts

CM 1.1a – Describe the appropriate methodologies used (e.g., the livelihoods framework) to estimate the net benefits to communities resulting from planned project activities.

The communities net benefits were estimated based on the Sustainability Matrix (SDS, 2006) designed by the State Secretariat for the Environment and Sustainable Development of Amazonas. It consists of 27 different socio-economic indicators considered of great importance in community development. To measure the net benefits, the project team evaluated how each of the activities would impact the community regarding these issues.

Improvement in the quality of life of the local communities depends on the identification of each community's needs, from the outcomes of the Sustainability Matrix method. Through the matrix, the local population identifies the actual conditions of the community for each one of the issues, such as education, housing, health, energy, trash collection, water, sewage, environmental monitoring, etc – on an evolving line development, moving from a critical situation to a desired condition, and all the necessary measures to improve on every line (see Figure 18).

Through a questionnaire answered by the head of the household, with the assistance of a team of technicians, the families are positioned in the matrix according to its reality on each parameter analyzed. The classifications are works as described below:

Level 1 Determines a situation of exclusion, degradation, simple forms or inexistent social organization. It reflects the worst situation possible in this scenario. At this level, subsistence is the only alternative.

Level 2 Defines a basic situation of regularization. At this level, there is a basic family and community structure. In addition, the relationship with the municipal government exists, but is not strong. The production chains and commercial networks are very primitive.

Level 3 Demonstrates a situation of good community development. Joint actions are created by the producers, aimed at reducing their costs and guaranteeing stable income generation.

Level 4 Illustrates an independent community. Commercial contracts and bank access allow long term planning of their productive activities. At this level, the community's products and services have a high added value.

A year after the implementation and operation of the project, the communities will be evaluated again according to the same criteria, maintaining the consistency of this methodology. The description of the net benefits expected with the implementation of the project activities is presented in a table in *CM1.1c*.

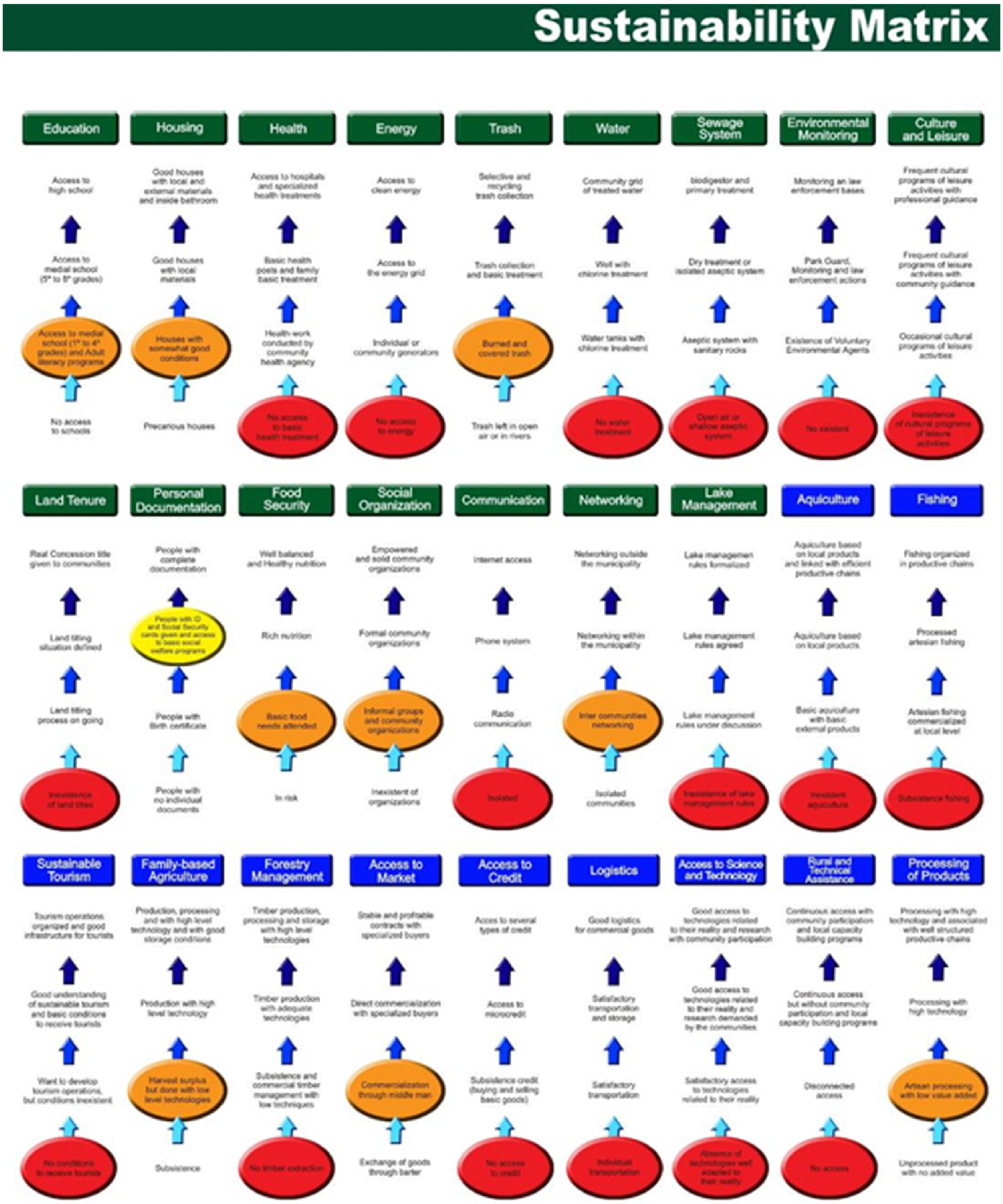

Figure 18: Model of the Sustainability Matrix, basis of the community monitoring plan

CM.1.1b - Include a credible estimate of net benefit changes in community wellbeing given project activities. This estimate must be based on clearly defined and defendable assumptions about how project activities will alter social and economic wellbeing over the duration of the project.

The estimate of each net benefit change expected in the communities' wellbeing is presented in Table 21. The activities are divided by the matrix criteria, in order to show how the project will help the community to progress in each area. The table illustrates how some of the activities of the project's operational plan directly affect the community, and which indicators will be used to measure the success of each of these actions.

CM.1.1c - Compare the "with project" scenario with the baseline scenario of social and economic wellbeing in the absence of the project. The difference (i.e., the net community benefit) must be positive.

Table 21 describes how the project is designed to operate regarding the different issues of community development, based on the Sustainability Matrix model (described in more details in *CM3.1*), showing how the net community benefit is expected to be positive.

Table 22 – Net Community Impacts Benefits

Area	Situation without the project	Program/Activity	Net Benefits	Indicators	Budget US$	Inst.
Education	Access to school (1st to 4th grades)	Creation of 3 schools according to the communities' needs, development of pedagogic materials, and support for teachers	Access to more advanced schooling (5th to 8th grade), computers and pedagogic materials	3 schools implemented and operational	398,176	FAS
Housing	Precarious houses	**Bolsa Floresta Social / Bolsa Floresta Family** The families will have more resources to invest in their houses	Good houses made with local and external materials and an indoor bathroom	Houses with better conditions	522.353	FAS
Health	No access to basic health treatment	Medical support, capacity building and support for health agents	Access to hospitals and specialized health treatment	Better access to medical support, improvement of health quality	68,824	FAS
Energy	No access to energy	Investment in solar energy system technology in the new schools	Access to clean energy	Solar panels installed	23,471	FAS
Water	No water treatment	Pro-chuva program will improve rain water storage and treatment	Well with chlorine treatment	Wells installed and working	70,588	CEUC
Personal Documentation	People have a birth certificate	The Bolsa Floresta Program will provide the lacking personal documentation	People have complete documentation	All community members have personal documentation	11,765	FAS
Social Organization	Informal groups and community organizations	**Bolsa Floresta Association** The Program stimulates social organization	Empowered and formal community organization	Formal social organizations articulated	44,471	FAS
Communication	Isolated	Creation of Communication Bases	Radio Communication System	Community bases built	88,235	FAS
Networking	Inter-communities networking	**Bolsa Floresta Association** Strengthening of grassroots organizations and cooperatives	Networking within the municipality	Information flow through associations	47,059	FAS
Lake Management	Lack of lake management rules	**Management Plan** Investment in community development, as well as ProBUC biodiversity monitoring in lakes	Lake management rules formalized and monitored	Lake management rules formalized, followed and monitored	32,941	FAS/ ProBUC

Area	Situation without the project	Program/Activity	Net Benefits	Indicators	Budget US$	Inst.
Aquiculture	Inexistent aquiculture	B**olsa Floresta Renda** Fish Farming Kits	Aquiculture based on local products and linked with efficient production chains	Aquiculture activities implemented and linked with efficient production chain	35,294	FAS
Family-based Agriculture	Subsistence/Harvest surplus done with low level technologies	Increase of productivity by developing new techniques, through technical assistance	Production with high level technology	New technologies implemented and in use	16,518	FAS

*From 2008 to 2011

The activities described above are those already planned by the program, but it is important to point out that there will be also a participative managing body to decide where to allocate the resources obtained through the Bolsa Floresta Program (Income Generation, Association and Social), depending on the communities' current needs, investing in any of the points covered by the Sustainability Matrix.

CM1.2a – Document local stakeholder participation in the project planning. If the project occurs in an area with significant local stakeholders, the project must engage diverse stakeholders, including appropriate sub-groups, under-represented groups and women living in the project vicinity.

As cited in *G3.6*, the process for the creation of the Juma Sustainable Development Reserve had the participation of residents involved in several types of work (fishermen, extractivists, farmers, ranchers, etc.). The process also included informal community associations (mothers, professors, artisans). Public hearings were also carried out in Novo Aripuanã and in the communities on March 15, 2006 (SDS, 2006), bringing together the community leaders and major local stakeholders, with representatives from City Hall, the City Council, local churches, and the local civil society organizations in attendance. Inhabitants of all communities within the Reserve were interviewed to obtain their perspectives on the social, economic and environmental context of the Reserve.

The Deliberative Council for the Juma Reserve will play an important role in the management of the Reserve as well as in the public decisions. The Council will have the participation of local communities, authorities and civil society, as established in Article 5, Paragraph III of Chapter V of Law N^{o}. 53 of June 5, 2007 – The State System of Protected Areas Law (ASSEMBLÉIA LEGISLATIVA DO ESTADO DO AMAZONAS, 2007). The Council will be responsible for the major decisions concerning the project area and relies, mandatorily, on the consultation and participation of local stakeholders.

CM.1.2b - Describe how stakeholders in the project's area of influence will have an opportunity before the project design is finalized to raise concerns about potential negative impacts, express desired outcomes and provide input on the project design. Project developers must document stakeholder dialogues and indicate if and how the project proposal was revised based on such input.

The stakeholders were informed verbally and, the FAS website, announced that the Project Design Document was available with the Head of the Reserve, for reading and commenting. During all the process, the stakeholders had the opportunity to express their concerns about the project, and to support some actions and decisions. The meetings held with the communities (see item *G3.2*) were also a moment when the community, as the main stakeholder, could better understand and opine about the project. All comments from any stakeholder are taken into consideration and, if considered adequate by the project team, they are incorporated into it. In addition to these events, comments can be made and incorporated into the project during its planning and implementation stages by the process described in *CM1.3c*

CM1.3a – Formalize a clear process for handling unresolved conflicts and grievances that arise during project planning and implementation.

The process for handling unresolved conflicts and grievances begins with the Field Coordinator, who will be responsible for receiving any complaints of conflicts and will have direct contact with the communities. The community populations will be informed in many different ways that there will be an open forum for any comments, suggestions, doubts, grievances or conflicts that may arise, and the Field Coordinator and his/her assistant will be the first ones to be contacted in these cases. The Field Coordinator will document the information received and, together with the Head of the Juma Reserve, will try to find a solution or apply the suggestion and document it. Otherwise, if a solution still needs to be found, it will be reported to the Project Coordinator.

The information will be discussed, as needed, with the President of the Reserve's Residents Association and the proper course of action will be sought. If this action resolves the conflicts/suggestions rose, the Juma Project Coordinator will document how it was done. If it cannot be resolved, the issue will be forwarded to the Executive Committee. If needed, the Deliberative Council will be also consulted and informed in order to form the final decision.

Any solution found or action applied needs to be documented and forwarded to the Project and Field Coordinator, who will archive all the documents. They will be available for consulting at any time, and if it appropriate, they will be publicized. They can be used as lessons learned, as examples in case other similar cases appear, and as input for the annual revision of the project's operational plan.

CM.1.3b - Include a process for hearing, responding to and resolving community grievances within a reasonable time period. This grievance process must be publicized to local stakeholders.

The entire process of handling unresolved grievances, conflicts or comments will be publicized to local stakeholders through printed material available in the Operational bases, schools, community's centers and meetings, in order to make them aware of how to proceed in case of grievances, unresolved conflicts and comments.

Every time the project team documents a conflict or grievance, the event will be publicized. This measure helps to create a common practice for the solution in case of reoccurrence of the problem. These documents will be always stored with the Field Coordinator in the project base and can be consulted by any direct stakeholder when necessary.

CM.1.3c - Describe how the project managers will attempt to resolve all reasonable grievances raised, and provide a written response to grievances within 30 days. Document grievances and project responses.

Figure 19 illustrates how the grievances, conflicts or comments will be resolved once they reach the Field Coordinator, who will be the first person responsible for receiving any complaints. A best effort will be made done to provide a written response within 30 days after the complaint/comment is documented. It is important to point out that some actions involved in this process may have logistical constraints.

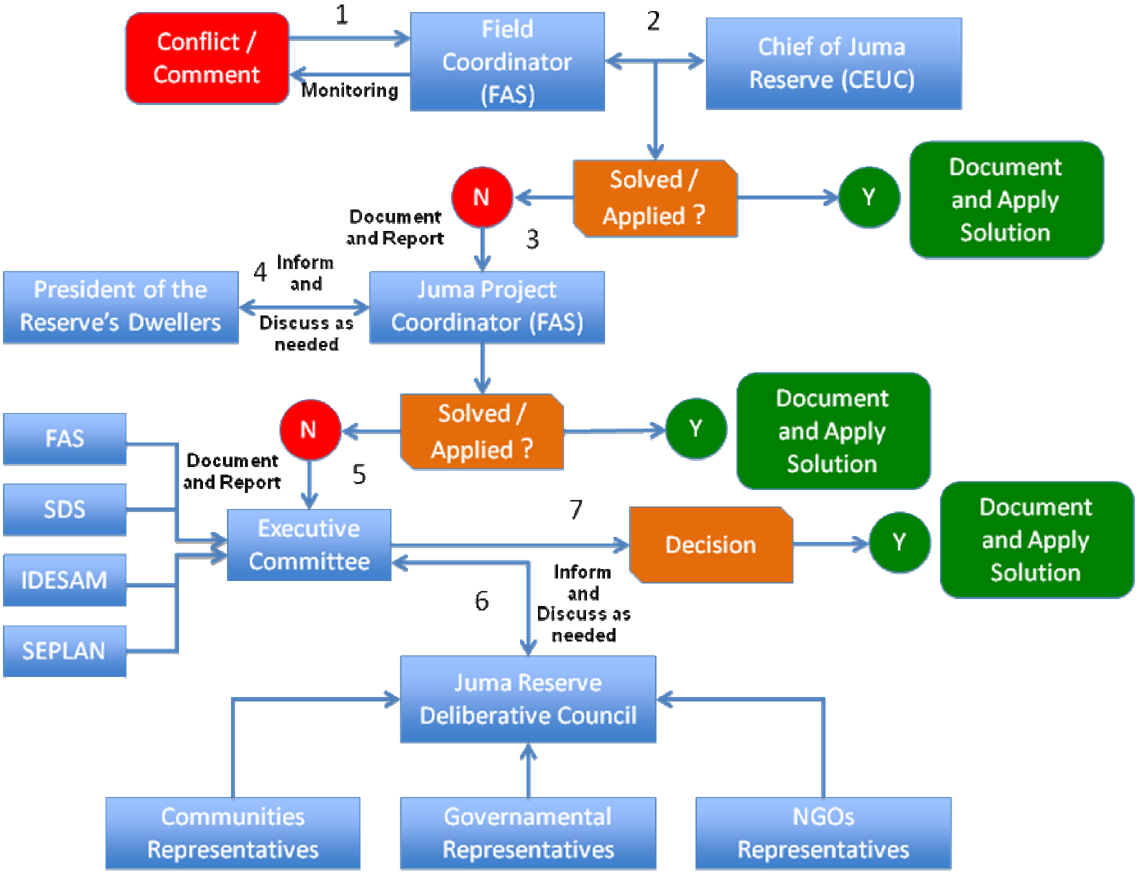

Figure 19. Process for handling unresolved conflicts, grievances and comments that may arise during project planning and implementation

CM2. Offsite Community Impacts

CM2.1 – Identify potential negative offsite community impacts that the project is likely to cause.

The project is not expected to have negative social impacts on the communities outside of the Juma Reserve. However, the implementation of the Juma RED Project includes mapping the local stakeholders who have some relationship with the Reserve, such as the proximity of their villages to the Reserve, commercial relationships with the Reserve's inhabitants or the use of the Reserve's natural resources. This process seeks to understand such relationships, in addition to understanding relationships between the local inhabitants and the outside areas, municipalities, surrounding environment, etc. This mapping process will be associated with the same monitoring and surveillance programs applied to the Reserve area to generate critical input to avoid and manage negative impacts to offsite communities, such as illegal logging, deforestation etc.

CM2.2 – Describe how the project plans to mitigate these negative offsite social and economic impacts.

If a negative impact is identified, the Reserve management team and the Deliberative Council, in which the offsite communities also have representation, will address such problems with fast and effective solutions. The issue will be discussed and mitigation actions will be designed.

It is also worth reiterating that the areas and communities adjacent to the Juma Reserve will benefit from the conservation and sustainable use of natural resources that will be promoted by the project to avoid potential negative impacts. There will be 12 communities outside the Reserve limits also included in the Bolsa Floresta Program. Since it promotes development within the communities through all the benefits offered by the program, it avoids negative impacts such as immigration, leakage of deforestation or any grievance with other communities.

CM2.3 – Evaluate likely unmitigated negative offsite social and economic impacts against the social and economic benefits of the project within the project boundaries. Justify and demonstrate that the net social and economic effect of the project is positive.

There have been no negative social or economic impacts from the project. To the contrary, the project should have positive impacts on the local economy (inside and outside the Reserve) since it will promote economic development based on the rational use of natural resources and add value to local products and markets. The resources to be generated by this project, which could reach several hundred million dollars over the next 42 years, will allow the full implementation of conservation and sustainable development policies and measures in the region of the Juma Reserve, not just within its boundaries, as mentioned in *CM2.1* and *CM2.2*.

CM3. Community Impact Monitoring

CM3.1 – Define the initial plan for selecting the community variables to be monitored, and the frequency of monitoring them. Potential variables include income, health, roads, schools, food security, education and inequality. Include in the monitoring plan community variables at risk of being negatively impacted by Project activities.

Community monitoring will be done based on the Sustainability Matrix, described in more details in *CM1.1a*, which includes 27 important variables to be evaluated, and will provide a picture of the community's situation. It consists of continuously evaluating the community in its development process, starting from a database built from interviews with the families. The information will be updated annually, according to the indicators determined in the matrix. This database is elaborated through a questionnaire answered by the head of household, with the assistance of a team of technicians qualified for this job.

The survey generates a range of information that feeds the database and qualifies the family in the Sustainability Matrix. According to this table, the community chooses, in a participative way, the priorities for its sustainable development. There is a table in Annex X indicating the parameters used for community monitoring, and how each one will be measured and reported.

The only negative impacts that could be caused by the project implementation can be summarized as loss of productive plantation area caused by the limitation of deforestation to shifting agricultures, as a part of the Bolsa Floresta Program implementation. To manage that issue, the Bolsa Floresta Program has three other sub-programs in order to increase productivity and effectiveness and diversify the activities based on sustainable development. The Bolsa Floresta monitoring program will also annually monitor this issue. Any negative impacts can be reported by the communities through the process for dealing with unresolved conflicts, grievances and comments, as explained in *CM1.3c*.

CM4. Capacity Building

CM4.1 - Explain how capacity building is structured to accommodate the needs of the communities, and not only those of the project.

The community members and local stakeholders are already involved in the implementation of the project activities and will continue to participate throughout the entire process of developing the project. The project will provide organizational, management and technical capacity building activities to underscore the ownership of the local people's management of the Reserve, as well as to insure their involvement in decision-making and implementation of programs and in conservation and sustainable development efforts. Workshops, training sessions and events for sharing experiences will be organized to provide community people and local stakeholders with the necessary tools to improve their ability to manage their environment in a lasting and sustainable way.

The Management Plan will include community-strengthening activities aimed at promoting the organization of community groups and the training of community members in sustainable production methods to improve their earning capacity. Other activities will be done to improve the quality of life in the Reserve, including training communitarian Health Agents to assist others in case of any first aid is needed.

The activities and trainings already planned for promoting capacity building for the project communities are better described in item *CM4.4*.

CM4.2 – Explain how capacity building is targeted to a wide range of groups, not just elites.

The concept of "elite" does not exist within the existing social structures in the Juma RED Project site. Inside the Reserve, economic conditions are very homogeneous. The only observed difference is between those individuals who live in communities with higher levels of social organization and those people living in communities that are still in the process of organizing themselves.

CM4.3 - Explain how capacity building is targeted at women, to increase their participation.

The management plans developed for the State of Amazonas protected areas does not differentiate between women and men regarding their participation in decision-making, development and implementation of plans and activities, as well as in capacity building efforts.

It should be noted that the Bolsa Floresta program, which provides a monthly payment of R$50 (about US$ 30 dollars) per family, is made in the name of the female head of household. This is done to support the social inclusion of women and provide them with an incentive to participate as equals in the family economy by giving them greater control over financial resources. It is believed that women have a better understanding of the family situation and needs.

Equal rights and opportunities will be provided to local people without consideration of their gender. If during the process of implementing the Reserve a need to promote gender equality is identified, then appropriate programs will be developed and implemented.

CM4.4 – Explain how capacity building is aimed at increasing community participation in project implementation.

In addition to the participation of community people in the Reserve's Advisory Council and in decision making regarding the development and implementation of the Reserve's management plan, several other programs will be implemented that require community participation, including:

- **Voluntary Environmental Agents Program**: The voluntary environmental agents are individuals without authority who are committed to the conservation of natural resources. These agents acts as multipliers of the awareness within the community and communicate with the authorities when there has been an infraction of the Reserve's rules and regulations. The Voluntary Environmental Agents Program is envisioned as a way of providing individuals interested in participating in environmental education, conservation, preservation and protection of natural resources of the protected area.

- **Health Agents:** Community members will be selected or will volunteer to receive training in healthcare assistance, in terms of emergency care (first aid), basic treatment of the most common health problems and treatments based on traditional knowledge. The intent is to provide sufficient knowledge for community representatives to rapidly assist other members in case of emergencies, and, if necessary, to forward the case to an appropriate assistance facility. This training will be organized and provided by FAS, with the support of qualified professionals from the area.

- **Biodiversity and Natural Resource Use Monitoring Program in State Protected Areas of Amazonas (ProBUC)**: The ProBUC program prepares and accredits community members and inhabitants of the protected areas to participate and collaborate in natural resource monitoring activities. This program will generate information about the status of biodiversity, its uses and threats. The duties of these monitors are as follows:
    - Census monitor – performs a weekly collection of information about natural resource use.
    - Fishing monitor – collects data about the production, marketing and selling of fish at the major docks in the municipality.
    - Boat monitors – collects data on the transit of boats at strategic points in the protected area.
    - Fauna monitor – monitors the presence and quantity of animals in the forest
    - Road Monitor – monitors the road traffic and types of goods transported

- **Forestry Management:** It is crucial for project success that good practices in Forestry Management are developed with the community. Some material (i.e., the publication "Sustainable Forest Management for Wood Production in the State of Amazonas) has already been distributed, and workshops are being planned in order to provide sufficient knowledge so that the community people can continue their forestry activities, without damaging the natural resources.

- **Environmental Awareness:** A program will be implemented at the public schools to train teachers and distribute material, so they can understand and disseminate information related to their reality, such as sustainability and climate change. It is believed that this measure will increase people's knowledge about their reality, situation and responsibilities related to sustainable development and nature conservancy, also increasing the success of the project in reducing deforestation.

- **Association:** Workshops were already held in order to provide knowledge and to promote the association to the representatives of the Reserve. A Council for gathering these representatives was already founded and the members are being chosen. Other workshops will be also set up in order to help them develop management rules.

Table 23 presents the dates when the training programs are planned to be held.

Table 23: Information on the Training programs

Training Program	Responsible Institution	Date
Environmental Agents	FAS	Dec. 2008
Health Agents	FAS	Mar. 2008
Biodiversity Monitors	CEUC	Dec. 2008
Forestry Management	FAS	Apr. 2008
Environmental Awareness	FAS	Apr. 2008
Association	CEUC	Jul. 2008

CM5. Best Practices in Community Involvement

CM5.1 – Demonstrate that the project was developed with a strong knowledge of local customs and that, where relevant, project activities are compatible with local customs.

The Juma Sustainable Development Reserve was created through a participatory process. This process included meetings and public hearings; interviews were performed with broad participation by local communities and stakeholders. The management plan is also developed by a participatory process, considering that community people and other local stakeholders know their environment and understand their conditions and needs better than anyone else.

When the area was chosen for the creation of a Protected Area, teams from the State Secretariat of the Environment and Sustainable Development of Amazonas went to the field to contact local communities and identify their conservation and sustainable development needs. Local communities in the Juma Reserve identified the “Sustainable Development Reserve” as the type of Protected Area that would allow them to balance improving their livelihoods with maintaining the environmental quality of their forests. It is important to point out that the teams that conducted these studies have extensive knowledge and experience in the reality of the Amazon.

The implementation of the Bolsa Floresta Program involves the communities in the process of deciding how to use the financial resources for community associations - resources that are equal to 10% of the total monthly payments to all families within a community. An additional R$ 4,000.00 (about US$ 2,400.00) per year is provided for community-wide investment plans.

It is important to reiterate that the development of the management plan will take five years from the date of creation (see SEUC). During this period, the authorities and technicians will incorporate local customs in establishing rules for the use and management of the Reserve. These rules will serve as the foundation for the Reserve management plan.

CM5.2 - Show that local stakeholders will fill all employment positions (including management) if the job requirements are met. Project proponents must explain how stakeholders will be selected for positions and where relevant, must indicate how traditionally underrepresented stakeholders and women will be given a fair chance to fill positions for which they can be trained.

The majority of the local stakeholders that are expected to be involved in the implementation of the project will be part of the FAS and SDS teams. Some specific actions (e.g., carbon and biomass dynamics studies) may require specialized professionals, who will perform this work on a contract basis. Local people will be prepared and trained, and will have the opportunity to be hired within some of the programs to be implemented as part of the development of this project (e.g., biodiversity monitors, climate monitors). They will also be invited to work in supporting field activities from project and Reserve managers.

In the case of biodiversity monitoring, all the field work will be performed by the communities' dwellers. The process of choosing these monitors is based on various requirements; the candidates must be over 18 years old, have personal documents, be approved in the initial evaluation for recognition of the candidate, have a good social relation with the other community members and have the recommendation approved by the community or dweller's association. After this initial selection, candidates have to participate and be approved in a capacity building course. It consists of a 10-day training session, in which community members receive information on geography, ecology of the forest, nature conservancy, natural resources management, biodiversity of the region, animal-man conflict and animals at risk of extinction. Following this training, each type of monitor receives differentiated training, depending on the function they will assume in the monitoring. (SDS, 2006)

The contract is made by registering at the State Secretariat of the Environment and Sustainable Development (IPAAM and SDS), and there is no employment relationship in it.. Each monitor will receive payment according to the number of days worked.

The other cases of employing community people and other stakeholders in the project's activities are already planned, and the under-represented will certainly be considered once they have the appropriate skills for the role. The selection process has not yet begun.

CM5.3 – Demonstrate that the project complies with international rules on worker rights

The hiring of other people for the project has not yet begun, but they will be made aware of their rights and obligations in their contracts as required by law. The recruiting done by SDS is done by the Government itself, and thus has an inherent legality. The recruiting done by FAS is subject to the institution's external auditing. The implementation of the project guarantees the compliance of all social legal requests of Workers legislation, health and work security.

CM5.4 – Comprehensively assess situations and occupations that pose a substantial risk to worker safety.

Local communities are accustomed to living in the forest ecosystems and to being surrounded by an environment rich in biodiversity. Major risks that could arise from the implementation of this project are related to potential forestry and forest management activities, the use of machinery and equipment, and the other related activities that are part of the process for implementing the sustainable production activities that will be promoted for the project's communities. Whenever necessary, appropriate training will be offered to people involved in such activities, including all safety procedures and the use of protection equipment that can manage the risks and avoid unnecessary accidents

CM.5.5 Describe the plan in place to inform workers of risks and to explain how to minimize such risks. Where worker safety cannot be guaranteed, project proponents must show how the risks will be minimized using best work practices.

In order to avoid the risks in activities related to community-based forestry and forest management, during the implementation of such programs the workers will receive specific training for the activities, in addition to information on how to minimize the risk of accidents. The special training includes major procedures to be adopted to reduce accidents during these activities, such as the use of personal protection equipment (special boots, helmets, suits, tools, medicine, etc.) and the guidance and instructions to use, fill and transport the sawmill and other machinery.

VI. BIODIVERSITY SECTION

B1. Net Positive Impacts

B1.1 - Describe the appropriate methodologies used to estimate changes in biodiversity as a result of the project. Base this estimate on clearly defined and defendable assumptions. Compare the "with project" scenario with the baseline "without project" biodiversity scenario completed in G2. The difference (i.e., the net biodiversity benefit) must be positive.

Under the "without project" scenario, 62% of the forest within the Juma Reserve will be lost before 2050. The loss of forest cover implies a loss of biodiversity and habitat for local flora and fauna, as well as the environmental services that the forest provides. This loss of forest also directly affects the conservation of the soils and disturbs the ecological processes on a larger scale (PAGIOLA *et al.*, 2004). The project is located in the center of endemism of Rondônia, which is defined by the Madeira River (to the left) and the Tapajós River (to the right). This area encompasses 475,000 km^2, of which 12.56% has already been deforested (DA SILVA *et al.*, 2005). This area contains a large number of endemic species, many of which occur in a very restricted area (DA SILVA *et al.*, 2005). These species will need more protected areas that are strategically located for them to be adequately represented in a biodiversity conservation system (RODRIGUES & GASTON, 2001).

The "with project" scenario assumes that the resources required to guarantee conservation and sustainable development are available. Under this scenario, it is assumed that at least 90% of the intact forests in the project area will be protected and thus will promote great benefits in terms of biodiversity conservation when compared to the "baseline" scenario. In addition to these benefits, the project will make possible the establishment of a robust system for biodiversity monitoring and research of the natural resources in the Juma Reserve area and its surroundings. This system is based on the "Biodiversity and Natural Resource Use Monitoring Program in State Protected Areas of Amazonas" (*Programa de Monitoramento da Biodiversidade e do Uso de Recursos Naturais em Unidades de Conservação Estaduais do Amazonas* - ProBUC) (MARINELLI *et al.*, 2007), which has already been established. ProBUC operates under the premise that the involvement of communities living in the Reserve serves to demonstrate to them the importance of their role in maintaining the integrity of the ecosystem (see also item *B.3*).

The main positive net impacts that the monitoring of the biodiversity will bring to the Project's area are shown in the table below. As shown, without biodiversity monitoring, it is impossible to gather information that allows better management and conservation of the biodiversity.

Table 24 – Net Positive Impacts on the Biodiversity

Area	Situation without the project	Program/Activity	Net Benefits	Indicators	Budget	Institution
Biodiversity Monitoring	No monitoring of biodiversity	ProBUC program involving communities in monitoring biodiversity	Help with the prevention and identification of negative impacts on biodiversity and on the livelihood of the communities	Data collected regularly and documented	111,765	CEUC

Biodiversity monitoring is based on ProBUC, which has five main monitoring programs. These programs are further detailed in item *B3.1*.

B1.2 – Describe possible adverse effects of non-native species on the area's environment, including impacts on native species and disease introduction or facilitation. If these impacts have a substantial bearing on biodiversity or other environmental outcomes, the project proponents must justify the necessity of using non-native species over native species.

In the Juma Reserve region, the only areas in which exotic species are found are the small patches of pasture (*poaceae* family), which are used for small-scale cattle production. These areas are already included in the "without project" scenario and represent the only possible situation with a potential for causing adverse effects. These activities are not to be included in the project implementation and are not characteristic of the critical activities of the communities. For this reason, no negative impacts are expected from the discontinued use of these pastures. The project's capacity training in the communities will provide them with more environmentally suitable techniques and substitute exotic grass species with native ones.

B1.3 – Identify all IUCN Red List threatened species and species deemed threatened on nationally recognized lists that may be found within the project boundary. Project proponents must document how project activities will not be detrimental in any way to these species.

The area of the project and other interfluvial areas of the Madeira and Tapajós Rivers were classified as being of high biodiversity importance in the Seminar for the Evaluation and Identification of Priority Activities for Conservation coordinated by the Ministry of the Environment (NELSON & OLIVEIRA, 1999). However, few studies and biodiversity inventories have been conducted in the Juma region (OREN & ALBUQUERQUE, 1991), which is believed to be of great importance for mammals, birds, reptiles and aquatic fauna. Before listing an endangered species, an initial effort must be made to identify the species found in the region, as many of them are rare and restricted to the region and risk becoming extinct before they are described and classified.

Rare, poorly known, or unknown and recently described bird species were registered by COHN-HAFT *et al.* (2007). *Micrastur mintoni*, *Touit huetii* and *Gypopsitta aurantiocephala* were recently described and are poorly known; the last two are absent in most of the Amazon basin and were found several times on the sides of the Aripuanã River during the survey. Approximately 100 individuals of *Streptoprocne zonaris* were found in the Aripuanã River, possibly representing the first resident population in the Amazon likely to nest on the waterfalls of the River. *Avocettula recurvirostris* was one of the few registers in the Amazon, an extremely poorly known species. The register of *Eubucco richardsoni* expands the occurrence of this species, giving to the lower Aripuanã River the largest occurrence of the Capitonideae taxon for the entire Amazon (4 species). Two new species of the genera *Herpsilochmus* and one of *Cyanocorax* were found, one on each side of the Aripuanã River. *Conopias parvus* and *Hemitriccus minimus* were frequently considered rare and were widely found in the area.

There were 17 species of primates (from 10 genera) identified in some regions of the interfluvial region, some of which were endemic and others considered endangered.[25] In the project area, 14 species of primates were identified (see *G1.6*). The area is also classified as having a high diversity of reptile species, including recently described species and rare species such as *Anolis phyllorhinus*, and various species in the genera *Phyllomedusa* and *Phrynohyas*, which are rare in other regions.

The list of endangered species does not include the endemic species recently found in the region that could be threatened, but until now were only considered endemic to the lower Aripuanã River. Below is a list of endangered species from the IUCN red list and a preliminary list of nationally recognized endangered species (IBAMA) found in the Juma Reserve. In the first year, a detailed analysis of the groups of flora and fauna will be conducted as part of the project's implementation.

[25] Public Consultation undertaken in the Juruena National Park, in the interfluvial area of Madeira-Tapajós. The document is available at: http://www.ibama.gov.br/consulta/parna_juruena.htm

Table 25: List of endangered species from the IUCN list found in the Juma Reserve

GROUP/Order/Species	IUCN Category	IBAMA Category
MAMMALIA		
Carnivora		
Leopardus tigrinus	NT	Vulnerable
Leopardus wiedii	LC	Vulnerable
Panthera onca	NT	Vulnerable
Pteronura brasiliensis	EN	Vulnerable
Speotus venaticus	VU	Vulnerable
Primates		
Ateles belzebuth	VU	Vulnerable
Sirenia		
Trichechus inunguis	VU	Vulnerable
Xenarthra		
Myrmecophaga tridactyla	NT	Vulnerable
Priodontes maximus	VU	Vulnerable
AVES		
Accipitridae		
Harpia harpyja	NT	Not listed
FLORA		
Lecythidales		
Bertholletia excelsa	VU	Vulnerable
Laurales		
Aniba roseodora	EN	Endangered

Source: IUCN, 2008[26]; MMA, 2008[27]

The implementation of ProBUC will allow for the identification of endangered species refugees. These sites will receive special attention and will be included in management activities with higher impact. Systematic monitoring of these species will allow for the assessment of their relative abundance within the Reserve, will determine the dynamics of their populations, and will identify what will be important to improve the Reserve's management plan.

[26] Available at: http://www.iucnredlist.org/info/categories_criteria2001#categories
[27] Available at: http://www.mma.gov.br/port/sbf/fauna/index.cfm

B1.4 - Identify all species to be used by the project and show that no known invasive species will be used.

The Juma RED Project is based on the management and conservation of native species and natural ecosystems. If management of any natural resource is to be promoted within the Reserve as part of an effort to generate income for local communities, these activities will comply will all applicable laws and rules. These activities will follow strict sustainable procedures to prevent the overexploitation of the underlying species. No activity involving invasive species is planned.

B1.5 - Guarantee that no genetically modified organisms will be used to generate carbon credits.

Both federal and state legislation prohibits the introduction of genetically modified species into protected areas. As mentioned in *B1.4*, the Juma RED Project is completely based on the natural ecosystems management and on the conservation of native species.

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B2. Offsite Biodiversity Impacts

B2.1 - Identify potential negative offsite biodiversity impacts that the project is likely to cause.

The implementation of the Juma RED Project is not restricted to the area within the boundaries of the Juma Sustainable Development Reserve. It also includes buffer zones and surrounding areas, which will be included in the monitoring program. The monitoring of resources by the ProBUC program will include the monitoring of areas around the Reserve, which will result in the project's positive biodiversity impacts being extended to the areas adjacent to the Reserve. The monitoring and surveillance programs will generate the necessary information for avoiding and managing negative offsite impacts, such as those caused by illegal logging, deforestation, etc.

B2.2 - Describe how the project plans to mitigate these negative offsite biodiversity impacts.

Whenever a protected area is created, activities are planned to guarantee the benefits provided by the status of protected area, inside as well as outside the Juma Reserve. The biodiversity in the area around the Reserve will benefit from the conservation of the natural resources and the activities aimed at reducing the negative impacts. Whenever an emergency is detected, the Reserve management, the Advisory Council and the appropriate authorities will take the necessary measures.

The simple fact of conserving the forest ecosystem, and the consequent conservation of the fauna, ecological processes of dispersion, colonization and soils, allows for the maintenance of these processes outside of the Reserve. The maintenance of these processes preserves genetic resources of both the animal and plant populations. The presence of a favorable microclimate that is less susceptible to fires and droughts as well as tree mortality within the forest (LOVEJOY *et al.,* 1986; LAURANCE *et al.,* 2002), causes the loss of richness in the tree community (TABARELLI *et al.,* 2004). Moreover, the "edge effects" caused by deforestation in the project area in the "without project" scenario would alter the habitat of the forest in the surrounding areas, causing, among other things, a high tree mortality rate and a reduction in animal species (LAURANCE *et al.,* 2000; FERRAZ *et al.,* 2007).

Sedimentation in bodies of water and contamination by agrochemicals are expected due to the cattle ranching activities that will occur under the "without project" scenario. Moreover, the project will ensure the maintenance of the downstream environmental quality and productivity in the Aripuanã and Madeira Rivers.

B2.3 - Evaluate likely unmitigated negative offsite biodiversity impacts against the biodiversity benefits of the project within the project boundaries. Justify and demonstrate that the net effect of the project on biodiversity is positive.

The Juma RED Project expects to generate at least US$ 189,7[28] million during its lifetime. These resources would allow the full implementation of conservation and sustainable development policies and measures throughout the region of the Juma Reserve, not only within its boundaries, as mentioned in *B2.1* and *B2.2*. Any activity having an impact on the biodiversity of the Reserve and the surrounding areas will immediately receive the appropriate attention. The monitoring and research on the plant and animal species will minimize any offsite negative effects on biodiversity. The benefits generated by the protection, conservation and research activities will by broad and long lasting, contributing to one of the major objectives of creating a protected area, which is to conserve a special set of biological diversity.

[28] Assumes that, over 42 years, deforestation will produce 189,7 million tons of CO_2 in the crediting areas, with a price of US$1 per ton of CO_2.

B3. Biodiversity Impact Monitoring

B3.1 - Describe the initial plan for how to select the biodiversity variables to be monitored. Potential variables include species abundance and diversity, landscape connectivity, forest fragmentation, habitat area and diversity, etc. Clarify the frequency of monitoring. Include in the monitoring plan biodiversity variables at risk of being negatively impacted by project activities.

The monitoring plan will follow the directives of ProBUC and scientific inventories of biodiversity, which involve monitoring the species richness of animals (mammals, birds and reptiles, as well as associated products like eggs and leather) and plants (timber and non-timber products) utilized by the communities. If these species are found to be in decline, management and protection actions will be undertaken to guarantee their conservation. This monitoring is expected to generate the knowledge required to develop proposals for managing these resources appropriately. The specific objectives of ProBUC are to:

1 – Raise awareness among community members about the relevance of monitoring natural resource use to establish the rules for their sustainable use.

2 – Train community members in the protected areas to operate as monitors of biodiversity.

3 – Monitor species used by local communities, such as synergistic fauna (mammals, birds, and turtles), commercial fish species and timber and non-timber species;

4 – Monitor "special interest" species, critically endangered species, endangered species, and species in threat of extinction (IUCN, IBAMA). In addition to monitoring charismatic species, the program monitors "conflict species" (man vs. animal), which are those species that cause an economic loss or compete for resources with local people, such as alligators (*Melanosuchus niger* and *Caiman crocodilus*), dolphins (*Inia geoffrensis*) and tucuxi (*Sotalia fluviatilis*).

5 – Monitor land use and changes in vegetation cover

6 – Monitor boat traffic in the area of the Reserve.

Participatory methods will consistently be used by the monitoring program, from its creation to the evaluation of the results obtained and in discussions regarding new approaches. The monitors will be trained to perform their specific jobs, and present the results obtained from the surveys. ProBUC is composed of five different programs, as shown in the chart below.

FAUNA MONITORS:
Monitor the presence and quantity of animals in the forest
Frequency: Every 15 days
People involved: 12

FISHING MONITORS:
Collect data about the production, marketing and sale of fish at the major docks in the municipality
Frequency: Daily visits at the boarding stop
People involved: 2.

BOAT MONITORS:
Collect data on the transit of boats at strategic points in the protected area
Frequency: Daily observations
People involved: 4

CENSUS MONITORS:
Perform a weekly collection of information about natural resource use
Frequency: Every week
People involved: 19

ProBUC also involves monitoring "*tabuleiros*" (turtle nesting sites), but there are none in the Juma Reserve. For this reason, this variable will not be monitored.

The collection of data by the community members will be recorded on data sheets provided by the project's technical team. These sheets allow for the standardization of the informationcollection and permit information storage and processing.

Moreover, the program will count on the support of fisherman-collaborators who will collaborate on scientific research of interest and who will support the diagnostics of resource use. The program's technical team, based in CEUC/SDS, is responsible for validating the data, entering it into a database, and GIS. CEUC/SDS will perform data analysis, monitor the system and coordinate the logistics of the program.

Together with the ProBUC monitoring, scientific research inventories will also be conducted, aimed at monitoring the biodiversity with more accuracy, as well as increasing the knowledge about recently discovered species and those that have not yet been described. These procedures will follow the same methodologies used and presented in item *G1.6*. Following the same methodology, it is possible to have the same basis of comparison between both data and to have more accurate results relating to their alteration over time.

Using the Study for the Creation of the Reserve as a basis, a list was generated containing all the species living within the Reserve area (both fauna and flora), identified in the scientific inventories. Then, the species contained in that list were cross checked with the IUCN Red List and IBAMA's list of threatened species. The matching species of both lists generated the "List of threatened species," in the Project area. Assuming that the Juma Reserve RED Project will protect and conserve these species, by keeping and conserving their natural habitats, these lists will be periodically revised (they are included in the monitoring plan) and, when necessary, updated. In this manner, it will be possible to know if the forest conservation is providing real benefits for the biodiversity by protecting the species that were already threatened and avoiding the addition of new species to the list.

The variables, frequency and other information that compose the monitoring plan, are described below:

Table 26 – Biodiversity parameters to be monitored in the Juma Reserve RED Project

Data Variable	Source	Data Unit	Measured, Calculated or Estimated	Frequency	Proportion	Archiving	Comment*
Daily Transit of Heavy Vehicles	Observations	Number and purpose class	Measured	Daily	Strategic spots of the Road	Paper and Digital data bank	There will be made periodic observations on the road, to verify the intensity of the traffic and to analyze the purpose of de vehicles on the AM-174 road.
Profile of the boats that enter the PA	Observations	Motor Type and purpose class	Measured	Daily	100% of the boats that enters the PA	Paper and Digital data bank	
Production of the fishing boats inside the PA areas	Survey on stop points	Quantity, specie´s name, sample of the size of the fishes and effort of extraction	Measured	Daily	100% of the fishing boats that accept to contribute with the monitoring	Paper and Digital data bank	In some time, with the management plan of the PA, we expect that all fishing boats contribute with the monitoring.
Species of sold fishes	Survey on local commerce	Specie´s name and price	Measured	Every month in each commerce	All local commerce	Paper and Digital data bank	
Timber extraction by residents	Questionnaires	Quantity, Specie's Name, place, purpose and way of extraction	Measured	Every 7 days	At least 10 houses of communities that are bigger than that or all the community.	Paper and Digital data bank	

Data Variable	Source	Data Unit	Measured, Calculated or Estimated	Frequency	Proportion	Archiving	Comment*
Non timber products extraction by residents	Questionnaires	Quantity, Specie's Name, place, purpose and way of extraction	Measured	Every 7 days	At least 10 houses of communities that are bigger than that or all the community.	Paper and Digital data bank	
Fish extraction by residents	Questionnaires	Quantity, Specie's Name, place and purpose	Measured	Every 7 days	At least 10 houses of communities that are bigger than that or all the community.	Paper and Digital data bank	
Terrestrial animals extraction by residents	Questionnaires	Quantity, Specie's Name, place, effort and demography structure of the animal	Measured	Every 7 days	At least 10 houses of communities that are bigger than that or all the community.	Paper and Digital data bank	
Key species sightings (flag, threatened – red lists, locally threatened or conflict species) by residents	Questionnaires	Number of sightings and place	Measured	Every 7 days	At least 10 houses of communities that are bigger than that or all the community.	Paper and Digital data bank	
Living alligators	Field Survey in lakes	Number of nests and reproduction success	Measured	Ten days, twice, every year	Main lakes of the PA for de alligators	Paper and Digital data bank	
Presence of living animals on the forest	Observations in transects	Name, number and distance from de transect	Estimated	Every 15 days	At least 16 micro-basins of the PA	Paper and Digital data bank	

Data Variable	Source	Data Unit	Measured, Calculated or Estimated	Frequency	Proportion	Archiving	Comment*
Species included on the IUCN list of threatened species	IUCN website	Name of specie	Measured	Every year	100% of the know species living within the project area	Digital files	The list of existing species will be crossed with the IUCN list of threatened species
Species included on the IBAMA list of threatened species	IBAMA website	Name of specie	Measured	Every year	100% of the know species living within the project area	Digital files	The list of existing species will be crossed with the IBAMA list of threatened species

- In all cases periodic bulletins are distributed in a frequency that will be accorded with the monitors, communitarian leaders and council participants, apart from the periodic evaluation and data discussion meetings

The main assumption of the program is that through scientific research on the Juma Reserve's biodiversity (e.g., ecology of species, dynamics of populations, etc.) the subsidies to improve the Management Plan of the Reserve will be obtained, helping also to identify the needs and opportunities for the next research and monitoring activities. The knowledge about the conservation status of the threatened species in and around the Reserve will be improved, which will lead to specific measures for protecting these species.

Through the knowledge of these data, it is possible to have an overview of the availability of exploited species, generating information about the level of exploitation. These data can help to generate measures for instructing the communities about how to use the natural resources in a sustainable way, without affecting either their needs or the resources.

B4. Use of Native Species

B4.1 - Show that the project will only use species that are native to the region, or justify that any non-native species used by the project are superior to native species for generating concrete biodiversity benefits.

The Juma RDS Project seeks to conserve the natural forests of the Amazon and the sustainable use of native species. No plan or intention exists to use exotic species in any activity within the Reserve, except those that are already part of the traditional production of the local communities (e.g., fruit trees, pasture grasses).

B5. Water and Soil Resource Enhancement

B5.1 - Identify project activities that are likely to enhance water and soil resources.

The appropriate conservation measures within the Juma Reserve and its buffer areas will allow the forests and rivers to remain in their natural state. This is key for maintaining the natural hydrological cycles, the quality and quantity of the water and soil conservation.

B5.2 - Credibly demonstrate that these activities are likely to improve water and soil resources compared to the baseline, using justifiable assumptions about cause and effect, and relevant studies.

One of the consequences of the conversion of the Amazon forest into pasture will be a decline in rainfall in the Amazon and adjacent regions, considering that these rains comes from the water that is recycled through evapotranspiration (FEARNSIDE, 1997).

Undisturbed forest has very low rates of soil and sediment loss. Deforestation generally increases rates of soil erosion by increasing the amount of surface runoff. The effect is considerably less than that which would exist with the presence of leaf litter, stems and branches. Roots increase the permeability of soil, increasing the absorption and infiltration of water. Forests also contribute to terrestrial evaporation and regulate the humidity of the soil through transpiration. Leaf litter and other organic residues transform the physical properties of the soil, increasing its capacity to hold water and nutrients. Deforestation can change the quantity of water present on the surface and underlying soil layers as well as the humidity in the atmosphere. Furthermore, these processes influence the rates of erosion and availability of water for ecological processes and for the maintenance of environmental services.

The creation and implementation of the Juma Sustainable Development Reserve forests will protect not only its biodiversity, but also the quality of life of the local inhabitants, and the climate. It will conserve the quality of soil and water, and the equilibrium of key processes like local hydrological cycles.

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ANNEXES

Summary

VIII. ANNEXES

ANNEX I – Future Deforestation Simulation Model (SIMAMAZONIA I)

All of the information presented in this annex is based on the supplementary material of Soares-Filho *et al.* article published in Nature (2006). All the information is available online, at the following websites:
http://www.nature.com/nature/journal/v440/n7083/suppinfo/nature04389.html
http://www.csr.ufmg.br/simamazonia

1. Overview

The architecture of the overall model combines two models within two spatial structures: (1) sub-regions defined by socio-economic stratification and (2) matrix cells (or rasters). The 47 sub-regions were defined using an index of anthropogenic pressure (GARCIA *et al.*, 2004). The overall model forecasts the deforestation rates for each of the sub-regions, processing the data on deforestation, highway construction and paving as well as existing and proposed conservation areas. The model is a spatially explicit simulation that uses cartographic data for the infrastructure (highways, railways, gas lines, waterways and ports), administrative units (national and state borders and protected area boundaries) and biophysical characteristics (topography, soil types, vegetation types) within a map in large raster of 3144 X 4238 cells of 1 km^2 resolution. Therefore, each sub-region has a unique spatial model with its own individual parameters. These models consist of two elements:

(1) A Cellular Automata model that simulates the spatial patterns of deforestation, incorporating a probability map describing the combined influence of the cartographic data and the allocation of deforestation; and

(2) A "road constructor" model that projects the expansion of the network of secondary roads and incorporates the effect of road expansion on the spatial patterns of deforestation in development.

2. Stratification of the Amazon Basin

Given the great variability of deforestation rates throughout the Amazon basin, the basin was divided into representative sub-regions of the network and connectivity between cities and their zones of influence. The stratification of sub-regions uses a synthetic rate for anthropogenic pressure, the level of the tertiary economy, and regional migratory flows (GARCIA *et al.*, 2004) to determine the amount of socio-economic and demographic growth in each sub-region (MONTEIRO & SAYER, 2001). This rate was calculated through the application of the "Grade of Membership" (GOM) method of "fuzzy" classification (MANTON *et al.*, 1994) of socio-economic, demographic and agricultural data.

This data includes population density and growth rate, rate of urbanization, growth in domestic production, income rates and municipal budget, number and types of agricultural implements, animal production, agriculture and silviculture, and parameters of education, housing and health. This data was stratified in a five dimensional space in which the axes were designated as follows:

(1) Demographic concentration and dynamics
(2) Economic Development
(3) Agrarian Infrastructure
(4) Agricultural and Timber Production
(5) Social Development

These axes were combined to produce a rate of anthropogenic pressure for each municipality. The positive effects from anthropogenic pressure correspond to the first four axes, while the negative effects correspond to the fifth axis. In the second step, the regional centers of development were identified and ordered in relation to the supply of services (LEMOS *et al.*, 1999), referred to in this model as the "tertiary economy."

3. Data for the projection of deforestation

The data in the model for each sub-region consists in an analysis of the historical deforestation rates, and its average yearly derivative, as well as the extent of the remaining forests, deforested areas and protected areas. For the business as usual scenario defined by Soares Filho et al. (2006), it was considered the historical deforestation rates within 1997 and 2001. The database used for the region was obtained from PRODES[29]. The methodology to obtain the deforestation data is available in Annex IX. The use of historical deforestation rates as method to defining reference deforestation levels for RED baselines, has been considered as the most straightforward system in the actual negotiations within the UNFCCCC. The Voluntary Carbon Standard guidance for RED also recommends the use of annual historical deforestation rates, collected within a period of 5 to 10 years prior to the project starting date.

The period of data collection for the SimAmazonia model was between 1997 and 2001, justified by the availability if data in the time the model was published (Soares-Filho 2006). This is thus in line with the 5 years period recommended by VCS.

To generate the deforestation year by year on the Juma Reserve, the 44 rasters of the model, were made available by the author and converted from geotiff format to the grid format of the ArcGIS program, and the dimension of the pixel converted to 100 x 100 m (1 hectare per pixel). This corresponds to the minimum mapping unit adopted in the project, having three different values for deforestation:

[29] National Institute for Space Research (*Instituto Nacional de Pesquisas Espaciais*). Monitoring of the Brazilian Amazon Forest by Satellite - PRODES Project (*Monitoramento da Floresta Amazônica Brasileira por Satélite- Projeto PRODES)* [online], available at http://www.obt.inpe.br/prodes (2004).

- -1 - Deforestation
- No data (no value) – corresponds to rivers and non forest vegetation
- 1 - Undisturbed forest

The classified Landsat image (methodology available in Annex VI) was also converted to the ArcGIS grid, with the same dimensions. Each vegetation class and land cover has its own unique number. Using the “Raster Calculator” tool of the Spatial Analyst extension of the ArcGIS, a multiplication of the grid was performed for vegetation/land cover and the grids for each year of the model, obtaining the negative values for the pixels where deforestation occurred, according to the model, and pixels with positive values, where there was no deforestation.

The area, in hectares, of deforestation for each vegetation class was given directly by the number of pixels present in this grid, since the resulting grid resolution is one hectare.

4. The deforestation forecast model

The model was run in VENSIM, a “system-thinking” program (VENTANA, 2004), which was developed to project deforestation in each sub-region. VENSIM processed the historic data on deforestation, on the paving of roads and on protected areas (proposed and declared), to generate deforestation scenarios over which the spatial simulation model was run. In other words, VENSIM generated the deforestation rates using historic data and forecast the deforestation for the following time interval. The spatial part of the model allocates this deforestation, with this processing being repeated for each iteration of the simulation.

It is important to stress that all the deforestation drivers interact within themselves in a complex system, which cannot be analyzed isolated. To quantify the impact of a change in the assumptions used for determining a specific driver considered in the model (eg. construction of a road), it is necessary to run the model all over again, as this would affect consequently the other drivers of the model (see also item 5. below). As cited on GEIST & LAMBIN (2001), deforestation results from complex socio-economic process, and in many situations, it is impossible to isolate a single cause.

5. Spatially explicit simulation

These simulations are an attempt to quantify and integrate the influences of the variables representing biophysical characteristics, infrastructure and territories (e.g., topography, rivers, vegetation, soils, climate, proximity of roads, cities and markets, land use zoning) into a spatial prediction of deforestation (Soares-Filho *et al.*, submitted). To incorporate these spatial variables into the simulation, Soares-Filho *et al.* (2006) developed a cartographic foundation consisting of a land cover map and subsidiary cartographic layers structured in one sub-group of static layers and a second sub-group of dynamic data layers (Figure 01)

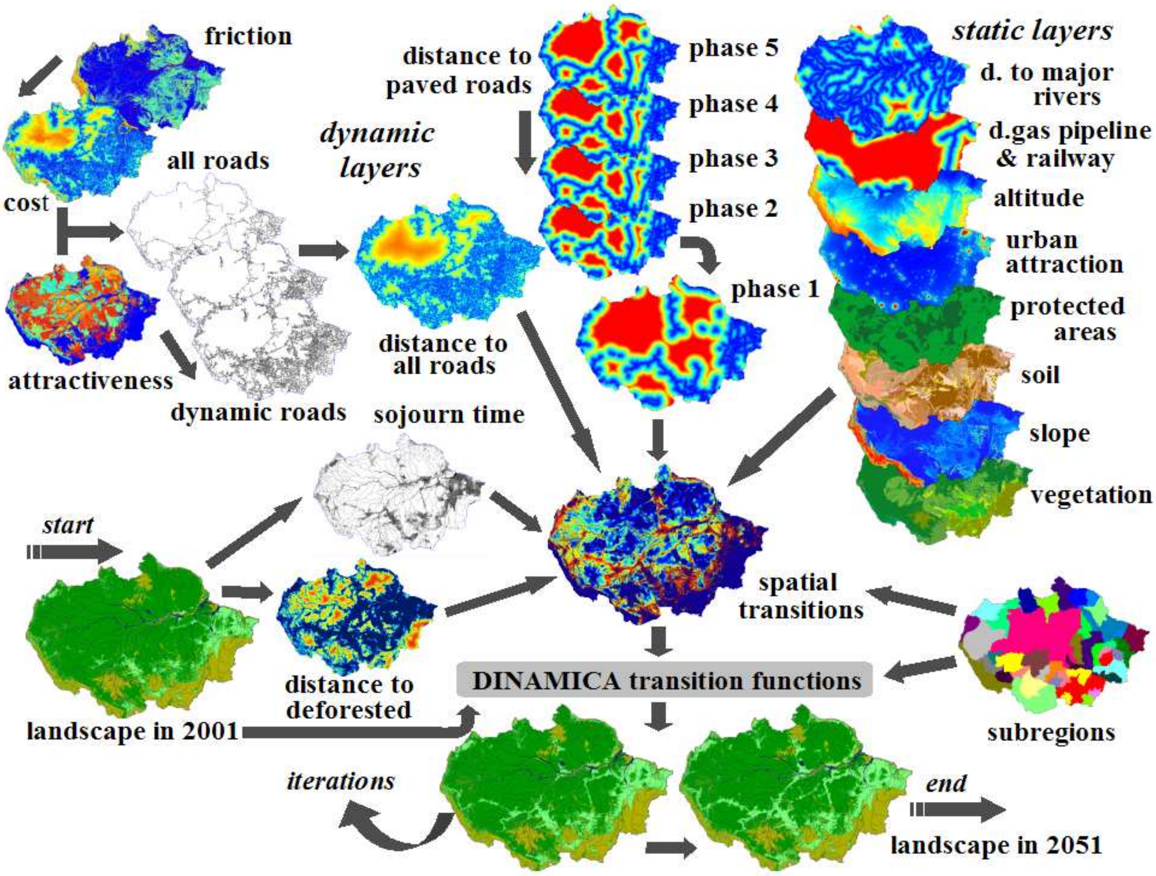

Figure 01. Entrance map, derivation and simulation in relation to the architecture of the spatial model

6. Simulation Platform

The spatially explicit simulation was run on the DINAMICA program (1, 26, 27). Among other characteristics, DINAMICA incorporates the concept of phase – defined as a group of steps in time with individualized parameters. Graphic analysis of deforestation demonstrated that deforestation is spatially and temporally correlated (SOARES-FILHO *et al.,* 2001; ALVES, 2002a; ALVES, 2002b). DINAMICA includes this feedback effect through the calculation of dynamic variables. In other words, the entry variables are updated after each iteration. The three types of dynamic variables used include frontal distance from a land cover class, time of temporal residence (sojourn time), and distance from roads. For example, the "distance from roads" variable used the percentage of the area deforested as a function of the distance from paved roads (Figure 02).

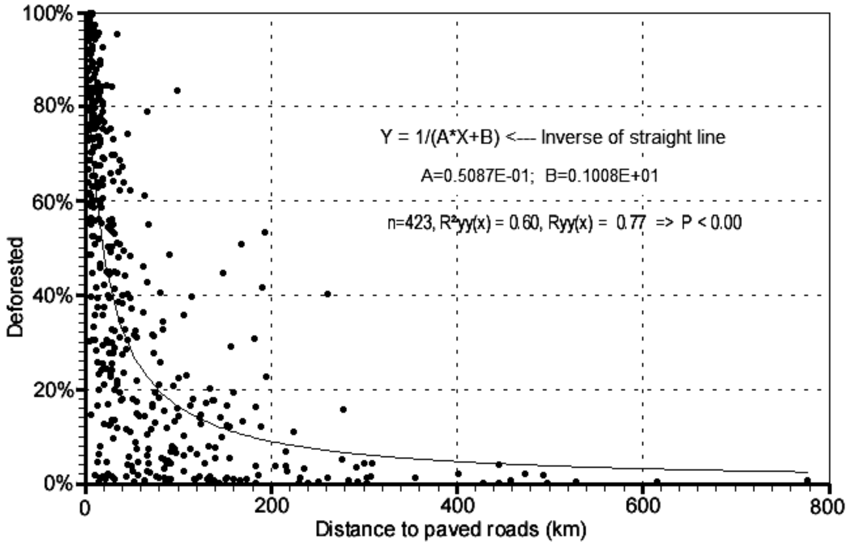

Figure 02. Percentage of a deforested area as a function of the distance from paved highways, derived for the municipalities of the Brazilian Amazon using PRODES 2001 and the average distance from existing paved roads

Spatial variables can be used to calculate probability maps (also referred to as "favorability") of deforestation. The analytical model forecasts for tropical deforestation include multivariable linear regression (REIS & MARGULIS, 1991; PFAFF, 1999), logistic regression (SOARES-FILHO *et al.*, 2001; LUDEKE *et al.*, 1990) or "weight of evidence" SOARES-FILHO *et al.*, 2004). The "weight of evidence" method was applied to analyze the effects of the spatial variables in the allocation of deforestation (SOARES-FILHO *et al.*, submitted). In general, the "weight of evidence" analysis demonstrated that deforestation is attracted to urban centers, and avoids low terrain and slopes, as well as flooded and elevated areas. Deforestation is not influenced by the soil quality or the vegetation type, nor does it necessarily follow the major river network. Of special interest is that this analysis identified that the "distance to previously deforested area" and "distance to roads" variables are the best predictors of deforestation. The model also demonstrated the importance of indigenous lands in deterring deforestation along the active frontier of deforestation.
In conclusion, the spatially explicit simulation model characterizes the multi-scale transition functions based on:

- proximity
- concept of phases and sub-regions
- use of data at various resolutions
- feedback through the calculation of spatial dynamic variables,
- connection between cellular automata
- a system-thinking program to compute probabilities of spatial transition using the "weight of evidence" method
- a component that drives the expansion of the road network.

Additional information about the model and its results are available at:
www.csr.ufmg.br/simamazonia.

7. Assumptions for Deforestation Rates and Scenarios

The Soares-Filho *et al.* model simulation of deforestation in the Amazon considers 8 scenarios running the model encompassing 50 annual time steps starting in 2001. The baseline scenario, referred to as "business as usual" (BAU), considers the deforestation trends across the basin, projecting regional rates by using 2001-2002 figures (from PRODES for the Brazilian Amazon) and their average yearly derivatives determined from 1997 to 2002 (see Table 01 and Figure 03 for Juma Reserve region 27), and adding to them the effect of paving a set of major roads.

This scenario was chosen as the baseline scenario in the project starting date (see additionality analysis in Annex III), as it reflects exactly the "business as usual" practices for the project area, in the absence of the project implementation.

Table 01. Deforestation trends of sub-region 27 of the Project area.

country	Sub	area	forest 2001	deforested 2001	non-forest	2001 gross deforest.	2001 net deforest.	annual derivative	protected forest	pr. forest + ARPAS
Brazil	27	1,647,690	1,481,503	27,080	139,107	1373	0.09%	6.84%	552,217	716,897

Areas in km^2, annual derivative (Δfd_t) is an average calculated from the difference between the 1997-2000, 2000-2001, and 2001-2002 annual deforestation rates.

The best-case "governance" scenario also considers the paving of a set of major highways and the current deforestation trends across the basin, but in this case the rate projection assumes an inverted U-curve to reflect a gradual increase of governance throughout the Amazon, trough the creation of new protected areas (what was not a common practice at the time – see additionality analysis in Annex III), investments for law enforcement, etc. In these scenarios, road paving follows a predefined schedule and its effect on accelerating deforestation is empirically estimated comparing density of deforested land with mean distance from current paved roads within Brazilian municipalities.

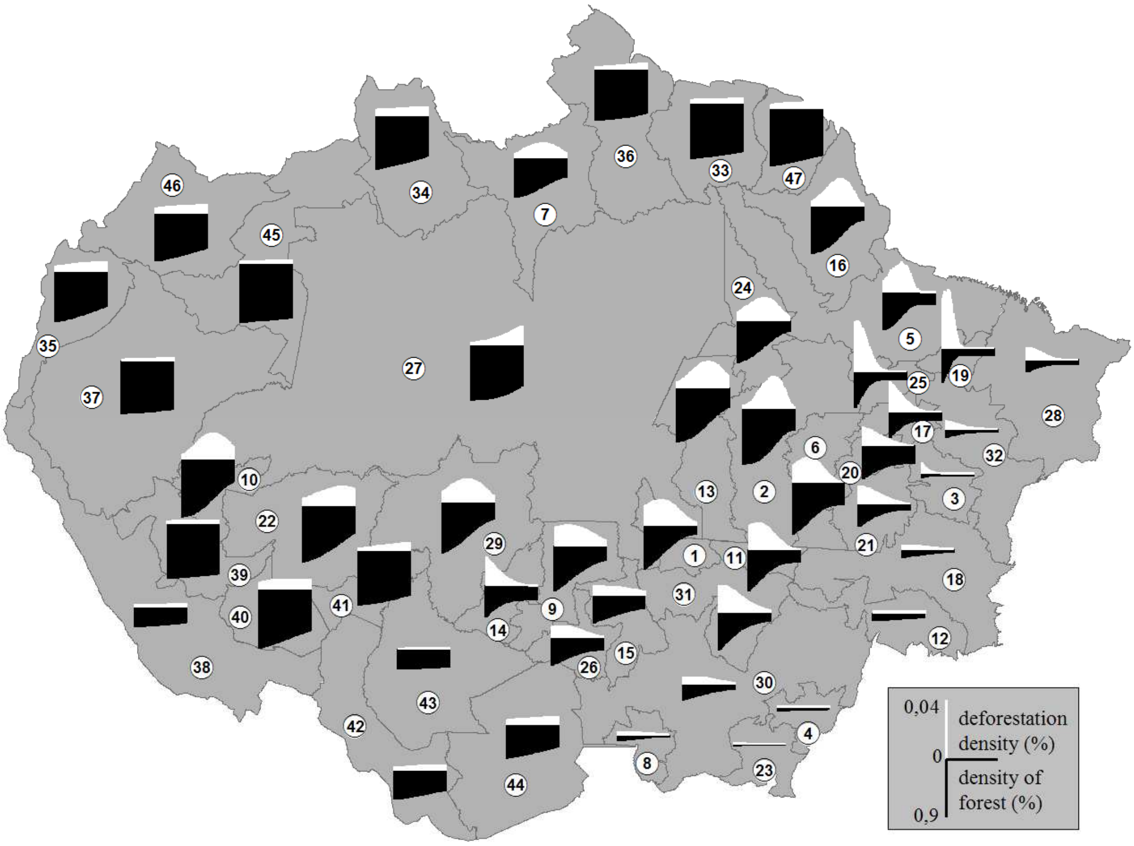

Figure 03. Stratification of the Amazon Basin, depicting annual deforestation and forest decline from 2001 to 2050 forecast for the subregions within the BAU scenario. The Juma Reserve is within sub-region 27.

8. Roads paving

Among the roads considered in the simulation, Table 02 shows the schedules for paving sections of BR-319 and BR-230. The only road access to the Juma Reserve is via the AM-174 road, which is connected to BR-230. Thus, any road paving of sections of BR-230 (the Trans-Amazonian highway) and BR-319 is likely to increase migration of key deforestation actors.

In this model, one of the most important determinant driver of deforestation is the construction and paving of roads. The information used in this model was obtained from governmental documents and conversations with governmental representatives. These information sources provided the timeline and data regarding the completion of the various road construction projects planned over the next three decades.

Table 02. Road paving schedule for the Juma reserve project area

Key	Code	Road Name	Sections to be paved	Paving completion
1-1'	BR-230	Trans-Amazonian	from Araguatins (TO) to Itupiranga (PA)	2008
2-2'	BR-230	Trans-Amazonian	from Itupiranga (PA) to BR-163	2012
3-3'	BR-230	Trans-Amazonian	from TO-040 to GO-118 and associated tracks in MA and TO	2025
4-4'	BR-163	Cuiabá-Santarém	from intersection to Colíder (MT) to BR-230 (Trans-Amazonian)	2008
7-7'	BR-319	Manaus-Porto Velho	from 160 km south of BR-174 southwards	2012
8-8'	BR-319	Manaus-Porto Velho	from 195 km south of BR-174 southwards	2018

Acronyms for the Brazilian states: TO - Tocantins, PA - Pará, GO - Goiás, MT – Mato Grosso, RO – Rondônia, RR- Roraima, AP – Amapá, AC – Acre. Phases for the completion of the roads are: 2001-2008, 2008-2012, 2012-2018, 2018-2025, 2025-2051. Names of the cities are in italics. Source: supplemental material for Soares-Filho *et al*., 2006.

It is important to stress that the likely dates assumed by Soares Filho to define when the road pavings would be completed were based upon analyses and sources of information obtained at the time when the study was published (2006). However, nowadays this assumptions can be considered as conservative , as recently the government has anticipated that most of the roads will be concluded previously than the expected. As an example, the most important road affecting the project, the BR-319,was considered in the model to be paved in 2018, butnow has been officially announced to be finished by 2012 (www.dnit.gov.br), thus anticipating in 6years the impacts expected with its construction.

Within the governance scenario, deforestation cannot surpass 50% of the forest cover outside of protected areas as required by governmental regulations, while in the “business as usual” scenario this limit is set to 85%. “The minimum areas of forest remnants in the ‘business as usual’ (15%) and governance (50%) scenarios are lower than that currently required by the Brazilian government, but we determined that these minima more realistically bracket the range of forest remnant values that will be attained” (Soares-Filho *et al*., 2006: complementary material, pp. 4-5). Table 03 below summarizes the assumptions for all 8 scenarios regarding special patches of forest.

Table 03. Scenario assumptions

	Assumptions					
Scenarios	Road paving pressure added to the deforestation trend	ARPA included in Protected Areas	Degree of protection for Protected Areas	Minimum % of forest reserve on private land	Rates projected by using yearly derivatives	Rates asymptotically projected by using yearly derivatives
Governance (GOV)	yes	yes	100%	50%	no	yes
Governance without further road paving	no	yes	100%	50%	no	yes
Governance without ARPAS	yes	no	100%	50%	no	yes
BAU with ARPAS, strict enforcement	yes	yes	100%	15%	yes	no
BAU without ARPAS, strict enforcement	yes	no	100%	15%	yes	no
BAU with ARPAS, lax enforcement	yes	yes	60%	15%	yes	no
Historical (no further road paving)	no	no	60%	15%	yes	no
Business-as-usual (BAU)	yes	no	60%	15%	yes	no

9. Datasets of Anthropogenic Pressure Index

The road paving and deforestation rates depicted for the sub-regions were applied to each municipality, and the model simulation added an anthropogenic pressure index (API) taken from each municipality. Specifically for the project area, the API data sources for determining the API for the Novo Aripuanã municipalitywere taken for the model period of analysis and were based on Monteiro & Sawyer (2001) and are shown in Table 04. The sources used are robust and recognized as they come mainly from official government agencies, as the National Institute for Geography and Statistics, UNDP and others. Thus this information matches perfectly with the conditions in

Table 04. Sources of data used to compose the Anthropogenic Pressure Index (API).

Data	Source	Year
Population Censuses	IBGE	1980, 1991
Population Count	IBGE	1996
Agriculture, livestock censuses	IBGE	1985, 1995-96
Agricultural production by municipality	IBGE	1990 to 1994
Livestock production by municipality	IBGE	1990 to 1994
Plant extraction and forestry	IBGE	1993
Human Development Index (Atlas)	UNDP, IPEA, FJP	1997
Total current and domestic revenues	National Treasure Secretariat	1989 to 1995
Health status	National Health Foundation	1993 to 1995

All those sources were used to derive the indicators used in the Soares-Filho *et al.* model simulation, and are described in Table 05.

Table 05. Indicators of API in the Legal Amazon

Indicators		
Demographic		
Total Population (rural and urban)		
Levels of urbanization		
Rural and total demographic densities		
Rate of population growth		
Socioeconomic		
Equity (wages)		
	total earning less than a minimum salary	
	total earning more than 20 minimum salaries	
Education		
	total number of illiterates	
Health		
	Life expectancy	Years
	Infant mortality	number of deaths/1000 births
	Malaria	number testing positive and ratio
Public expenditures		
	total current revenues	
	domestic revenues	
	total current expenses	
Extractivism (nuts, rubber, wood)		
	nuts	quantity (Kg)
	rubber	quantity (Kg)
	wood	quantity (cubic meters)
Human Development Index		
Life expectancy at birth		
Income (purchasing power)		
	GDP adjusted to local cost of living	
Anthropogenic Pressure Index		
Population pressure (urban and rural)		
	Urban	Total size and Total growth
	Rural	Density and density of total growth
Agricultural pressure (cattle and arable farming)		
	Cattle	Density and density of total growth
	Arable Farming	Density and density of total growth

The methodological basis for developing the API consists of combining the stock (size or density) and the flow (speed or growth) sizes (Sawyer, 1997). It is assumed that pressure is greater when the stock and flow are higher, and less when both are lower. Stock and flow sizes were placed at one of the three levels (low, medium and high), represented, respectively, by the values 0, 1 and 2. Overlaying two variables creates a 3X3 matrix, with nine data fields, and the sum of the values of the two variables gives a scale from 0 to 4, as shown in Table 06.

Table 06. Stock and flow classes of API.

Stock	Flow		
	0	**1**	**2**
0	0	1	2
1	1	2	3
2	2	3	4

To develop an anthropogenic pressure index for the region, five levels were used: very low, low, medium, high and very high, represented by the values 1, 2, 3, 4 and 5, respectively. Thus, the overlay of two variables generated a 5X5 matrix, giving an index scale that ranges from 2 to 10, as shown in Table 07, below:

Table 07. Anthropogenic Pressure Index Matrix.

Stock	Flow				
	1	**2**	**3**	**4**	**5**
1	2	3	4	5	6
2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9
5	6	7	8	9	10

For the Juma Reserve, the API was based on the values of the Novo Aripuanã municipality, and the indicators are summarized in Table 08.

Table 08. Values of indicators of the Novo Aripuanã municipality explicitly available in Monteiro & Sawyer (2001).

Indicator	Value	Unit
Population density	0.1 to 5	person
Urbanization level	40 to 60	%
Growth rate	1.14 to 3.45	%
Total illiterates	approx. 5000	person
Infant mortality	39 to 57	infants/1000
life expectancy	61 to 64	age (years)

10. Spatial resolution and differences between the minimum mapping units

In regard to the differences between the resolution of the model, which has pixels of 1 x 1 km, and the resolution of Landsat images, which is 30 x 30 m, these differences do not adversely affect the accuracy of the projections, since the resolution of the Landsat, which is the satellite that will be used to do the monitoring, is better than the one used in the model. For this reason, small spots of deforestation can be identified, being even more accurate than the model used to define the baseline scenario.

The main difficulty in using a model with pixels of 1 km is that the original size of attributes, such as rivers, is increased and the limits of the non-forest vegetation of the model do not correspond to reality. These attributes are excluded from the crediting area, and this can be considered a conservative measure, for their original size is already larger than in reality (for example, a river that has a width of 30 m is considered by the model to have a width of 1 km). In this way, forest areas that could be included in the crediting area are automatically excluded by the model, and thus will not be claimed as having the potential to generate RED carbon credits, even though they will be addressed and monitored to avoid generating potential offsite decreases in carbon stocks (leakage).

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ANNEX II – SimAmazonia I Model Validation

Validation of the SimAmazonia-1 model for the State of Amazonas

The spatial validation of the deforestation projection results by the SimAmazonia-1 model (Soares-Filho et al., 2006) for the State of Amazonas was performed using the fuzzy method of map comparison (Soares-Filho et al., 2008, Almeida et al., in press). See methodology in the annex.
This method compares only the regions that changed on the maps. In this way, the comparison uses difference maps between 2001 and that observed by Prodes, the Basin Restoration Program (INPE, 2008), for the years from 2002 to 2007 regarding the deforestation simulated by the model for the respective years. Lastly, the year 2007 was chosen as the result to be spatially shown. This year was chosen for being the last year with available data of observed deforestation.

The comparison is made in two ways, that is, by comparing the observed changes with the simulated ones and vice-versa. In this case, a continuous decreasing function was used and the adjustment measured in windows with sizes of 50 and 100 km on each side. The method considers as an adjustment the minimum amount found in the comparison of the two ways.
For a comparison window of 50 km per side, the derived adjustment varied from 63% in 2002 to 78% in 2007 (Fig. 1). For 100x100 km, the adjustment reached 90% for the year of 2007 (Fig. 01). Note that the adjustment grows over time, showing that the SimAmazonia model's spatial prediction capacity tends to improve with the advance of deforestation.

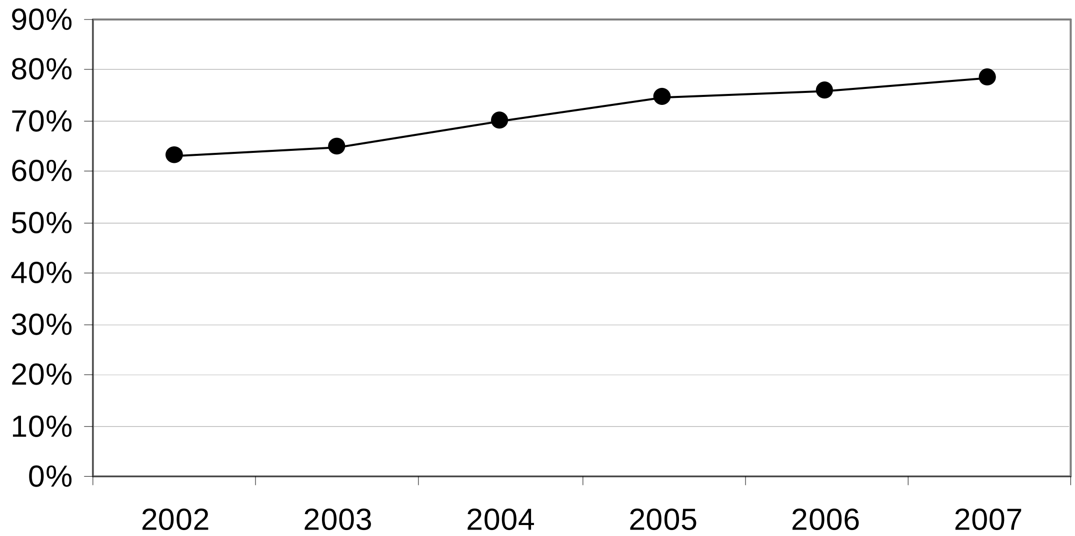

Fig.01 – Spatial adjustment of the SimAmazonia deforestation projection between 2002 and 2007 using a comparison window of 50x50 km

In relation to the deforestation spatial prediction, Fig. 2 shows the regions where the model corresponds to the observations in red and it shows the regions not corresponding in blue. Not all of the 100x100 km windows are represented, since the only areas that are compared are those in which deforestation cells occurred. Note that there is agreement between the result of the model and the deforestation observed in the region of Juma Preservation Unit.

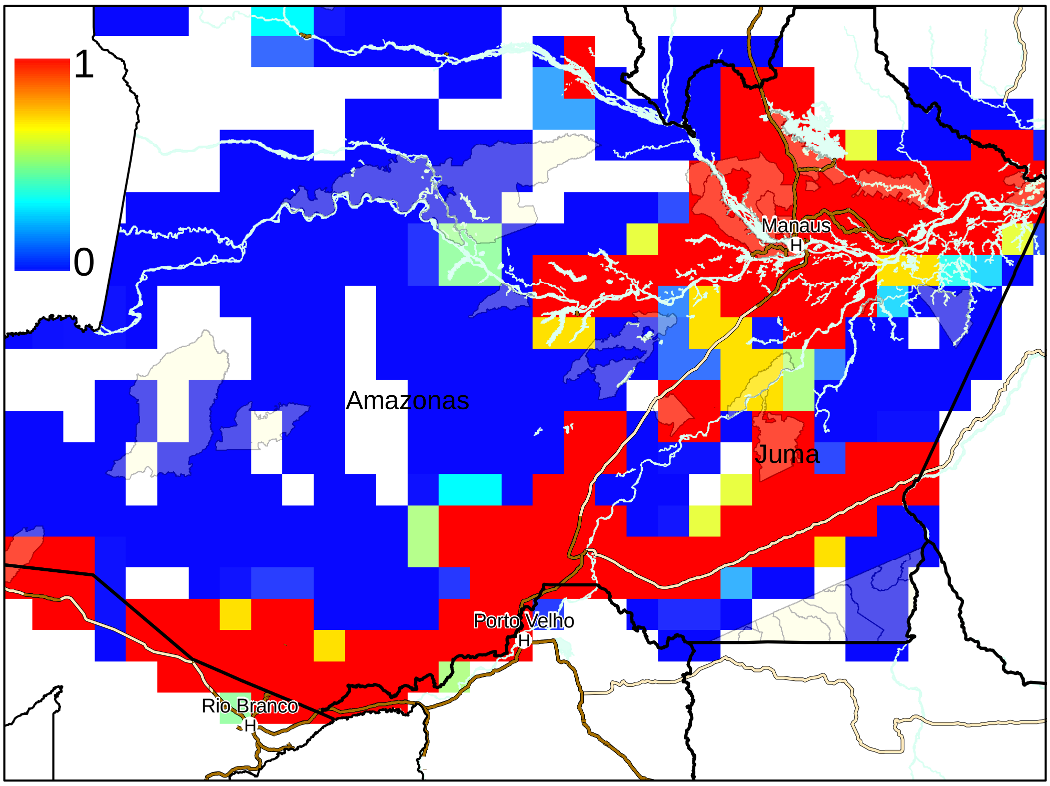

Fig. 02 – Comparison between the deforestation observed by PRODES for 2007 in the State of Amazonas with the simulated deforestation within the BAU ("business-as-usual") scenario by SimAmazonia-1. Comparison window of 100x100 km

The blue squares show the regions where there is divergence between the SimAmazonia results and the Prodes data. They can imply both the absence of real deforestation as well as that of simulated deforestation that would be expected. In the case in question, they represent more the absence of simulated deforestation.

In this way, we can consider that the model's correlation rate is high, since there are many more cells in the red blocks than in the blue ones, which makes the adjustment be high in this resolution of 100 km.

An analysis of the frequency of the distribution of the cells (50 x 50 km) that are overestimating and those that are underestimating the real deforestation is presented below. In this case, dark blue underestimates, light blue is equivalent, and warmer colors overestimate.

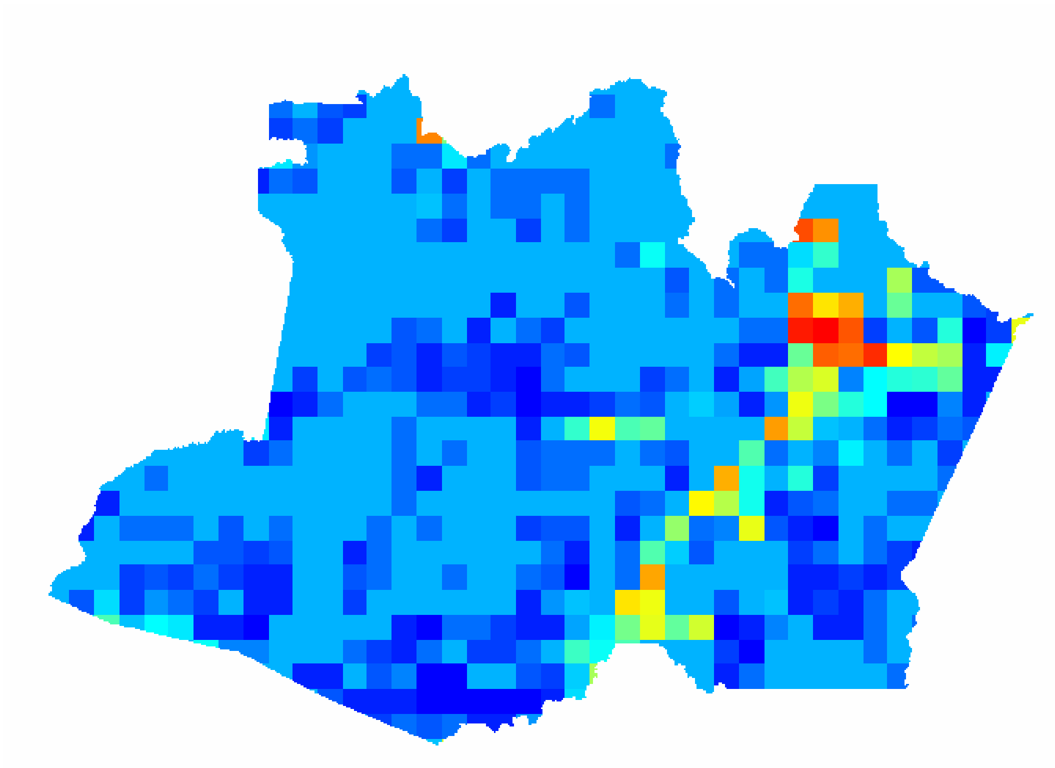

Figure 03 – Analysis of frequency of under and overestimates of the model

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These data generate an evaluation of the correlation of the amount of predicted deforestation and the amount of deforestation observed by Prodes:

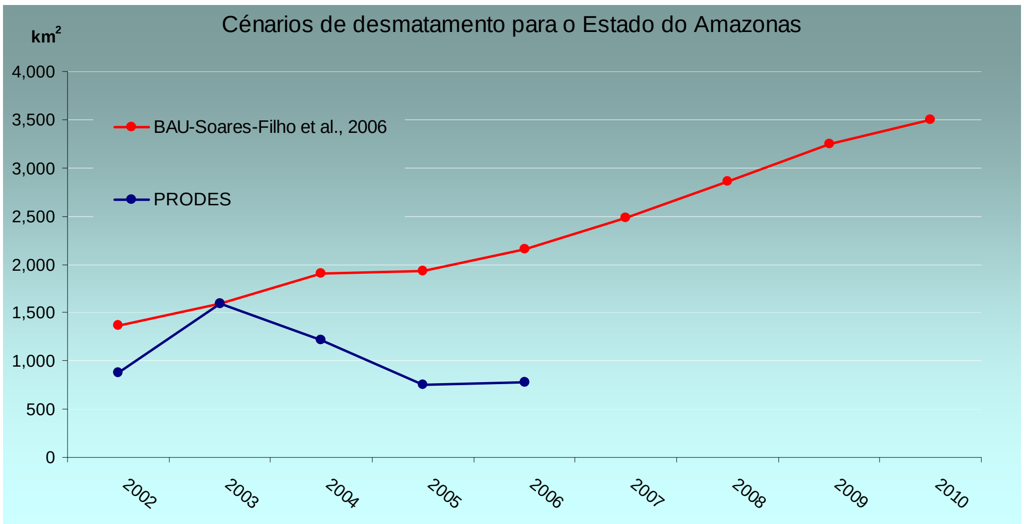
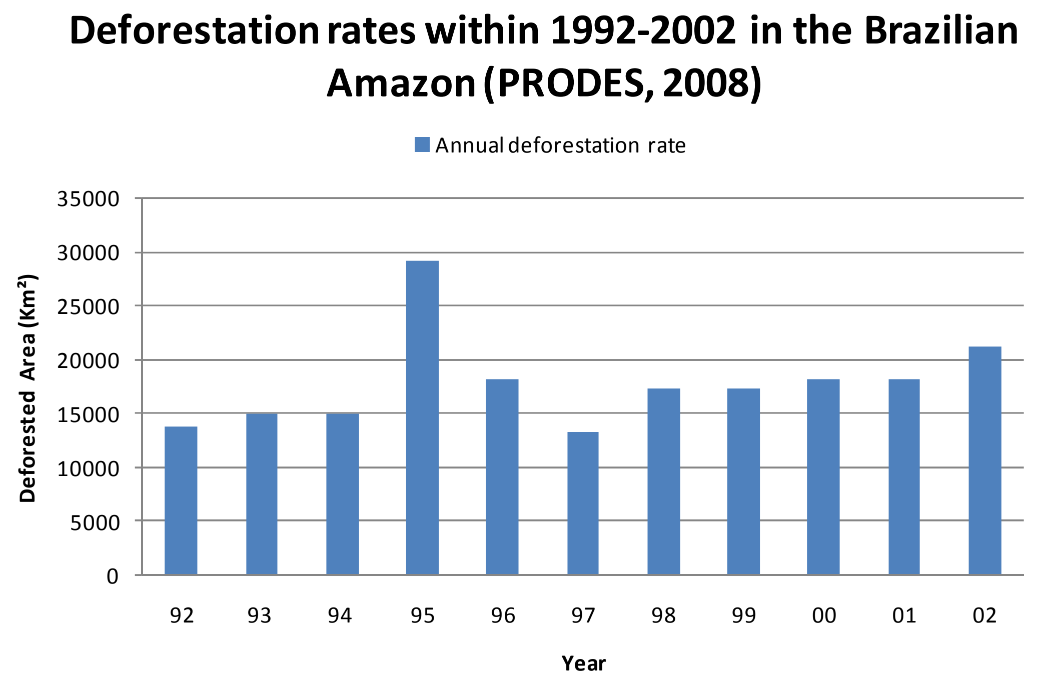


Figure 4 - Deforestation scenarios for the State of Amazonas

The success rate, in quantitative terms, of the deforestation predicted by the model is obtained by dividing one curve by the other.

The deforestation data incorporated to the model considers deforestation rates between 1997 to 2002 (collected from PRODES/INPE). This is the official data published by Soares-Filho and authors in 2006, and is robust and realistic if compared with other annual deforestation rates in the period. Figure 05 presents the annual deforestation rates for Amazonia from 1992 to 2002 (data collected from PRODES):

Figure 05: Deforestation rates in the Brazilian Amazon from 1992 to 2002



Source: PRODES/INPE (2008). Available at: http://www.obt.inpe.br/prodes/prodes_1988_2007.htm

Table 01 shows a comparison of the deforestation data within 3 periods:

- 1997-2002: 5 years period as used for the model
- 1992-1997: period from the 5 previous years
- 1992-2002: period from the 10 previous years

	Period analyzed	Average deforestation rate (km².ano-1)	Difference within the periods (A/B and A/C)
A	Model - 1997 a 2002	17.582,9	
B	5 years - 1992 a 1997	17.337,5	1,4%
C	10 years - 1992 a 2002	17.845,0	-1,5%

Source: INPE (2008). Available at: http://www.obt.inpe.br/prodes/prodes_1988_2007.htm

As presented, the difference on the average deforestation rates within the periods analyzed doesn't change significantly, and proves also that the deforestation data considered by the project is realistic and conservative, since the average deforestation rate considered by the model (1997-2002) is still below (1,5%) the rate calculated using the 10 years period from 1992 to 2002. This is also in accordance with the guidance provided by VCS AFOLU document.

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Appendix

Map comparison method

Traditionally maps have been compared using contingency table, also known as confusion matrix, resulting from cross-tabulating pair of maps pixel-by-pixel. Nevertheless, spatial models also require a comparison within a neighborhood context, because maps, that don’t match exactly pixel-by-pixel, could still present similar spatial patterns and therefore spatial agreement within a pixel vicinity. To address this issue several vicinity-based comparison methods have been developed. For example, Costanza (1989) introduces the multiple resolution fitting procedure that compares a map spatial fit within increasing window sizes. Pontius (2002) presents a method similar to Costanza (1989), but that now differentiates errors due to location and quantity. Power *et al*. (2001) provide a comparison method based on hierarchical fuzzy pattern matching. In turn, Alex Hagen (Risk, 2004) made available a map comparison tool kit that contains several of these methods as well as his own developed metrics, including the *fuzzy similarity* that takes into account fuzziness of location and category within a cell neighborhood and the *Kfuzzy*, considered to be equivalent to the *Kappa* statistic (Hagen, 2003).

Our method consists of a modified version of the *fuzzy similarity* (Hagen, 2002) that better deals with the comparison of changes.
According to Hagen (2003), the *fuzzy similarity* is based on the concept of fuzziness of location, in which a representation of a cell is influenced by the cell itself and, to a lesser extent to the cells in its neighborhood. Not considering fuzziness of category, the fuzziness of location can be represented by the fuzzy neighborhood vector. First a crisp vector is associated to each cell in the map. This vector has as many positions as map categories, assuming 1 for a category = *i* and 0 for categories others than *i*. Then the fuzzy neighborhood vector ($\mathbf{V}_{nbhood}$) for each cell is determined as follows:

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

$$\mu_{nbhood_i} = \left| \mu_{crisp_{i,1}} * m_1, \mu_{crisp_{i,2}} * m_2, ..., \mu_{crisp_{i,n}} * m_n \right|_{\text{Max}}$$

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

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

where $\mathbf{V}_A$ and $\mathbf{V}_B$ represent the fuzzy neighborhood vectors for maps *A* and *B* and $\mu_{A,i}$ *and* $\mu_{B,i}$ are their neighborhood memberships for categories $i \subset C$ in maps *A* and *B*, as in equation (17). According to Hagen (2003), since the similarity measure $S(\mathbf{V}_A, \mathbf{V}_B)$ tends to overestimate the spatial fit, it is applied the two-way similarity instead, so that:

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

The overall similarity of a pair of maps can be calculated by averaging the *two-similarity* values for all map cells. However, this calculation carries an inertial similarity between the two maps due to their areas unchanged. To avoid this problem, we have introduced a modification into the overall *two-way similarity* method, first using two maps of differences, which bears only 1 for changed and 0 (meaning null) for nonchanged cells. In this way each type of change is analyzed separately using pairwise comparisons involving maps of differences: 1) between an initial condition map and a simulated one and 2) between an initial condition map and a reference one. This modification helps us solve two matters. First, as we deal only with one type of change per time, the *two-way similarity* measure can be applied to the whole map without the constraint, pointed out by Hagen (2003), due to the different number of cells per category. Second, the inherited similitude between the simulated map and its initial can be eliminated from this comparison by simply ignoring the null cells from the overall counting. But, there are two ways do that. One consists of counting only *two-way similarity* values for nonnull cells in the first map of difference and another by doing the opposite. As a result, we can obtain three measures of overall similarity, being the third the average of the two ways of counting. As a random pattern maps tend to score higher due to chance depending on the way the nulls are counted, it is advised to pick up the minimum overall similarity value.

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"Tool for Demonstration and Assessment of Additionality in Project Activities Reducing Emissions of Greenhouse Gases (GHG) from Deforestation and Forest Degradation (REDD)" (Adapted Version 1.0)

APPLICATION AT THE JUMA RESERVE RED PROJECT
(25th August 2008)

I. PROCEDURE

6. Project participants shall apply the following five steps:

STEP 0. Preliminary screening based on the starting date of the project activity;
STEP 1. Identification of alternative scenarios;
STEP 2. Investment analysis to determine that the project activity is not the most economically or financially attractive of the identified land use scenarios; or
STEP 3. Barrier analysis;
STEP 4. Common practice analysis.

STEP 0. Preliminary screening based on the starting date of the REDD project activity

Until 2002, the business as usual scenario for land use in Amazonas was characterized by incentives to agriculture and cattle raising, instead of forest conservation. The deforestation rates at that time were escalating. As an example, the former Governor of Amazonas State at the time used to distribute chainsaws in political campaigns to promote deforestation.

In January 2003, the current Governor of Amazonas, Eduardo Braga, made an official commitment, which was published and notarized before the beginning of his first term (AMAZONAS 2002)[30]. The basis of his commitment – the **Green Free Trade Zone Program** (***Programa Zona Franca Verde - ZFV***) – was to reduce deforestation and promote sustainable development in the State by adding value to the environmental services in relation to the Amazonas' forests (BRAGA & VIANA 2003).

The implementation of sustainable development policies that have positive impacts on the reduction of deforestation is costly and compete for very limited governmental resources. Given the huge demand for social program funding (human development rates vary between 0.4 and 0.6 in Amazonas) – mainly health and education – investing in activities directly aimed at reducing deforestation was a huge challenge with high political risks.

Governor Braga took the risks and put in place a program for creating new State Protected Areas as central focus at ZFV. This program generated a **133% increase in the area of state protected areas** (increased from 7.4 million ha in 2003 to 17 million ha in 2007). Deforestation was reduced

[30] All references can be found in the bibliography section in the end of this document.

by **53%** (decreased from 1,585 ha/year in 2003 to 751 ha/year in 2006) (INPE, 2008). Such results and an intense process of political articulation both in national and international levels were the foundation of the first proposal of a compensation mechanism for ecosystem services provided by the State[31] of Amazonas.

This first proposal was presented by the Government of Amazonas at the 11th Conference of the Parties of the UN Framework Convention on Climate Change (UNFCCC), held in Montreal in 2005 (VIANA *et al.* 2005). At the time, REDD was first discussed as an official agenda at the COP/MOP. In November 2006, the "Amazonas Initiative" was presented in Nairobi, at the UNFCCC' COP 12 (VIANA *et al.* 2006).

The creation of the new protected areas in Amazonas was only possible with the perspective of implementation of the financial mechanism under construction through the activity of the Amazonas Initiative. The creation of the Juma Reserve (in 2006) and the construction of this PDD (as the first REDD pilot-project of Amazonas) are the ultimate steps of the long-term commitment started in 2003 by the Government of Amazonas[32].

Therefore, for the addition assessing purposes, the start date of the activities of REDD project is 2003 – when the ZFV Program was launched. However, regarding the definition of the project crediting period, the project start date is the date of the creation of the Juma Reserve (2006), when the project's boundaries were clearly delimited and the Juma REDD Project started being implemented "on the ground".

There was no legal requirement for the Government of Amazonas to create the Juma Reserve, at the date it was created in 2006. The most likely scenario for the land (state land) would be the creation of rural settlements for cattle ranching or agriculture, or its occupation by land-grabbers. This situation can be confirmed as the business as usual scenario for land use observed in all the other states of the Brazilian Amazon in recent years.
The consideration of carbon finance in the decision of creating the Juma reserve (as well as the other protected areas newly created by the actual Government of Amazonas) was always considered in the process of creating the policies and programs of the ZFV program for forest conservation and payment for environmental services, envisioned by the Government of Amazonas in 2003 (Braga & Viana, 2003) This had to follow a chain of events which takes time and follow a slow and bureaucratic politic process as: the creation of new laws, convincement of parliaments, modification of the annual state budgets, articulation with national and international stakeholders, contacts with donors and investors, etc.

At the time this process started, in 2003, there was no mechanism for compensating reduction of emissions from deforestation (REDD), nor in the perspective of the UNFCCC negotiations, nor in the global voluntary markets, so the consideration of carbon finance in the process was not straightforward. The now so called "REDD carbon benefits" were considered in the light of

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[31] This proposal was crafted during a workshop held in Manaus - organized by the Government of Amazonas and Institute for the Conservation and Sustainable Development of Amazonas (IDESAM) - with the presence of various Brazilian governmental institutions, scientists, and NGOs.
[32] The Appendix presents a memory with the whole chain of events and that configured the construction of the Amazonas Initiative, and the implementation of the Juma Reserve RED Project.

"payment for environmental services" and is extensively documented in Braga & Viana (2003) and in Amazonas (2002). Afterwards, the Government of Amazonas was very active and had a key role on influencing the whole process of the REDD agenda in the UNFCCC negotiations, and the actual promising development of REDD activities in the voluntary markets (Viana & Cenamo, 2005, Viana et. Al 2006, Amazonas 2007).

All these steps were fundamental and correct in time, to conduce to the creation of the Juma Reserve REDD Project (2006), the Climate Change and PA's laws (2007), the Amazonas Sustainable Foundation – FAS (2008), and finally the contract with Marriott international – which concludes the long cycle of a "learn by doing" process that was necessary for the Government of Amazonas to establish the actual existent framework for marketing ecosystem services to promote forest conservation and reduction of deforestation within State lands.

STEP 1. Identification of alternative land use scenarios to the proposed REDD project activity

This step is to identify alternative land use scenarios for the activities proposed by the REDD project that could serve as baseline scenario, through the following sub-steps:

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

The identified land use scenarios for the land within the project boundaries in the absence of the project are:

A1) Continuation of current forest cover; i.e., forest conservation resulting from the proposed project activities not being undertaken as part of a REDD project

B1) Deforestation of the lands for cattle raising and agriculture

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

Current laws and/or regulations basically allow the two alternative scenarios identified. There is no mandatory law forcing forest conservation in public lands (unless a protected area is created), therefore the land where the project was implemented did not have to be protected on the project start date.

Basically, there were three possible scenarios for land tenure in the project area in 2003: (i) the creation of a protected area by law, (ii) the creation of rural settlements for agriculture and cattle raising, and (iii) the uncontrolled occupation of the land by land-grabbers and independent producers.

The creation of state protected areas was not a common practice in the "business as usual" (BAU) scenario in Amazonas State, and even today the illegal or uncontrolled occupation of public lands is widespread, representing a great part of the land where deforestation occurs.

According to a broad study recently carried out by IMAZON (2008), the Brazilian government does not have control over the land in a great part of the Amazon territory. The research indicated that **only 12% of the land "supposedly" under private control or tenure is officially registered** and has up to date land titles at the government's central office.

Therefore, the most likely scenario for the project area was options (ii) and (iii), which would result in deforestation. In both alternatives, there are laws applicable that mandate forest conservation, however such laws are systematically not observed in the region. This incompliance with environmental laws and legal requirements for land use is quite common in the Amazon and can be found in many relevant writings and studies about the region.

According to GREENPEACE (2008), only 10% of the deforestation that took place in the Amazon in 2006/2007 was legally authorized (i.e., happened in properties legally entitled and respecting the limits of deforestation permits[33]). The lack of law enforcement is also a key factor for the common practice of deforestation: in 2007 **only 3,4% of the illegal deforestation detected by the National System of Deforestation Monitoring (DETER) was processed and fined by the legal authorities** GREENPEACE (2008)**.**

Not even the legally protected areas stay safe of deforestation. In the period between july 2007 and august 2008, it was registered that 5,4% (14,9 km^2) of the total deforestation occurred in the Legal Amazon happened inside protected areas (IMAZON, 2008).

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

The historical trends regarding land use and land occupation in the Amazon indicate that deforestation would be the most likely scenario for the forest land within the project's boundary. According to the National Space Agency (INPE, 2008), over the last 50 years, 17% of the Amazon's original forest cover has been destroyed. In the last 7 years alone, between 2000 and 2007, about 150,000 km², or 3.7% of its forests cover area, was lost.

Although the State of Amazonas has had a historical low rate of deforestation, with ninety-eight percent (98%) of the State's original forest cover still intact, the most advanced models for simulating deforestation indicate that the deforestation rate in the State of Amazonas will increase fast in the coming decades. Many experts consider the deforestation model of SOARES-FILHO et al (2006), SimAmazonia I, as one of the most refined models for the Amazon region[34][35].

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[33] The Brazilian Forest Law ("Código Florestal, Lei Nº 4.771/1965") sets that private lands in the Amazon Basin should keep 80% of the original forest cover protected as "legal reserve".

[34] SimAmazonia I was designed by program "Amazon Scenarios", lead by the Institute for Environmental Research in the Amazon (IPAM), The Federal University of Minas Gerais, and the Woods Hole Research Center.

[35] A detailed description on the model functionality, its parameters, and assumptions is presented in Annex X.. The model is also available for public use online on the website (in English): http://www.csr.ufmg.br/simamazonia/

The model indicates that there will be an intense deforestation trend in the near future, which could result in a loss of up to 30 percent of the Amazon’s forest cover by 2050. According to SimAmazonia I model, the region where the project is located (cities of Novo Aripuanã and Apuí) will be one of the most deforested on the upcoming decades.

Currently, this is already happening: according to IMAZON (2008), the City of Novo Aripuanã figured as the 4th city with the highest deforestation rates in the whole Amazon region in the first semester of 2008. See Figure 01 and Table 01.

***Table 01. Ranking of the Top 10 Municipalities with higher deforestation in May 2008 (Source: Imazon/ SAD*).**

Municipality	State	Ranking	Area (km2)
Altamira	Pará	1	76,57
Novo Progresso	Pará	2	63,55
Itaituba	Pará	3	15,79
Novo Aripuanã	Amazonas	4	15,16
São Féliz do Xingú	Pará	5	12,58
Pimenta Bueno	Rondônia	6	10,64
Porto Velho	Rondônia	7	8,39
Apuí	Amazonas	8	6,42
Nova Ubiratã	Mato Grosso	9	4,81
Santa Carmen	Mato Grosso	10	4,77

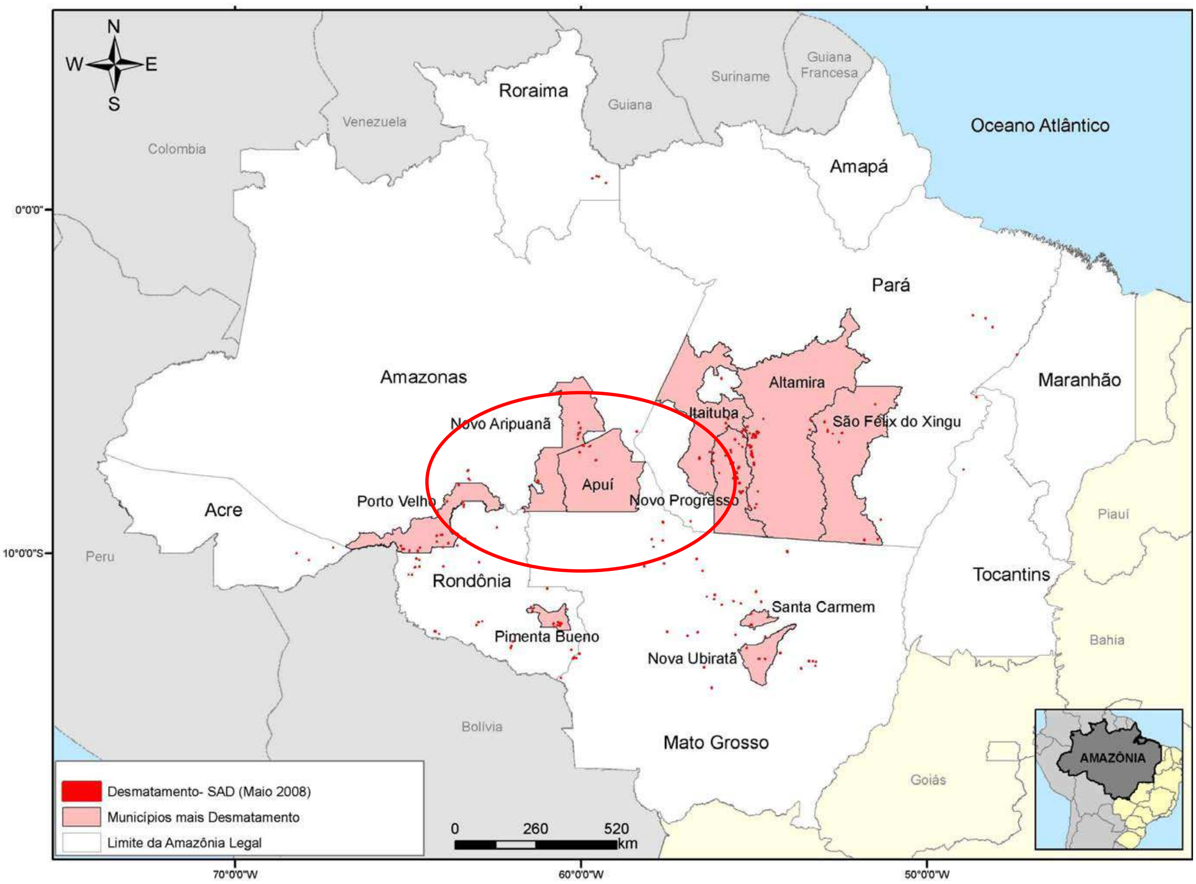

Figure 01: Map with the Top 10 Municipalities with higher deforestation in the Amazon - May 2008, with highlight to Novo Aripuanã in the State of Amazonas (Source: Imazon/ SAD).

Cattle ranching and soy farming accounts for some 82 % of the deforestation in the Amazon (GREENPEACE, 2008). Regionally, according to the Institute for the Agriculture and Livestock Development of Amazonas (IDAM), in the municipality of Apuí – the closest and most developed municipality in the south of Novo Aripuanã – 88% of the "productive lands" are occupied by cattle raising.

The most likely baseline scenario by Juma Project is deforestation of the land (scenario A1). The amount of deforestation expected in the project area is given by the "business as usual scenario (BAU)" as described by Soares Filho et al and published in Nature (2006). A more detailed description of the baselines scenario expected on the project area is presented on the PDD on the item G2 – Baseline Projections.

Step 2. Investment analysis

The investment analysis does not apply to Juma Project, as the creation of the reserve is not considered as an economic investment activity.

STEP 3. Barrier analysis

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

- **Investment barriers:**

The basics of deforestation is quite simple and motivated by an economic rationality. Development policies and the world economy have always favored deforestation: agricultural products are worth more than standing forests. International demand for food and biofuels is making large scale plantations more profitable than any other land use activity. Forest destruction for agriculture and cattle raising has been a rational choice to small, medium, and large-sized farmers alike.

The creation and implementation of protected areas (PAs) in developing countries is costly and competes for very limited governmental resources. In Amazonas, its high costs are associated with long distances and lack of access by land, poor transportation and communication infrastructure, and isolation of indigenous and traditional populations. Given the huge funding demand for social programs (human development rates vary between 0.4 and 0.6) - mainly health and education - activities directly aimed at reducing deforestation are always and significantly underfunded.

According to JAMES et al. (2006) the annual costs for maintaining protected areas (PAs) in developing and developed countries can range from US$ 1.57 to US$ 20.58 per ha/year. Specifically for the State of Amazonas, AMEND *et al.* (2006) has conducted a study in 10 PAs close to Manaus, and estimated that these costs can vary from US$ 0.18 to US$ 141.11. The main reason for cost variation in the Amazonas PAs is related to the distance from urban centers and availability of transport infrastructure.

A preliminary estimate made by AMEND *et al.* (2007) calculated that the annual costs for implementation and maintenance of all Amazonas State PAs would be around **US$ 69 million per year** – without considering costs for re-location of populations and amends for private areas, which alone are preliminary estimated in some **US$ 642 million for the hole system**.

Even though the Government of Amazonas has made strong efforts to enhance the environmental protection through the increase of its share in the annual budget, the "demand is still much higher than the bid". Table 02 presents the annual budget available for all environmental protection and management programs within the Amazonas State, and specifically the amount that effectively is destined and needed to be invested in the State PAs.

Table 02: Amazonas State' annual budget for environmental management and implementation of protected areas (PA's), in comparison with its real annual costs (AMEND, 2008) and other public sectors.

AMAZONAS STATE BUDGET / INVESTMENTS BY PUBLIC SECTOR (US$)*					
Public Sector	**2003**	**2004**	**2005**	**2006**	**2007**
A - Public Security	177.231.203	196.336.928	236.063.430	261.053.686	281.899.436
B - Health	447.275.609	534.947.496	618.031.793	665.539.094	743.244.833
C - Education	366.395.666	427.775.199	482.852.153	539.716.083	600.041.739
D - Environmental Protection and Management	5.065.075	13.082.269	18.371.352	18.420.847	23.834.266
*D1 - TOTAL BUDGET FOR PA's***	101.301	261.645	367.427	368.417	476.685
E - Total State Budget	2.245.856.826	2.267.117.027	2.727.606.436	3.483.764.669	3.821.193.316
% of the Total Budget / PA's (D1/E)	**0,005%**	**0,012%**	**0,013%**	**0,011%**	**0,012%**
F - TOTAL BUDGET NEEDED FOR PA'S	26.261.905	31.514.286	94.542.857	105.047.619	110.300.000
% State Budget Available / Needed for PA's (D1/F)	**0,4%**	**0,8%**	**0,4%**	**0,4%**	**0,4%**

*The annual budgets are originally provided in BRL R$. Solely for the purposes of this analysis it was used an exchanche rate of 1,65 (1 US$ = 1,65 BRL)

** Estimated as around 2% of the total budget for environmental protection and management

Source: *"SEFAZ – Secretaria Estadual de Fazenda", 2008 - "Balanço Geral do Estado - 2003-2007*"

As presented in Table 02, only 0.4% of the annual budget necessary to implement the Amazonas State PAs (created by the ZFV Program) is available on the State's Budget. These PAs have been undermanaged with lack of resources, and their program and activities have been funded, basically, by grants provided by international foundations. These grants provided to implement the State System for Protected Areas are presented at Table 03l.

In the specific case of the Juma Reserve, since its creation it was invested US$ 560,380 (US$ 183,456 per year) during 2006-2008 (see Table 09). Comparing it with the annual costs needed for its management and implementation (AMEND *et al*., 2008), it was verified a deficit of 95% of the investments needed, i.e the government could invest only 5% of the necessary for its implementation. For the fisrt 4 years after the contract with Marriott (2008-20011), it will be invested approximately U$ 2,5 million upfront by FAS and Marriott (see item G 4.4), plus at least 4,2 million from the carbon revenues (see CL 1.1 Table 17). This amount (US$ 6,72 million) will balance the deficit of investments for the Reserve, covering at least 57% of it's annual implementation costs. It's important to mention that AMEND et al (2008) estimates are preliminary and the Juma implementation costs are been re-assessed by FAS and CEUC teams.

Table 03: Total budget available combining all international grants and donations for SDS plus the State's budget for maintaining the Amazonas State System for Protected Areas, in comparison with the total budget needed according to AMEND et al. 2008.

Budget available for the Amazonas System for Protected Areas 2003-2008 (US$)*						
DONOR/SOURCE	**2003**	**2004**	**2005**	**2006**	**2007**	**2008****
Gordon and Betty Moore Foundation (GBMF)	$ -	$ -	$ 727.273	$ 1.636.364	$ 2.303.030	$ 1.515.152
Amazon Region Protected Areas (ARPA)	$ -	$ -	$ 3.127.273	$ 2.836.364	$ 3.515.152	$ 727.273
World Wildlife Foundation (WWF)	$ -	$ -	$ 339.394	$ 254.545	$ 230.303	$ 272.727
A - Total Grants	$ -	$ -	$ 4.193.939,39	$ 4.727.272,73	$ 6.048.484,85	$ 2.515.151,52
B - Total State Budget for PA's	$ 101.301	$ 261.645	$ 367.427	$ 368.417	$ 476.685	N/A
C - Total Budget Available (A+B)	**$ 101.301**	**$ 261.645**	**$ 4.561.366**	**$ 5.095.690**	**$ 6.525.170**	**$ 2.515.152**
D - Budget Needed for PA's (AMEND, 2008)	26.261.905	31.514.286	94.542.857	105.047.619	110.300.000	$ 110.300.000
% Grants + State Available / Budget needed for PA's (C/D)	**0%**	**0%**	**4%**	**5%**	**5%**	**2%**

* the annual budget are originally provided in brazilian R$. For the purposes of this analysis it was used an exchanche rate of 1,65 (1 US$ = 1,65 BRL)

** Estimated budget - not yet confirmed due actualls

Source: SDS (2008), SEPLAN (2008), AMEND *et. al.* (2008)

- **Institutional barriers, inter alia:**

Until 2002, the former governor of Amazonas used to distribute chainsaws to the population in public campaigns. The creation of protected areas by the ZFV Program has faced a lot of resistance in its first years. Juma Reserve RED Project will be the first project of its kind to be implemented since the creation and approval of the Climate Change State Policy Law (*Lei da Política Estadual de Mudanças Climáticas*, PEMC-AM) and the State System for Protected Areas (*Sistema Estadual de Unidades de Conservação*, SEUC-AM). This legislation provides the entire legal framework necessary to implement these types of projects in Amazonas.

Unlike any other State, the creation of the PEMC-AM and SEUC-AM legislations was the first of its kind in Brazil, and granting an independent public-private foundation (FAS) with the legal rights over the management of the State PAs environmental services and products (including the carbon credits generated by RED project activities) seeks to guarantee a long-term commitment not subject to changes in governments policies.

- **Barriers due to social conditions, *inter alia*:**

Illegal deforestation for grazing, cattle raising, and agriculture is widespread in the whole Amazon region and also in the project area. According to GREENPEACE (2008), only 10% of the deforestation that took place in the Amazon in the year 2006/2007 was legally authorized (i.e., took place in legally titled properties and respecting the limits of deforestation permits[36]) and only **3.4%**

[36] The Brazilian Forest Law ("Código Florestal, Lei Nº 4.771/1965") sets that private lands in the Amazon Basin should keep 80% of the original forest cover protected as "legal reserve".

of the illegal deforestation detected by the National Deforestation Monitoring System (DETER/INPE) was processed and fined by the legal authorities GREENPEACE (2008)**.**

This situation is typical in the region where the project was created, which actually is one under the highest pressure pro-deforestation in the whole Amazon basin. Even after the creation of Juma Reserve RED Project, deforestation threats inside its boundaries have been detected, coming from outside land-grabbers and illegal timber loggers. Without the successful implementation of the project as a RED project activity, in ways as to provide the substantial financial resources needed to halt the deforestation threats, it would not be possible to enforce the law at the level needed to stop deforestation inside the project.

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

The identified barriers do not affect the alternative land use scenario (deforestation for cattle raising and agriculture) negatively and in fact can be considered as incentives for it.

Step 4. Common practice analysis

The proposed REDD Project is the first of its kind in Brazil. Despite the existence of a significant amount of legally protected areas in the Amazon, the illegal deforestation in such areas is widespread and the creation of State PAs is not a common practice. Historically, the land use related State policies have always preferred to promote agriculture and cattle raising (thus, deforestation), instead of protecting or managing forests.

Table 04 shows the total deforested areas in all the Amazon States. Deforestation has been the “business as usual” scenario for the land use. Amazonas does not want to follow such examples.

Table 04: Deforestation by States of the Brazilian Amazon accumulated up top 2007 (Source: PRODES, 2008).

State	(A) Total territory (km2)	(B) Original forest cover (km2)	(C) Acumulated deforestation in 2007 (km2)	% of the territory deforested in 2007 (C) / (A)	% of the original forest cover deforested	Rank in deforested Areas
Pará	1.249.576	563.388	218.369	17,5%	38,8%	1
Mato Grosso	904.895	419.827	201.013	22,2%	47,9%	2
Maranhão	335.902	249.574	95.587	28,5%	38,3%	3
Rondônia	240.404	420.127	82.849	34,5%	19,7%	4
Amazonas	1.601.920	271.430	33.223	2,1%	12,2%	5
Tocantins	278.998	40.262	30.003	10,8%	74,5%	6
Acre	158.881	376.809	19.368	12,2%	5,1%	7
Roraima	226.232	377.828	8.350	3,7%	2,2%	8
Amapá	142.930	111.593	2.522	1,8%	2,3%	9

The approval and implementation of the proposed REDD project will overcome institutional, economic, and financial hurdles, as well as other identified barriers, and thus enable the proposed REDD project activities to be undertaken and generate the following benefits:

- Prevention of carbon emissions to the atmosphere, that would occur as a result of the land use activities prevalent in the alternative scenarios. Even in the project scenario, an intense deforestation pressure in favor of cattle raising and agriculture in the project area is expected.

- Influence and attraction of other regional, national, and international stakeholders (both government and private land dwellers) who can see this as a testing ground for future carbon finance activities related to REDD, and are expected to be motivated to participate in a "learning by doing" exercise regarding carbon monitoring, verification, certification, trading, and carbon project development in general.

- Increase of interest in forest conservation related activities, since nowadays, the "possible" generation of REDD carbon credits is only (high risky) possible income, and thus is not an economically and socially attractive investment for land dwellers.

- The proposed REDD project will entail close interaction between individuals, communities, government, forest entrepreneurs, and carbon markets to intensify the institutional capacity to link networks for environmental products and services.

- Creation of a new land management model with high social and biodiversity benefits, such as sustainable production activities, improvement of livelihoods trough education, health and welfare for local communities, as well as scientific biodiversity management, monitoring, and reporting.

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Appendix I – Chain of Events of the Amazonas Initiative

DATE	EVENT	PLACE
August 2002	Launch of the Green Free Trade Zone (GFTZ) as a part of Governor Eduardo Braga Governance Plan	Manaus, Brazil
January 2003	Beginning the implementation of GFTZ	Amazonas, Brazil
September 2003	Swiss Re – Katoomba Meeting	Switzerland
November 2005	I Workshop on Global Climate Change	Rio Negro, Manaus, Brazil
December 2005	Presentation at UNFCCC' COP 11 and launch of the Paper: "*Reducing emissions from deforestation in Amazonas, Brazil: a State Government's proposal for action"*	UNFCCC' COP 11/MOP 1, Montreal, Canada
July 2006	Presentation at the: *"Religion Science and the Environment – Symposium VI" sponsored by Patriarch Bartholomew I*	Manaus, Brazil
July 2006	Creation of the "Sustainable Development Reserve of Juma", through the Law Decree n.26.010	Manaus, Brazil
September 2006	Technical meetings with business and governmental officials in London	London, UK
October 2006	Presentation at the Katoomba Meeting: *Valuing Environmental Services: Securing the Natural Capital of Present and Future Generations*	Sao Paulo, Brazil
November 2006	Presentation at UNFCCC' COP 12 and launch of the Paper: *"Amazonas Initiative for Forest Conservation and Ecosystem Services"*	UNFCCC' COP 12 / MOP 2 Nairobi, Kenya
January 2007	Beginning of the second term of Governor Eduardo Braga	Amazonas, Brazil
January 2007	II Workshop on Global Climate Change: "Strategies to Market Ecosystem Services Derived from Forest Conservation"	Rio Negro, Brazil
April 2007	Law Decree of the Amazonas State Policy for Climate Change	Manaus, Brazil
April 2007	Workshop - Alliance of the Forest People: *"The importance of the Forest People for Global Climate Change"*	Manaus, Brazil
April 2007	Forum on Sustainability: *Council of the Americas, Association of UN Organizations*	New York, USA
June 2007	Creation of the first Brazilian Law on Climate Change, Environmental Conservation and Sustainable Development	Manaus, Brazil
September 2007	Launching of the "Bolsa Floresta Program", first Brazilian program of payment for environmental services to the forest guardians	Manaus, Brazil
December 2007	Creation of the "Amazonas Sustainable Foundation" - FAS	Manaus, Brazil
December 2007	Establishment of the partnership between FAS and Marriott International, and the beginning of the PDD's elaboration	Manaus, Brazil
April 2008	Creation of the State Center for Climate Change (CECLIMA)	Manaus, Brazil
July 2008	Submission of the PDD for the CCB validation of the "Juma Reserve RED Project"	Manaus, Brazil

ANNEX IV: Risk assessment based on VCS risk analysis methodology for RED Projects

This methodology is provided by the Voluntary Carbon Standard (VCS) Guidance for Agriculture Forestry and Other Land Use Projects (AFOLU Guidance – November 2007), available at the VCS webpage: http://www.v-c-s.org

Table 1: Risk assessment for the Juma Reserve RED Project

Risk factor	Risk rating
1. Land ownership type	**Low-Medium**
Private or public forest conservation organization with a credible track record in similar activity / legally protected land with good enforcement	Low
Privately owned land / legally protected land	Low-Medium
Uncertain land tenure / legally unprotected land or protected with weak enforcement	Medium-High
2. Technical capability of project developer/implementer	**Low**
Proven capacity to design and successfully implement strategies for ensuring longevity of carbon benefits?	Low
No previous experience in the design and implementation of strategies for ensuring longevity of carbon benefits	Medium-High
3. Net revenues from the protected forest (including carbon)	**Low**
Lower than pre-project / lower than alternative land-uses	High
Similar to pre-project / similar than alternative land-uses	Medium
Higher than pre-project / higher than alternative land-uses	Low
4. Infrastructure and natural resources	**Medium-High**
High likelihood of new road(s)/rails being built near or inside the protected forest	Medium-High
Low likelihood of new road(s)/rails being built near or inside the protected forest	Low
High-value natural resources (oil, minerals, etc.) known to exist in the protected forest	High
High hydroelectric potential within protected forest	Medium High
5. Population surrounding the project area	**Low**
Decreasing, or increasing but with low population density	Low
Stable and high population density	Medium
Increasing and high population density	High
6. Net financial returns for deforestation agents	**High**
> 10% compared to pre-project situation	Low
About similar	Medium
< 10% compared to pre-project situation	High
7. Incidence of crop failure on surrounding lands from severe droughts, flooding and/or pests/diseases	**Low**
Infrequent (<1 in 10 years)	Low
Frequent (>1 in 10 years)	Low-High

Table 02: Definition of the size of the risk buffer, based on the interpretation of the risk assessment provided in Table 01, according to VCS AFOLU guidance

Risk Class	Freq. Ocurrance	% Ocurrance	Buffer Range
Low	4,5	64,3%	5-10%
Medium	1	14,3%	10-20%
High	1,5	21,4%	20-30%
Overall rank for the project:		**Low to Medium**	**10%**

ANNEX V – Geographic Coordinates of the Juma Reserve RED Project and the communities inside the Reserve

1 - Geographic coordinates of the RED Project for the Juma Reserve boundaries, according to the Law decree n°26.010 of 3th july 2006, that refers to its creation

Ponto	ºS	ºW	Ponto	ºS	ºW
01	5,181944	60,43889	30	5,523889	60,43778
02	5,257778	60,54528	31	5,583611	60,43444
03	5,342778	60,49278	32	5,615556	60,42333
04	5,375278	60,50083	33	5,594167	60,3525
05	5,406667	60,51694	34	5,6325	60,32139
06	5,423611	60,50694	35	5,663889	60,38889
07	5,471389	60,51222	36	5,656111	60,39806
08	5,519722	60,55333	37	5,658611	60,46389
09	5,563056	60,56222	38	5,612778	60,44889
10	5,572778	60,58528	39	5,619722	60,50333
11	5,574444	60,63806	40	5,575833	60,50556
12	6,501944	60,54583	41	5,573333	60,48889
13	6,2675	60,06611	42	5,543611	60,49639
14	6,170278	60,10083	43	5,542778	60,46889
15	6,151389	60,08028	44	5,439167	60,45333
16	6,151111	60,03222	45	5,440556	60,47472
17	6,233889	60,00389	46	5,434167	60,47528
18	6,211111	59,94361	47	5,431667	60,45694
19	5,653611	59,92111	48	5,396944	60,45361
20	5,624444	59,99889	49	5,396111	60,47194
21	5,586389	60,06361	50	5,3875	60,47167
22	5,566667	60,14806	51	5,387222	60,46583
23	5,626389	60,22611	52	5,373611	60,46778
24	5,560278	60,23333	53	5,356944	60,46083
25	5,550278	60,23806	54	5,286667	60,46972
26	5,554444	60,30361	55	5,279444	60,4475
27	5,542778	60,32778	56	5,2475	60,43333
28	5,536111	60,39111	57	5,1975	60,42167
29	5,518056	60,39278	58	5,193056	60,43278

2 – Geographic coordinates of the communities living inside the Juma Reserve

Nr	Community	Nr. Of Families	LAT	LONG
1	**Limão**	**7**	**-5,586810**	-60,633720
2	**Nova Jerusalém**	**9**	**-5,639530**	-60,627120
3	**São Luiz**	**2**	**-5,565960**	-60,629440
4	**Amapá**	**8**	**-5,430070**	-60,582050
5	**Tauari**	**6**	**-5,517640**	-60,624580
6	**Boa Vista**	**8**	**-5,455370**	-60,580040
7	**Santo Antônio**	**8**	**-5,515300**	-60,644530
8	**São José dos Brasões**	**11**	**-5,709810**	-60,607160
9	**Belas Águas**	**10**	**-5,484430**	-60,611660
10	**Repartimento**	**18**	**-5,822970**	-60,536460
11	**Livramento**	**12**	**-5,754070**	-60,570470
12	**Alvorada**	**25**	**-5,384080**	-60,437070
13	**São Felix**	**11**	**-5,329210**	-60,427650
14	**São Francisco**	**10**	**-5,349950**	-60,437480
15	**Santa Rosa**	**6**	**-5,320350**	-60,426160
16	**Santo Antônio da Capintu**	**9**	**-5,531210**	-60,410650
17	**Novo Oriente**	**5**	**-5,721650**	-60,286480
18	**Santa Maria**	**14**	**-5,770560**	-60,265890
19	**Nova Olinda**	**11**	**-5,502050**	-60,408860
20	**Capituba**	**8**	**-5,656380**	-60,319310
21	**Sivirino**	**12**	**-5,588110**	-60,372200
22	**Boa Frente**	**15**	**-5,556720**	-60,385230
23	**Flexal**	**11**	**-5,678790**	-60,273360
24	**São Jose do Cipotuba**	**5**	**-5,803630**	-60,223810
25	**Tucunaré**	**11**	**-5,862150**	-60,238390
26	**Santa Luzia**	**7**	**-5,999940**	-60,187730
27	**Santana**	**21**	**-6,290640**	-60,360670
28	**Cacaia**	**8**	**-5,748494**	-60,443779
29	**Barraquinha**	**5**	**-5,619285**	-60,449932
30	**São Francisco do Arauá**	**9**	**-5,186410**	-60,382260
31	**São Francisco da Anap I**	**12**	**-5,651220**	-60,218560
32	**Floresta**	**3**	**-5,671450**	-60,452847
33	**Paraíso**	**5**	**-5,989940**	-60,197730
34	**São Francisco da Anap II**	**5**	**-5,671220**	-60,241890
35	**Abelha**	**12**	**-5,640000**	-60,468000

ANNEX VI – Satellite Imagery Classification Methodology used to generate the vegetation classes used on the Juma Reserve RED Project

1 Field data

The data used to classify the vegetation was obtained on a flyover, performed on 08/03/2008, to geographically reference the points of different vegetation/LUC (Land Use Classes). A video camera was placed outside of the airplane, which sent the images to a monitor inside the plane, showing the existing vegetation on the exact point on the ground and the GPS reading. In all, 338 points were collected to "train" the classification and control points, aiming to verify the accuracy of the classification. The total number of points for the different categories of vegetation/LUC is shown in Table 01:

Table 01 – Total number of points collected for each category of vegetation and Land Use Class Accuracy Assessment table

Vegetation/LUC	Total number of points	Used for classification	Used for control
Non-Forest vegetation*	131	66	65
Dense Forest	107	53	54
Alluvial Forest	79	49	30
Deforestation**	51	30	21

***** Included secondary forest

****** For deforestation, official data was also used from PRODES, a program from the National Institute for Space Research (INPE), which researches deforestation in the Amazon Basin.

2 Image data

The boundaries of the project are included in two images from the Landsat 5 Tm+© satellite 230-64 (date 07/14/2008) and 231-64 (date 07/21/2008) which were downloaded from the National Institute for Space Research (INPE) and which are available on http://www.dgi.inpe.br/CDSR/.
The RGB 543 color compositions of the two images are shown in Figure 01.

3 Pre-processing

Pre-processing typically includes geometric corrections, cloud and shadow removal, radiometric corrections and reduction of haze. In this case, none of these techniques was necessary, as only one temporal data was used, without clouds and shadows, and the haze was minimal. Only the geo-referencing of the images was performed, using the images from Zulu-NASA, recognized for its good precision in georeferencing.

4 Classification

To classify the images, the IDRISI ANDES© program and the MAXLIKE classifier were used. MAXLIKE performs a Maximum Likelihood classification of remotely sensed data based on information contained in a set of signature files. The Maximum Likelihood classification is based on the probability density function associated with a particular training site signature. Pixels are

assigned to the most likely class, based on a comparison of the posterior probability that belongs to each of the signatures being considered.
The signature for each vegetation/LUC class was a polygon derived from the points collected in the flyover, and the prior probabilities for each signature are show in Table 02.

Table 02 – Prior probabilities to each signature

Vegetation/LUC	**Prior probabilities**
Non-Forest vegetation	0.2
Dense Forest	0.2
Alluvial Forest	0.2
Water	0.2
Deforestation	0.2

After the classification, a 7x7 mode filter was used to eliminate misclassifications and homogenize the classes.

The results for this classification are in picture 1B.

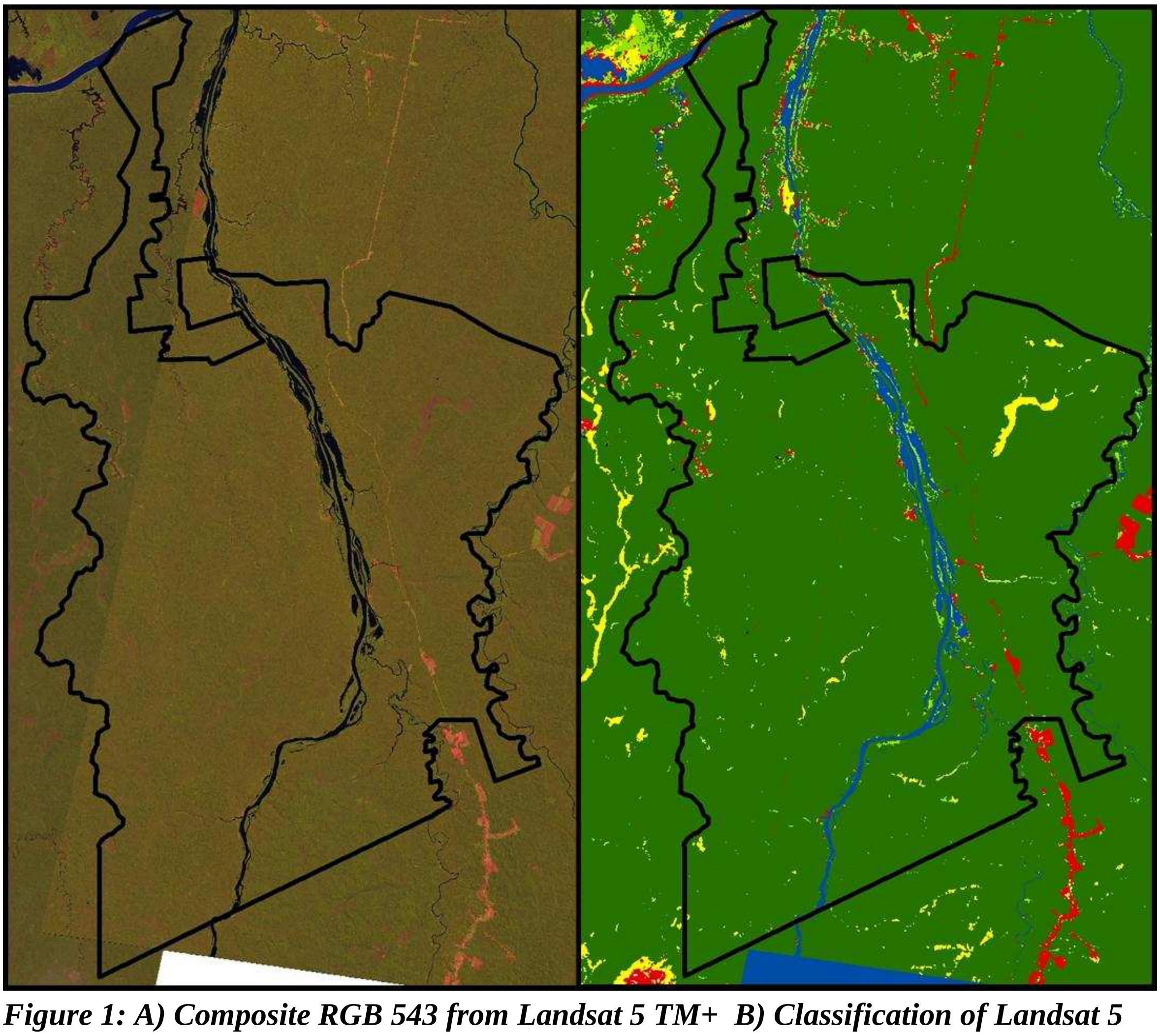


Figure 1: A) Composite RGB 543 from Landsat 5 TM+ B) Classification of Landsat 5

The results for this classification are shown in Figure 02 and the data for the area are available in section G1.2.

5 Post Classification

An independent accuracy assessment of the image classification was performed to produce a credible baseline[37].

The accuracy assessment is an estimate on a *class*-by-*class* (vegetation types) basis. The number of sample points on the map and their corresponding correct classification generates an error matrix. The first table shows the absolute values, and the second shows the proportion of correct classification.

Accuracy Assessment Matrix

Table 01 – Absolute Values

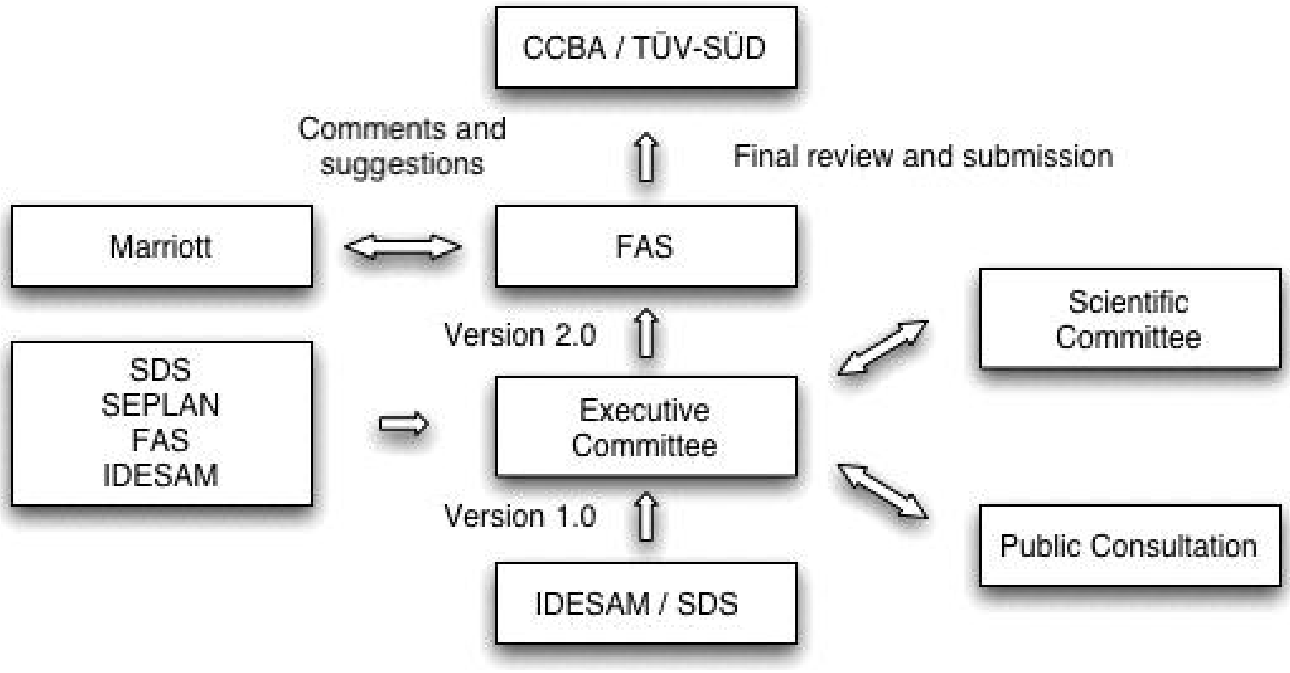
	Non-Forest vegetation	Dense Forest	Aluvial Forest	Deforestation
Non-Forest vegetation	119	2	3	7
Dense Forest	1	97	8	1
Aluvial Forest	3	2	73	1
Deforestation	3	0	1	47

Table 02 – Proportion values

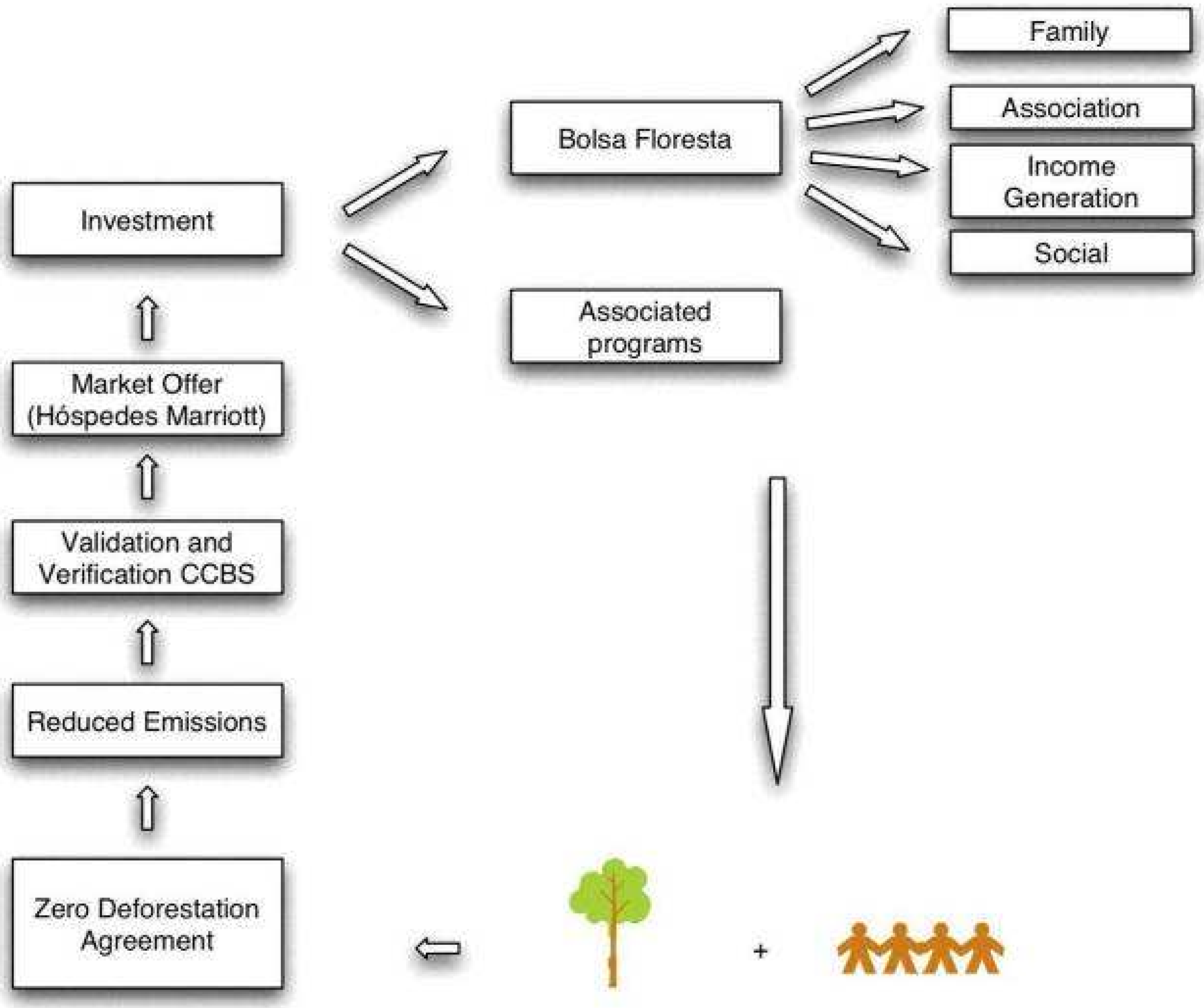
	Non-Forest vegetation	Dense Forest	Aluvial Forest	Deforestation
Non-Forest vegetation	90,84%	1,53%	2,29%	5,34%
Dense Forest	0,93%	90,65%	7,48%	0,93%
Aluvial Forest	3,80%	2,53%	92,41%	1,27%
Deforestation	5,88%	0,00%	1,96%	92,16%

[37] See Chapter 5 of IPCC 2003 GPG, Chapter 3A.2.4 of IPPC 2006 Guidelines for AFOLU, and Section 3.2.4 of Sourcebook on REDD (Brown *et al*., 2007) for guidance on map accuracy assessment.

ANNEX VII –Juma Reserve RED Project Validation Fluxogram



ANNEX VIII – Resource's Generation Chain Fluxogram



ANNEX IX – Deforestation Rates Source - Explanation

The program PRODES (Program for Calculating the Deforestation in the Amazon) was developed by INPE (National Institute for Space Research) in collaboration with the Federal Ministry of the Environment and IBAMA, and is financed by the MCT (Federal Ministry of Science and Technology).

The images used are from the Landsat satellite, in which a whole image of the satellite represents an area of 185 x 185 km on the ground, forming a grid that covers the Brazilian Amazon.

Image Interpretation Procedure: The image interpretation methodology consists of the following steps: selection of the images with lower cloud cover and with acquisition date as close as possible to the reference date, to calculate the deforestation; georeferencing (or geometric correction) of the images; transformation of the radiometric image data into scene image components (vegetation, land and shadow), through the application of a spectral mixture algorithm for concentrating the deforestation information; segmentation of the images into fractions of land and shadow; non-supervised classification of the images of land and shadow; mapping of the non-supervised classes into informative classes (year of deforestation, forest, etc.); editing of class mapping results; and elaboration of mosaics of thematic maps of each Federative Unit.

For each scene, the deforestation in the area covered by clouds is estimated, which may imply the need to use different satellite images, and for each pair of scenes of consecutive years, the annual increment and the total deforestation on the reference date is estimated. For every two total deforestation estimates (in the current and past year), the rate is estimated as a difference.
From these rates, the results are edited, organized and publicly released in annual reports.
For more details, see http://www.obt.inpe.br/prodes/metodologia.pdf

The National Institute for Space Research has been producing annual estimates of deforestation in the Brazilian Legal Amazon since 1988. These estimates have been produced using digital classification since 2002 based on the PRODES methodology. The main advantage of this procedure is in the accuracy of the georeferencing of deforestation polygons, as a way of producing a multi-temporal digital geographic dataset.

The annual rates are estimated for August 1 of the reference year, based on the increments of deforested area identified in each image. The shapefiles used to estimate deforestation within the Juma Reserve were taken from the web site and have as a base the year of 2006. From that shapefile (Figure 1), the deforested areas of the Juma Reserve were separated (Figure 2) from the total, using the CLIP function of the ARC TOOLBOX. The deforested area was calculated afterwards using the XTOOLS extension.

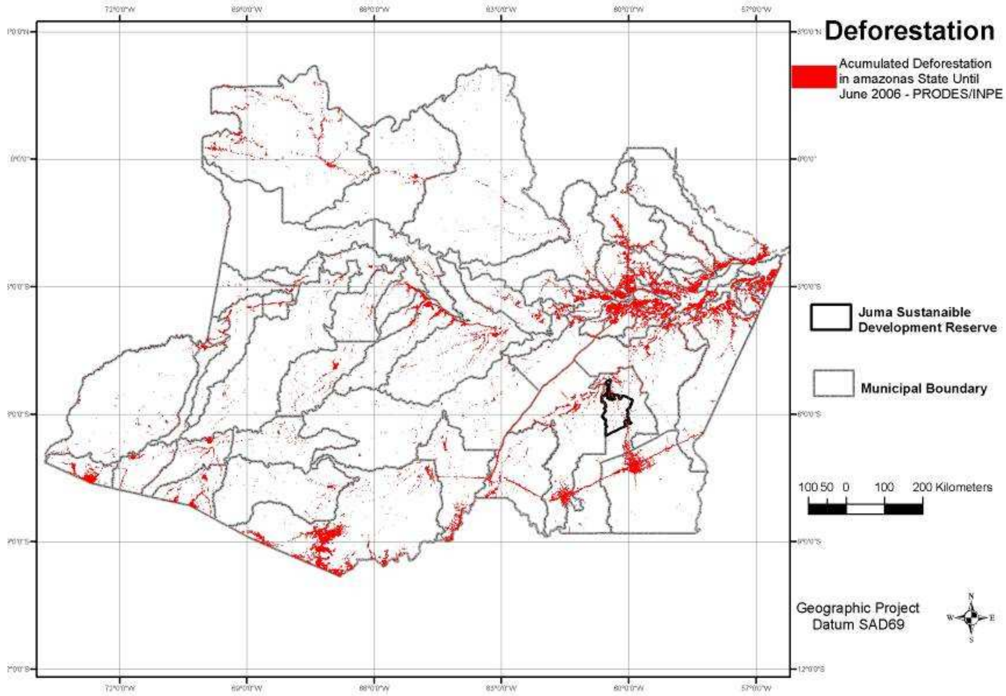


Figure 1: Deforestation in the State of Amazonas in 2006. Source: PRODES INPE 2006

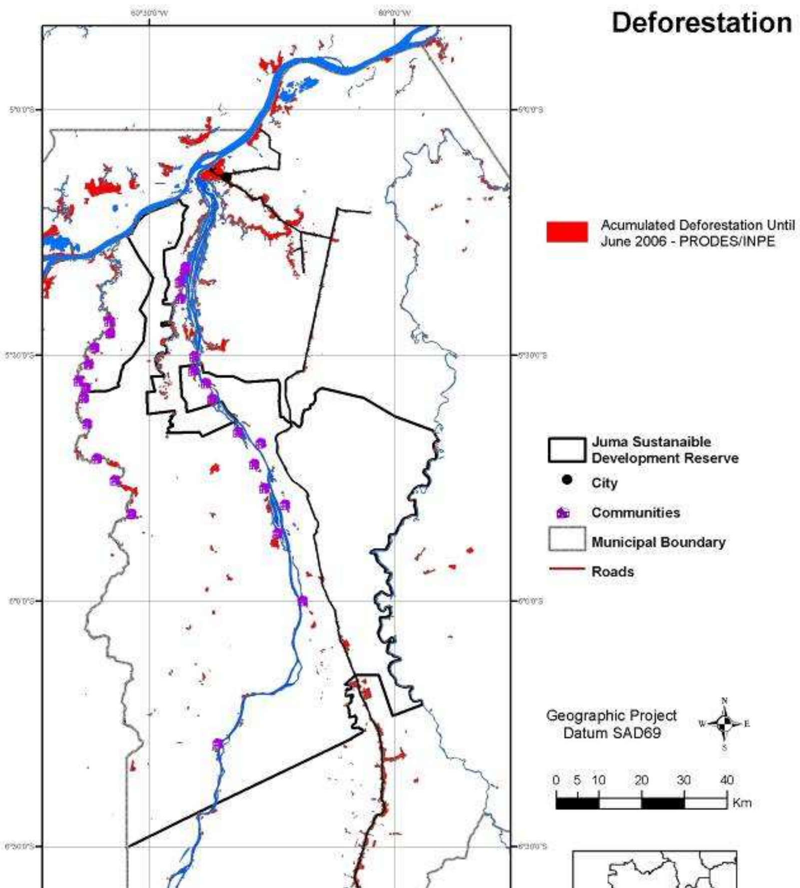


Figure 2: Deforestation extracted for only the area of the Juma Reserve

ANNEX X: Parameters of community monitoring

Data Variable	Source	Data Unit	Measured, Calculated or Estimated	Frequency (years)	Proportion	Archiving
School implementation and attendance in classes	Field survey and observation	Number	Measured	Annually	100%	Digital and paper
Housing conditions	Field survey and observation	Qualitative comparison	Estimated	Annually	100%	Digital and paper
Improvement of health quality and assistance	Field survey, observation and Technical analysis	Qualitative comparison	Estimated	Annually	100%	Digital and paper
Installation and operation of solar panels	Observation and documentation	Yes/No	Measured	Annually	100%	Digital and paper
Installation and operation of wells	Observation and documentation	Yes/No	Measured	Annually	100%	Digital and paper
People with personal documentation	Field survey	Percentage	Measured	Annually	100%	Digital and paper
Formal social organization articulated and working	Field survey and documentation analysis	Yes/No + Report	Estimated	Annually	100%	Digital and paper
Construction of communication bases	Observation and documentation analysis	Yes/No	Measured	Annually	100%	Digital and paper
Information flow through association	Observation and interviews	Yes/No + Report	Estimated	Annually	100%	Digital and paper
Lake management rules formalized, followed and monitored	Observation and documentation	Yes/No + Report	Estimated	Annually	100%	Digital and paper
Aquiculture activities implemented and linked with efficient productive chain	Field survey and observation	Yes/No + Report	Estimated	Annually	100%	Digital and paper
New technologies implemented and in use, and no new areas deforested for shifting agricultures	Field survey, observation and technical analysis	Yes/No + Report	Measured and estimated	Annually	100%	Digital and paper
New technologies of sustainable timber production implemented and in use	Field survey, observation and technical analysis	Yes/No + Report	Estimated	Annually	100%	Digital and paper

Data Variable	Source	Data Unit	Measured, Calculated or Estimated	Frequency (years)	Proportion	Archiving
New technologies of sustainable non-timber production implemented and in use	Field survey, observation and technical analysis	Yes/No + Report	Estimated	Annually	100%	Digital and paper
Increase of community income	Field survey, observation and technical analysis	Money	Measured and estimated	Annually	100%	Digital and paper
Warehouse constructed and boats in use	Observation and documentation	Yes/No + Report	Measured	Annually	100%	Digital and paper
New technologies implemented and working	Field survey, observation and technical analysis	Yes/No + Report	Measured and estimated	Annually	100%	Digital and paper
Technical knowledge applied by communities	Field survey, observation and technical analysis	Yes/No + Report	Estimated	Annually	100%	Digital and paper

ANNEX XI: The Juma Reserve RED Project Investment Plan for 2008 to 2011

A. Support for Monitoring and Law Enforcement		**TOTAL (R$)**	**TOTAL (US$)**
1.	**Infrastructure and Equipment**	**645,000**	**379,412**
1.1	Operational Base	160,000	94,118
1.2	Surveillance Base	160,000	94,118
1.3	External Communication Bases	120,000	70,588
1.4	Internal Communication Bases	30,000	17,647
1.5	Personal protection equipment	10,000	5,882
1.6	Equipment for the operational bases	35,000	20,588
1.7	Field trip material	20,000	11,765
1.8	Vehicles, logistics and maintenance	110,000	64,706
2.	**Operational & Coordinator Staff**	**1,041,760**	**612,800**
2.1	Project Coordinator	280,800	165,176
2.2	Project Assistant	93,600	55,059
2.3	Field Coordinator	280,800	165,176
2.4	Field Assistant	93,600	55,059
2.5	GIS Technician	163,800	96,353
2.6	Forest Guards	69,160	40,682
2.7	Consultancies	60,000	35,294
3.	**Maintenance Costs**	**155,000**	**91,176**
3.1	Fuels and lubricants	80,000	47,059
3.2	Food and uniforms	55,000	32,353
3.3	Office Material	20,000	11,765
4.	**Training, capacity building and implementation**	**65,000**	**38,235**
4.1	Training and capacity building	65,000	38,235
TOTAL (A)		**1,906,760**	**1,121,624**

B. Social Investment		**TOTAL (R$)**	**TOTAL (US$)**
1	**Infrastructure and Equipment**	**385,000**	**226,471**
1.1	Warehouse, boat and field structure	45,000	26,471
1.2	Community Lodge	70,000	41,176
1.3	Greenhouse for Brazil Nuts / Dried Base Industry	70,000	41,176
1.4	Organic and Fair Trade Certification	70,000	41,176
1.5	Forest Management and equipment	70,000	41,176
1.6	Fish farming kits	60,000	35,294
2	***Operational Staff***	**60,000**	**35,294**
2.2	Consultancies	60,000	35,294
3	**Maintenance Costs**	**28,000**	**16,471**
3.1	Office and field materials	28,000	16,471
4	**Training, capacity building and implementation**	**220,000**	**129,412**
4.1	Implementation of community based timber forest management	80,000	47,059
4.2	Implementation of community based non-timber forest management	60,000	35,294
4.3	Strengthening of grassroots organizations and cooperatives	80,000	47,059
TOTAL (B)		**693,000**	**407,647**

C. Community Development, Scientific Research and Education	**TOTAL**	**TOTAL**

		(R$)	(US$)
1.	**Infrastructure and Equipment**	**877,500**	**516,176**
1.1	Manioc processing house	37,500	22,059
1.2	Community centers	80,000	47,059
1.3	Water wells and Pro-Chuva Program	120,000	70,588
1.4	Boats for school transportation	50,000	29,412
1.5	Solar energy systems	40,000	23,529
1.6	Schools	480,000	282,353
1.8	Research Centers	50,000	29,412
1.9	Health and research equipment	20,000	11,765
2	**Operational Staff**	**127,000**	**74,706**
2.1	Teachers and Health Agents support	72,000	42,353
2.2	Training consultant and activities	55,000	32,353
3	**Maintenance Costs**	**200,000**	**117,647**
3.1	Computer and school materials	45,000	26,471
3.2	Fuel and lubricants	80,000	47,059
3.3	Medicine for Health Agents	45,000	26,471
3.4	Research supplies	30,000	17,647
4	**Training, capacity building and implementation**	**1,190,000**	**700,000**
4.1	Biodiversity monitoring	190,000	111,765
4.2	Carbon Methodology and Validation Process	390,000	229,412
4.3	Local carbon research	240,000	141,176
4.4	Publicizing and organization of scientific workshops	110,000	64,706
4,5	Creation of pedagogic materials	80,000	47,059
4.6	Elaboration of Management Plan	180,000	105,882
TOTAL (C)		**2,394,500**	**1,408,529**

D. Payment for Ecosystem Services (PES) - Bolsa Floresta		**TOTAL (R$)**	**TOTAL (US$)**
1	**Infrastructure and Equipment**	**24,000**	**14,118**
1.1	Equipment	24,000	14,118
2	**Structure of Bolsa Floresta Program**	**1,154,400**	**600,706**
2.1	Bolsa Floresta Family	888,000	522,353
2.2	Bolsa Floresta Association	88,800	52,235
2.3	Bolsa Floresta Social	88,800	13,059
2.4	Bolsa Floresta Income Generation	88,800	13,059
3	**Workshops and visits**	**215,000**	**126,471**
3.1	Bolsa Floresta on-site visit	120,000	70,588
3.2	Bolsa Floresta workshops	55,000	32,353
3.3	Community meetings	40,000	23,529
TOTAL (D)		**1,393,400**	**741,294**

TOTAL A+B+C+D	**TOTAL (R$)**	**TOTAL (US$)**
Exchange rate US$ 1= R$ 1.70	**6,387,660**	**3,757,447**

ANNEX XII - Investments from project partners from 2005 to 2011

Event	Responsible Institution	2005	2006	2007	2008	2009	2010	2011
Study for the creation of the Juma Sustainable Development Reserve	SDS	29,412	-	-	-	-	-	-
Public Consultation Meetings	SDS	-	29,412	-	-	-	-	-
Publication of the creation of Juma Sustainable Development Reserve	SDS	-	29,000	-	-	-	-	-
Approval of FAS and appointment of the first president	Government of the State of Amazonas	-	-	17,647	-	-	-	-
Partnership with Marriott International	Government of the State of Amazonas	-	-	-	29,412	-	-	-
Land Tenure Analysis	ITEAM	-	-	-	14,706	-	-	-
Creation of Juma Reserve Management Council	SDS	-	-	-	11,765	-	-	-
Chief of the Reserve costs	CEUC	-	-	-	22,235	44,470	44,470	44,470
Community meeting (Association)	CEUC	-	-	-	1,765	-	-	-
Support to project activities	CEUC	-	-	-	-	11,765	11,765	11,765
Law enforcement activities	IPAAM	-	-	-	-	73,529	73,529	73,529
TOTAL (US$)		**29,412**	**58,412**	**17,647**	**79,883**	**129,764**	**129,764**	**129,764**

ANNEX XIII –Monitoring Plan

Component 1: Monitoring

There are four monitoring tasks:

1.1 Baseline monitoring
1.2 Project monitoring
1.3 Leakage monitoring
1.4 *Ex post* calculation of net anthropogenic GHG emission reduction

1.1 Baseline monitoring

The baseline scenario will be monitored trough an assessment of the driver variables and assumptions assumed by the SimAmazonia I to project deforestation expected in the baseline scenario. This parameters will be re-validated after each *crediting period* (every 10 years), based on the calculation of the verified *post facto baseline deforestation* (in hectares) of the past 10 year period – in comparison with other location not affected by the project activities. If deforestation is verified as 10% lower or 10% higher than originally predicted, the *post facto carbon baseline* shall be re-adjusted using the observed values of the driver variables. See Annex I for the baseline parameters that will be monitored.

1.2 Project monitoring

The monitoring of the project involves 4 tasks:

1.2.1. Monitoring of project implementation
1.2.2 Monitoring of land-use and land-cover change.
1.2.3 Monitoring of carbon stocks and non-CO2 emissions.
1.2.4 Monitoring of large natural disturbances.

1.2.1. Monitoring of project implementation

The implementation of the project' activities and programs will be monitored basically by FAS and the Government of Amazonas, based on annual reports that will be made available by FAS as the main implementing institution. These reports will also be published annually in the following instances:

a) electronically, at FAS website (www.fas-amazonas.org)
b) electronically and hardcopy at the local headquarters in Novo Aripuanã city and the base inside the Juma Reserve

The elaboration and planning of the annual investment budgets (Annex XX) will also be based on the project's annual reports, and will have to be approved by the deliberative council of the Juma Reserve (which includes representatives from all the communities and other local stakeholders) (see item G3.6)

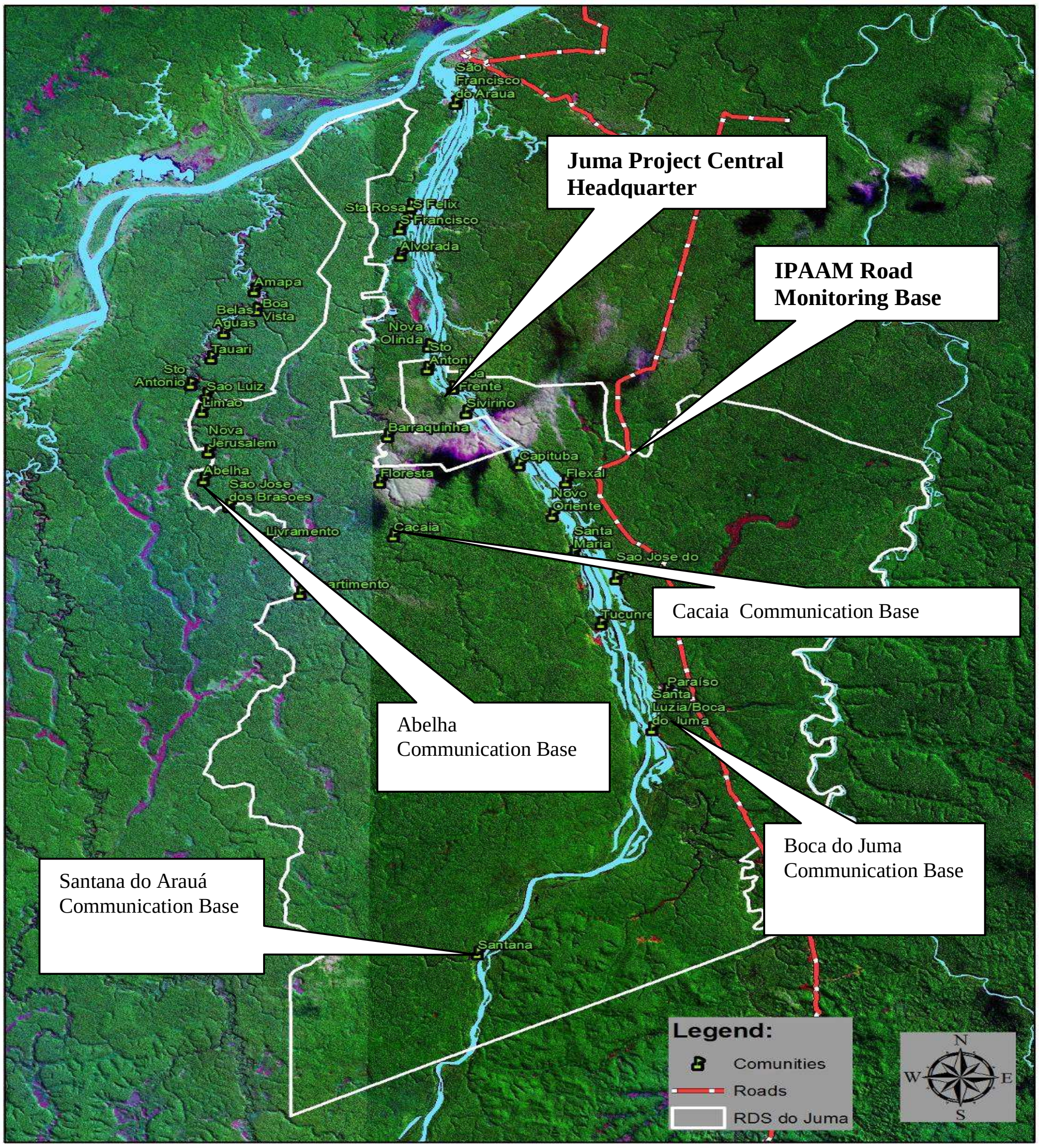
All the specific indicators of the project activities as presented in Items G3.2, B3.1, CM 1.1c and CL 1.3. will be monitored.

1.2.2 Monitoring of land-use and land-cover change.

The monitoring of land-use and land cover change (deforestation) will be made through the integration of (i) remote sensing analysis for identification of deforestation focus and pressures (based on PRODES, INPE), and (ii) *in situ* actions to enforce the law and prevent deforestation and illegal logging inside the project area. This strategy will be made through a cooperation within FAS, the Environmental Protection Institute of Amazonas (IPAAM) and its Special Group for Combat Against Illegal Crimes (GECAM)[38].

The roles of each partner institution and its activities for the Juma Project is described in details on the Item G4.1. The description of the remote sensing methodology that will be used for project monitoring is described in Annex IX. The plan for monitoring and control of deforestation "on the ground" will be based on the following strategy and infrastructure, to be implemented in the project area (see Figure 01):

Figure 01: Distribution of the infrastructure for the project monitoring



38 GECAM is the Special Group to fight environmental crimes

1. **Juma Project Central Headquarter (JCH):**
   - Location: Community Boa Frente (main access to the Project area, through the Aripuanã river)
   - Staff: the headquarter will be permanently managed and operated by FAS, CEUC and IPAAM staff, which will use the base as the central office for coordinating all project activities and operations inside the project
   - Equipments: the base will be well prepared with all equipments necessary to carry out the project monitoring actions (radio systems, speedboats, security and rescue tools, etc.) as well as surveillance camera which will control 24hours the flux of people and embarkations in the river, and to inside the reserve.

2. **IPAAM Road Monitoring Base (RMB):**
   - Location: Road Novo Aripuanã-Apuí (AM-174), in the upper boundary of the reserve, near the city of Novo Aripuanã
   - Staff: the base will be managed mainly by IPAAM and GECAM, which will use the base mainly to coordinate the operations for control of deforestation and fighting against environmental crimes
   - Equipments: the base will be well prepared with all equipments necessary to carry out the project monitoring actions (radio systems, trucks, motorbikes, security and rescue tools, etc.) as well as surveillance camera which will control 24hours the flux of people, cars and trucks in the road and to inside the reserve.

3. **Communication Bases:**
   - Location: the communication bases will be located in strategic communities spread over the Juma reserve, to keep frequent contact with the main operational bases (JCH and RMB) and report daily activities:
     - Community Boa Frente (JCH)
     - Community Abelha
     - Community Cacaia
     - Community Boca do Juma
     - Community Santana do Arauá
     - IPAAM RMB
   - Staff: the communication bases will be operated by the own members of the communities, which will be trained to work as environmental agents as well as monitors of the ProBuc program.
   - Equipments: the communication bases will be equipped with radio systems and surveillance cameras. The main radio stations will have the also same frequency of the central radio station based in Manaus, at SDS base, which will be operated by CEUC – State Center for Protected Areas.

1.2.3 Monitoring of carbon stocks

In principle, the *ex ante* estimated average *carbon densities* and *carbon stock changes* should not be significantly changed during the crediting period, as it uses a confident estimation adequate for the project area. However, as the project wants to maintain a continuous program for improvement on information quality, it will accomplish a detailed forest inventory inside the project boundaries. When new and more accurate *carbon stock* data become available from these sources, it will be used to estimate the "post-facto" net anthropogenic GHG emission reduction of the project – which will have to be re-validated by an operational entity. The carbon stocks forest inventory methodology is described in the Appendix I.

1.2.4 Monitoring of large natural disturbances.

The monitoring of natural disturbances will be made through the analysis of PRODES satellite images and also directly on the field, following the complete schedule of activities predicted for the project implementation (see Item G3.2).
If a natural disturbance have an impact on the project carbon stocks, the boundary of the polygons where such changes happened will be measured and the change in the carbon stock factored out.

1.3 Leakage monitoring

Although it is not expected any leakage with the project implementation, deforestation will be monitored in all the surrounding zone of the project (leakage belt), as described in item CL 1.1.

1.4 Calculation of *ex post* net anthropogenic GHG emission reductions

The calculation of *ex post* net anthropogenic GHG emission reductions is similar to the e*x ante* calculation with the only difference that the *ex ante* projected emissions for the project scenario and leakage are replaced with the *ex post* emissions calculated from measured data. In case it is verified differences in the *post facto* adjusted carbon baseline (due *ex post* improvements of carbon stocks data, factoring-out of the impact of natural disturbances, etc.) the *ex ante* estimated *baseline* will be replaced by a *post facto baseline*, as describes:

$$C_{RED} = C_{BASELINE} - C_{ACTUAL} - C_{LEAKAGE} \qquad (14)$$

Where:

C_{RED} = *ex post* net anthropogenic greenhouse gas emission reduction; tonnes CO_2e
$C_{BASELINE}$ = *ex ante* (or *post facto*) baseline greenhouse gas emission within the project area; tonnes CO_2e
C_{ACTUAL} = *ex post* actual greenhouse gas emission within the project area; tonnes CO_2e
$C_{LEAKAGE}$ = *ex post* leakage greenhouse gas emission within the leakage belt area; tonnes CO_2e

*Table 01 – Specific variables and respective parameters of the monitoring plan **

ID number	Data Variable	Data Unit	Data Source	Measured (M), calculated (C), estimated (E)	Recording Frequency	Proportion of data monitored	Comment
01	Stratum ID	Alpha numeric	Stratification map, GIS	-	Before and after the start of the project	100%	Each stratum has a particular combination of soil type, climate, and possibly tree species
02	Stand ID	Alpha numeric	Stand map, GIS	-	At stand establishment	100%	Each stand has a particular year to be planted under each stratum
03	Confidence level	%	Forest Inventories	C	During the forest inventory (after the first field assessment)	100%	For the purpose of QA/QC and measuring and monitoring precision control
04	Precision level	%	Forest Inventories	C	During the forest inventory (after the first field assessment)	100%	For the purpose of QA/QC and measuring and monitoring precision control
05	Standard deviation of each stratum	%	Forest Inventory	C	At each monitoring event *	100%	Used for estimating numbers of sample plots of each stratum and stand, as necessary

ID number	Data Variable	Data Unit	Data Source	Measured (M), calculated (C), estimated (E)	Recording Frequency	Proportion of data monitored	Comment
06	Number of sample plots	Number	Forest Inventory Plan	C	Before the start of the inventory and adjusted thereafter *	100%	For each stratum calculated from 03 - 05
07	Sample plot ID	Alpha numeric	Project and plot map, GIS	-	Before the start of the inventory	100%	Numeric series ID will be assigned to each permanent sample plot
08	Plot location	GIS Coordinates	Project and plot map and GPS locating, GIS	M	5 years	100%	Using GPS to locate before start of the project and at time of each field measurement
09	Number of trees	Number	Plot measurement	M	5 years	100% trees in plots	Counted in plot measurement
10	Diameter at breast height of living and standing dead trees (DBH)	cm (living/dead)	Plot measurement	M	5 years	100% trees in plots	Measuring at each monitoring time per sampling method
11	Mean DBH	cm	Calculated	C	5 year	100% of sampling plots	Calculated from the average of all DBHs

ID number	Data Variable	Data Unit	Data Source	Measured (M), calculated (C), estimated (E)	Recording Frequency	Proportion of data monitored	Comment
12	Height of living and dead trees	m	Plot measurement	M	5 years	100% trees in plots	Measuring at each monitoring time per sampling method
13	Mean tree height	m	Calculated	C	5 year	100% of sampling plots	Calculated from 09 and 12
14	Wood density	t d.m. m^{-3}	Local-derived, national inventory, GPG for LULUCF	E	5 year	100% of sampling plots	Local-derived and species specific value have the priority
15	Biomass expansion factor (*BEF*)	Dimensionless	Local-derived, national inventory, GPG for LULUCF	E	5 year	100% of sampling plots	Local-derived and species specific value have the priority
16	Carbon fraction	t C.(t d.m)$^{-1}$	Local, national, IPCC	E	5 year	100% of sampling plots	Local-derived and species specific value have the priority
17	Root-shoot ratio	Dimensionless	Local-derived, national inventory, GPG for LULUCF	E	5 year	100% of sampling plots	Local-derived and specie sspecific value have the priority
18	Carbon stock in aboveground biomass of stands	t C	Calculated from equation	C	5 year	100% of strata	Calculated from 20 and 22

ID number	Data Variable	Data Unit	Data Source	Measured (M), calculated (C), estimated (E)	Recording Frequency	Proportion of data monitored	Comment
19	Carbon stock in belowground biomass of stands	t C	Calculated from equation	C	5 year	100% of strata	Calculated from 21 and 22
20	Mean Carbon stock in above-ground biomass per unit area per stratum per vegetation type	$t\ C\ ha^{-1}$	Calculated from plot data	C	5 year	100% of stands	Calculated from 06 or 16 and 22
21	Mean carbon stock in below-ground biomass per unit area per stratum per vegetation type	$t\ C\ ha^{-1}$	Calculated from plot data	C	5 year	100% of stands	Calculated from 20, 06 and 17
22	Area of stand	ha	Stratification map and stand data, GIS	M	Every 5 years	100% of stands	Actual area of each stand
23	Deadwood category of standing tree	Dimensionless	Plot measurement	M	Every 5 years	100% of sampling plots	Measuring at each monitorin time per sampling method
24	Diameter of lying dead tree in each density class	Cm / density class	Plot measurement	M	5 year or more	100% of sampling plots	Measuring at each monitoring time per sampling method
25	Carbon stock change in above-ground biomass	$t\ C\ yr^{-1}$	Calculated from equation	C	5 year	100% of strata	Calculated from 18

ID number	Data Variable	Data Unit	Data Source	Measured (M), calculated (C), estimated (E)	Recording Frequency	Proportion of data monitored	Comment
26	Carbon stock change in below-ground biomass	$t\ C\ yr^{-1}$	Calculated from equation	C	5 year	100% of strata	Calculated from 19
27	Deadwood stock	t C	Calculated from equation	C	5 year	100% of strata	Calculated from 22 - 24 and 17
28	Carbon stock change in deadwood	t C	Calculated from equations	C	5 year	100% of strata	Calculated
29	Annual carbon stock change in litter	$t\ C\ yr^{-1}$	Calculated from formula	C	5 year	100% of strata and stands	Calculated from 30
30	Mean carbon stock in litter	t C	Calculated from formula	C	5 year	100% of strata and stands	Calculated from 30
31	Mean weight of litter	$t\ ha^{-1}$	Laboratory measurement	M	5 year	100% of strata and stands	Measuring at each monitoring time
32	Measuring at each monitoring time	$t\ C\ (t\ d.m.)^{-1}$	Laboratory measurement	M	5 year	100% of strata and stands	Measuring at each monitoring time
33	Area of slash and burn	ha	Measured during implementation	M	During the first year of the project duration	100%	Measured for different strata and sub-strata
34	Loss of above-ground biomass carbon due to slash and burn	$t\ C\ yr^{-1}$	Calculated using Equation	C	During the first year of the project duration	100%	Calculated using Equation
35	Carbon stocks at project site	$t\ C\ (t\ d.m.)^{-1}$	Calculated using new carbon data	C	After first field inventory	100% of the vegetation types	Calculated using new data provenient from field inventories

ID number	Data Variable	Data Unit	Data Source	Measured (M), calculated (C), estimated (E)	Recording Frequency	Proportion of data monitored	Comment
36	Baseline Emissions	t CO_2e yr $^{-1}$	Calculated using equations	C	After the first inventory	100% of project area	Calculated using new carbon stocks data provenient from field inventories
37	Baseline parameters		The baseline will be revised at year 10 of project	C	On year 10 of project (2016)	100%	The baseline will be revised and the emission values may change on the subsequent years
38	Deforestation	ha	Public images available by INPE (Digital images, paper, GIS)	M	1 year	100% of the reserve	The satellite images are public and will be assessed
39	Forest Fires	ha	Public images available by INPE (Digital images, paper, GIS)	M	1 year	100% of the reserve	The satellite images are public and will be assessed
40	CH_4 emission from biomass burn	t CO_2-e yr^{-1}	Calculated using Equation	C	During the first year of the project duration	100%	Calculated using equation 09
41	Project emissions from deforestation with "slash and burn" practices	t CO_2e yr $^{-1}$	"Ex post" calculations	C	Every year	100% of project area	Calculated from deforestation data obtained from PRODES multiplied by the respective emission factors for each type of vegetation

ID number	Data Variable	Data Unit	Data Source	Measured (m), calculated (c), estimated (e)	Recording Frequency	Proportion of data monitored	Comment
42	Project emissions from deforestation (slash, not burn)	t CO_2e yr^{-1}	"Ex post" calculations	C	Every year	100% of project area	Calculated from deforestation data obtained from PRODES multiplied by the respective emission factors for each type of vegetation
43	Grievance Registry	Number and results	Project Annual reports and field verifications	M	Every year	100%	Will be performed a verification in order to assure that every grievance presented was either solves or had a answer
44	Leakage	ha	Remote Sensing and GIS, field assessment	C	Every year	100% of the surroundings	There will be made assessments to verify if there is deforestation happening on the surrounding area of the project
45	Vegetation boundaries inside the project area	GIS coordinates	GIS, remote sensing	C	Every 2 years	100% of the project area	Verified using PRODES images and checked with field assessment

ID number	Data Variable	Data Unit	Data Source	Measured (m), calculated (c), estimated (e)	Recording Frequency	Proportion of data monitored	Comment
46	Ownership and Carbon Rights		Oficial contracts and legislations	-	Every certification period (10 years)	100%	This will be verified trough the legal status of the carbon ownership and rights
47	Environmental crimes and deforestation activities	Occurrences (illegal activities, suspect people etc.)	Community members and environmental agents – paper and photos	M	daily	variable	The community members will report directly to the project staff
48	Road and rivers monitoring	Occurrences (illegal activities, suspect persons etc.)	Guards and surveillance camera	M	Monthly reports with dailty registries	Strategic places under pressure of deforestation	Records in images, paper reports and films
49	Carbon Stocks at non-Forest classes	t C (t d.m.)$^{-1}$	Publications and updated studies applied to the project region/conditions	E	Every 5 years	-	Performance of regular searches on trustworthy publications to verify if new and more accurate data are released regarding to carbon stocks in non-forest classes

ID number	Data Variable	Data Unit	Data Source	Measured (m), calculated (c), estimated (e)	Recording Frequency	Proportion of data monitored	Comment
50	Resources Investment from other institutions	Reais (R$)	• IPAAM • SDS • CEUC • CECLIMA • ITEAM	M	Every Year	100%	It will be performed a verification to assure that there is no displacement of public funding and all the resources applied to the project are additional

*All the parameters related to the forest inventory and uncertainties assessments will be performed according to the IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry. (IPCC, 2003)

Appendix I – METHODOLOGY FOR CARBON STOCKS INVENTORIES AND MONITORING

A) Forest Inventories

The Forest inventory to estimate the live biomass pools (above and below ground) and carbon in tropical rainforest areas of Juma Sustainable Development Reserve (RDS), in the State of Amazonas, must be strategic and tactic. Strategic because it is a measure to contain the deforestation pressure taken by the Government of the State of Amazonas and to gather the resources to implement the Reserve. Must be tactic as it must attend a specific demand, which is the inventory and monitoring of the carbon stocks at Juma Reserve.

The Juma Reserve is a State Protected Area covering 589,612 , located in the Southeast of the State of Amazonas. The forest will be inventoried through samplings taken every two years in areas with the same extension, distributed in a way as to contemplate every phytophysiognomies present inside the Reserve.

Every arboreal individual with the DBH equal or higher than 10 cm is to be monitored. To analyze the biomass and carbon stock, death rate, and recruiting differences between different periods, the permanent plots must be measured again every two (02) years. In the second field inventory, the permanent plots will be measured again and new temporary plots will be installed.

The permanent plots will be used, mainly, to monitor the recruitment and death rate. The group of plots (sampling unit) will be used to monitor the forest dynamics as a whole.
The field data collection will involve (i) forest inventory data and (ii) data to adjust the allometric equations. Such collections will be made simultaneously, and the data for allometry will be collected through the destructive method. For this reason, the plots will be implemented near communities for later use in the subsistence agriculture. The allometry data will be used to validate the Silva’s equations (2007) and to calibrate the data for Juma Reserve.

Shapes and Placing of Plots
The Juma Reserve area contains a part of the Amazon Rainforest, a natural tropical rainforest. Due to the high variability of this forest type, the rectangular plots are the most recommended because, in comparison with the square ones, they have a larger area and are able to comprise a bigger variety of the population. Also, it is easier to install them on the field, when compared to the circular one.

To execute the inventory, the used plots must be shaped as a transect, having a Primary Unit divided into Secondary Units. The transect must have a 20 km x 20 m length (which must contemplate every phytophysiognomy in the area), divided into eighty 125-meter long rectangles (Secondary Units).

The Primary Units must be systematically and alternately distributed. In the case of the plots installed along the Aripuanã river, the transects must be installed in a perpendicular fashion. 6 Primary Units are to be installed, three (03) on each side of the River. Regarding the plots installed to sample the phytophysiognomies not contemplated in the first method, they will be allocated inside every “vegetation spot”.

Each Secondary Unit must be placed 375 meters away from the other. That way, there will be a sampling unit at every 1 km, with 20 plots in total - or Secondary Units - in every Primary Unit or transect. The arrangement of the sampling plots comprises, per Primary Unit, a total area of 40 hectares. (See scheme attached).

Such shape allows the plots to contemplate every vegetation type, as the sampling units go up to 20 km in the forest, and yet, some plots will be directed to sample every vegetation type.

Plot sizes

According to Higuchi *et al.* (1982), working with a minimum diameter of 25 cm, the ideal size of the plot, the one that presented a smaller error limit and uncertainty, is that of 5.625 m^2, sized 37.5 m x 150 m. Although, specifically for this work objective, which is to measure the biomass and the carbon stocks, the minimum diameter to be measured is 10cm, and the size is 2,500 km^2, sized 20 m wide and 125 m long, which, according to Higuchi *et al.* (1982), presented very satisfactory values of uncertainty, error limit, and relative efficiency for trees with Diameter at Breast High above 25cm.

Sampling Intensity

According to Higuchi *et al.* (2008), in every forest inventory made in a tropical rainforest area in the State of Amazonas, regardless of the vegetation type, an average of 89 sampling units were installed, obtaining a 5% uncertainty half the precision required for the IPCC and for the consulted literature on forest ecosystems inventories. Therefore, allocating the Primary Units according to the method described in item 1.1 above, 160 plots will be installed, which should be enough to measure the biomass and carbon stocks at Juma Reserve. Out of those, 100% must be installed as permanent plots. Despite the sampling intensity adopted in the pilot inventory, for any sampling intensity option, the uncertainty for the parameter estimates must be lower than 10%. In the cases where the uncertainty is higher than that, it is necessary to increase the sampling intensity.

a) Field Procedures

Plot Installation
The person responsible for the inventory must, before starting the data collection and at the moment where he has located the forest point to be sampled, geo-reference, by means of a GPS, the initial and final point of every plot, and also the walking direction inside the plot. If it's necessary, the slope must be measured to correct eventual errors relative to the plots area.

After geo-referencing it and the direction of the plot is decided, the boundaries of the sampling unit must be identified with stakes. Two stakes on the side boundaries of the plots, marking 20 meters, and one at the center, on the trail. Along the sampling unit, a stake must be put at every 25 meters in the trail and, at the end of the plot, three more stakes as per the beginning (see demonstration in the Annex).

For the temporary plots, the boundaries can be defined with less resistant materials, such as tree branches, for these plots will only be measured on one single occasion. In permanent plots, the boundaries must be identified with durable materials, such as PVC pipes. Information is to be registered for every stake, such as plot number and stake's position, if it is located at the beginning or at the end.

The installing of the permanent plots must be alternating, i.e., one permanent transect followed by a temporary one. Keeping in mind that only 50% of the sampling plots must be permanent.

Data to be collected
After installing the plot, the team carrying out the inventory activities must measure and register the DBHs (Diameter at Breast High), which should be measured 1.30 meter high from the ground, for every individual with DBH higher than 10 cm found inside the sampling plots. Also, the team must register observations such as the condition of the tree (whether alive or dead, broken canopy, etc) as well as observe and register the presence of lianas, etc. The measured trees inside the permanent plot must be identified with an aluminum sign containing a number, which must be registered on the field file.

In a botanic inventory at Experimental Station ZF-2, at INPA (National Institute for Amazon Research), Carneiro (2004) made an inventory and identified 737 arboreal species belonging to 59 botanic families in an 8 hectare area. Considering the abundance of species, it is necessary to carry out a botanic inventory on the area. The preliminary identification of the botanic material must be made on the field, through common names and, later on, checked, complemented, and/or corrected with the support of experts to recognize the species. This must be done based on materials found in taxonomy labs and herbariums that contain examples of the Amazon ecosystem.

At least 300 botanic samples (exsiccatae) are to be collected, and 50 must come from individuals with commercial importance, identifying them up to the gender level. The exsiccatae must be collected, identified according to the field inventory file (e.g.: code of the exsiccatae from tree X, plot Y), pressed, dried, and identified.

The sampled trees for botanic identification must be identified according to morphological characteristics such as leaf, flower, or fruit type, aspect of bole, presence or absence of skin, resin, latex, etc.

According to the IPCC Good Practice Guidance, it is recommended to measure the carbon in soil pools, however, in this project, this is not going to be measured due to the difficulty of collection, and for having a very low carbon stock.

Regarding the death rate, the trees that were measured in the first inventory and that are identified as dead or not will be included in the database as emitter source or just excluded from the forest's biomass stock. The recruitment rate will be obtained using the same procedure, but the trees that will be considered are those that, in the first inventory, did not have at least 10 cm diameter, but that, in the following inventory had reached the 10 cm. This way, this tree can be considered as a recruited tree and included in the biomass stock database and the death rate will be identified through the inverse process, which means the individuals that are measured in the first inventory and that, in the next inventory, are identified as dead, will be inserted in the database as emitter source. The inventory of the necromass is made through the sampling of dead individuals (necromass), i.e., measuring the quantity of carbon emitted per area unit for the necromass, inventorying the dead individuals found inside the plots.

To determine the biomass emitted through the litter, a "trash can" must be installed in the plots for a certain period of time and the amount of biomassand, in consequence, the quantity of carbon emitted that was found in that place are to be accounted for. For example, if in a " trash can" with an 1m² area, a total of 1kg of vegetal biomass was accounted for in one day, in 10.000m², over a one year period, the equivalent to 3650 tons of vegetal biomass will be emitted.

Collection Methodology

The diameter must be collected with a "suta" or a diametric tape with precision up to one decimal place. In the permanent plots, all the measured individuals must be identified and their diameters registered, so in the inventories for later years, it is possible to measure the same diameters at the same height and for the same individuals.
When marking the diameters, the tree's skin should not be taken out and the bole should not be damaged. For the temporary plots, there is no need for identifications or individual markings, as these won't be measured again.

Field Files

At the header of the field file, the following information should be found: name of the person responsible for the inventory team, plot coordinates, name of the place or community, phytopshysiognomy, start and end time, date, plot number and type (permanent or temporary). Apart from the info contained in the header, the field file should have the number of the tree, common name, scientific name, DBH, and qualitative observations, when necessary (see chart 1 – annex).

Accounting Process and Statistical Analysis

The forest inventory allows for the survey of some descriptive statistic such as: minimum, middle, and maximum DBH, variance, standard error, and standard deviation. The minimum DBH is the lowest value found in the inventory, and the maximum DBH is the highest. The middle diameter is determined by the arithmetic mean of the DBH. The variance, standard deviation, and error must be calculated through the respective formulas described by Koehler (1999), as shown below:

Variance (s^2):

$$s^2 = \frac{\left\{\sum x^2 - \left[\frac{\left(\sum x\right)^2}{n}\right]\right\}}{(n-1)}$$

Standard Deviation (s):

$$s = \sqrt{s^2}$$

Standard Error of Sampling (s_x):

$$s_{\bar{x}} = \frac{s}{\sqrt{n}}$$

After the first inventory, the uncertainties will be calculated, and they are:

Sampling Intensity:

$$n = \frac{Nt^2 \times s_x^2}{\left(LE \times \bar{x}\right)^2}$$, where:

n = number of sampling plots;
N = total number of population units
t = value previously defined due to the admitted probability and the freedom degrees;
s_x^2 = variance
LE = error limit accepted on the inventory
X = mean of the population.

Standard Error

$$s_{\bar{x}} = \pm \frac{s_x}{\sqrt{n}} \times \sqrt{(1-f)}$$, where:

s_x = standard error;
s_x = standard deviation;
f = fraction of sampling.

Confidence Interval for the Mean

$$IC = \left[\bar{x} - \left(2 \times s_{\bar{x}}\right) \leq \bar{X} \leq \bar{x} + \left(2 \times s_{\bar{x}}\right) \right] = P$$

Note: Based on the normal distribution, the trust interval will be calculated based on the standard deviation, with a 95.41% probability

Uncertainty

$$inc. = \frac{\bar{x} - \left(2 \times s_{\bar{x}}\right)}{\bar{x}} \times 100$$, where:

Inc. = Uncertainty in %.

In addition to the descriptive statistics, some parameters of the forest must be estimated, such as the amount of trees per area unit, in this case – hectare, basal area, fresh aboveground biomass stock (abg), and total (abg + roots) for the forest and per hectare, and the total and per hectare carbon stocks.

Keeping in mind that the literature demands a minimum precision that of 10%, in case such precision is not reached, it's necessary to increase the sampling intensity until it reaches 10%. And having such goal in mind, more plots should be installed. Below are shown the equations to estimate such parameters:

Number of trees per hectare (N/ha) according to Sanquetta *et al*., (2006)**:**

To know the N/ha, first it is necessary to calculate the proportionality factor, the value that expresses how many times the characters of a sampling unit are represented in one hectare.

$$F = \frac{A}{a}$$

where:

F = proportionality factor;

A = 1 hectare area, i.e., 10,000m²;

a = area of the sampling unit.

$$N = m \times F$$

where:

m = number of trees included in the sampling unit

Basal Area (G), according to Sanquetta *et al*., (2006)**:**

$$G = \sum_{i=1}^{m} g_i \times F$$

where:

g_i = transversal or sectional of each tree *i* for the considered sampling unit

Fresh Aboveground biomass weight (PF_{abg}): fresh weight (PF) of the living matter will be preliminarily estimated, from simple entrance allometric equations (DBH as independent variable), which were developed by Silva (2007).

$$PF_{abg} = 2{,}2737 \times DBH^{1{,}9156}$$

(r^2 = 0.85 and uncertainty = 4.2%), where:

PF_{abg} = fresh weight, in kg;

DBH = diameter at breast height, in cm.

Total Fresh Biomass:

Total fresh biomass is given by: **abg + thick roots**[39]

Fresh Weight estimated, preliminarily, from allometric equation preliminarily estimated, from allometric equations of simple entrance (DBH as independent variable), developed by Silva (2007).

Total and aerial biomass

$$PF_{tot} = 2{,}7179 \times DBH^{1{,}8774}$$

(r^2 = 0.94 and uncertainty = 3.9%), where:

PF_{tot} = Total fresh weight, in kg.

Dried Biomass abg and total:

The dry weight (PS) is obtained, preliminarily, using the water contents determined by Silva (2007), which are, respectively, 40.8% and 41.6%.

$PS_{abg} = (PF_{abg}) * 0.592$

$PS_{tot} = (PF_{tot}) * 0.584$

where:

PS_{abg} = Dried aboveground weight, in kg;

PS_{tot} = Total dried weight, in kg.

Carbon (C) of arboreal vegetation: the C is obtained, preliminarily, using the carbon contents determined by Silva (2007), which is 48,5%.

$C_{abg} = (PS_{abg}) * 0.485$

$C_{tot} = (PS_{tot}) * 0.485$

where:

C_{abg} = Aboveground carbon, in kg;

C_{tot} = Total Carbon, in kg.

To turn the carbon (C) into carbon dioxide (CO_2), all one has to do is multiply the 3.6667 constant, i.e.:

$CO_2 = C * 3.6667$

where:

C = Estimated carbon quantity, in kg.

[39] Thick roots are those that have a base diameter higher or equal to 2 mm; those that have narrower diameters are not considered roots for they are not, empirically, separable from organic matter (IPCC, 2006).

After the field survey, it is necessary to analyze if there are, statistically, differences between the sampling units. To do this, it is necessary to do a Variance Analysis (ANOVA). If there is any significant difference, the averages for the estimated parameters must be analyzed separately. Otherwise, in case there are no significant differences, the averages will be analyzed normally. Below is the chart of ANOVA, described by Koehler (1999):

Variation Sources	**GL**	**SQ**	**MQ**	**F**
Between plots (Treatments)	t - 1	SQE	MQE	MQE/MQD
Inside the plots (residues)	n - t	SQD	MQD	
Total	n - 1	SQT		

Where:
t = Plots numbers;
n = amount of repetitions;
GL = degrees of freedom;
SQ = Sum of the Squares / SQE = Between Plots / SQD = inside the plots / SQT = total;
MQ = Mean of the Squares MQE = Between Plots / MQD = inside the plots;
F = probability.

In case of low probabilities (around 5%), i.e., if the result of the F test is significant for differences between the averages among Primary Units, it is necessary to apply the Tukey post hoc test to identify which ones are the different plots. After identifying the different sampling units, their average must be separately analyzed and weighed for a full assessment of the whole area.

Allometry

This is process will be made only once where the collected data, through the weighing of the sampled individuals, will be used to validate the equation applied to the inventory database. In this case, the data will be collected to validate the equations developed in Manaus (Silva, 2007) and to calibrate it according to the conditions of Juma Reserve. The collection will be made through the destructive method in 100 m² plots, sized 10m x 10m. In each plot, the inventory of every arboreal specie found is to be made, which means measuring every DBH. Then, the botanic identification of every individual and the collection of exsiccatae will be performed. According to Silva (2007), from 100 sampled and weighed individuals is an amount high enough to meet the required precision.

To obtain the real fresh weights, each tree inside this plot will be totally cut and measured. The weights will be determined separately for the trunk, thick and thin branches, leaves, flowers and/or fruits, and thick roots (colon diameter equal or higher than 2 mm). Samples will also be collected to determine the carbon and water contents. After calculating the real weights of each tree, these values will be used to adjust the equation by means of a regression.

Losses due to disturbances

The annual losses, whether or not due to disturbances, will be determined through the continuous forest inventorying. The biomass stock will be determined in the first inventory, and from such inventory, the results of following inventories will say if there was any loss or increase in the forest biomass.

In the event of biomass loss, the possible reasons for such loss are to be analyzed, as well as in the event of forest stock increase. To conclude that there was loss, the result of the first inventory must be higher than the following, and, to conclude that there was increase, the results of the first inventory must be lower than the ones of following years.

Data Processing, Storage, and Publication (*Quality Assessment and Quality Control*)

After the field survey, the inventory data will be processed at the office, where mathematical formulas will be used to estimate the parameters described above. The field files will be digitized using Microsoft Excel®. To process the data, statistical programs will be used, in addition to Microsoft Excel.

The publishing of the data will be made by means of reports and scientific articles published on the internet. The presentation of the data will be made through tables and quantity and stock of biomass and carbon, estimated for Juma reserve and for each area unit (hectare)

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APPENDIX II

Example of plots installation

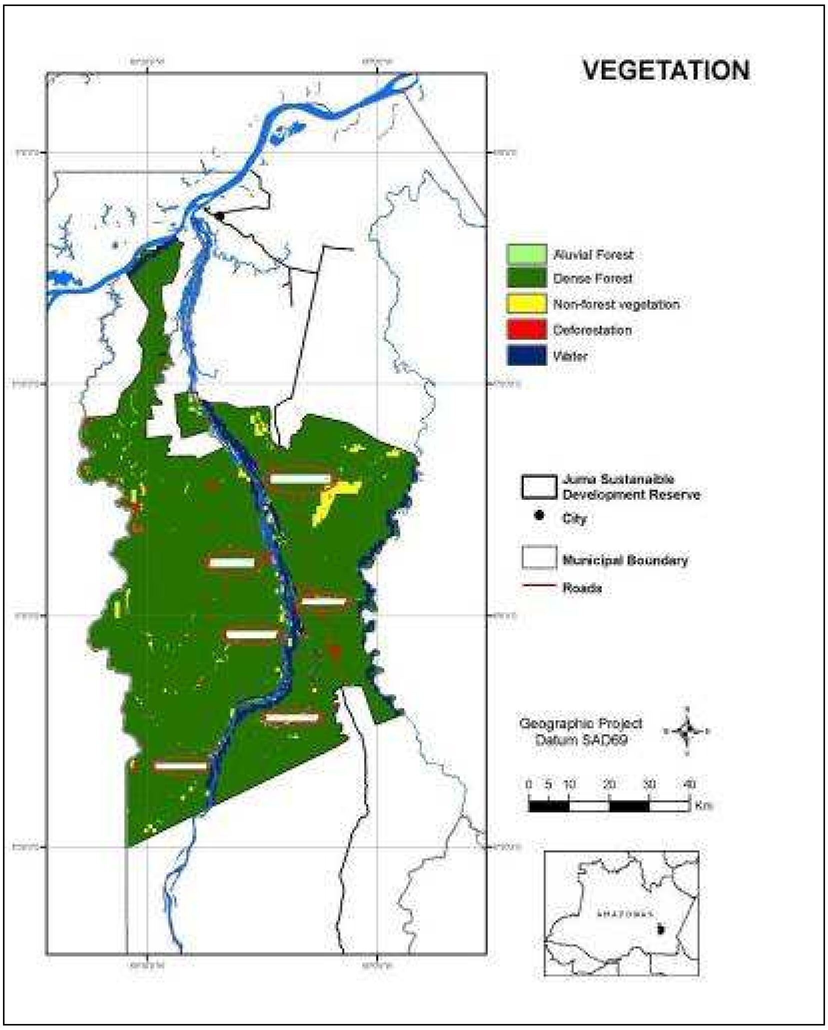
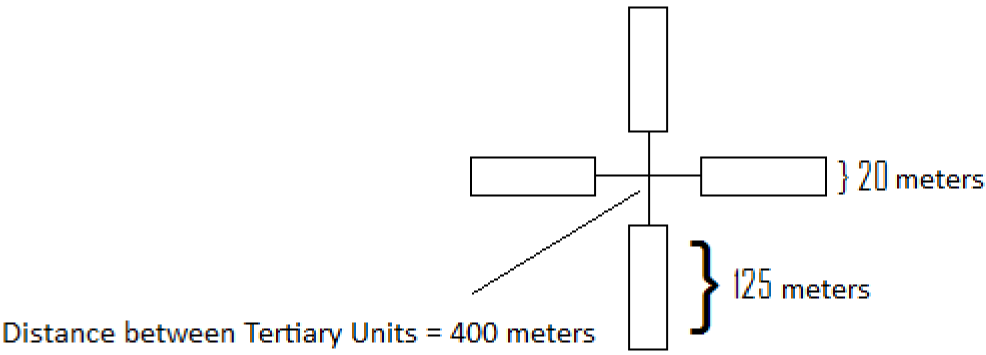
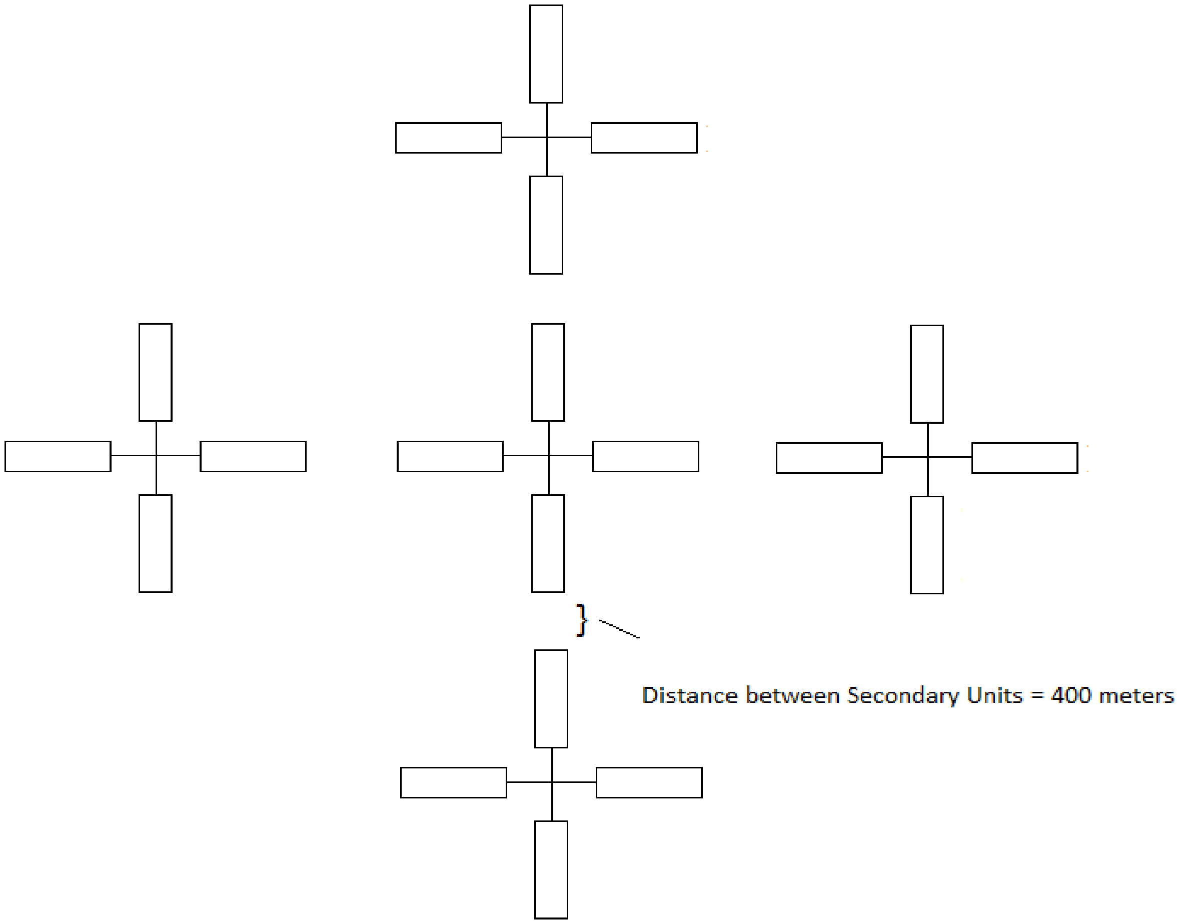


Figure 01 – Example of plots installation along the river

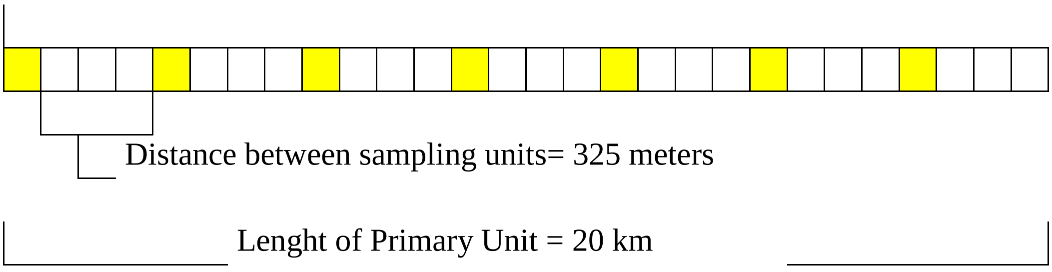
Example of Secondary Unit (option 1)



Example of Primary Unit (option 1)

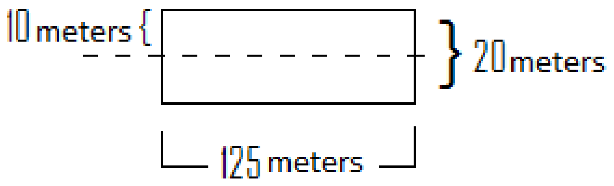


Example of Secondary Unit (option 2)



* Illustrative Example

Example of tertiary unit (option 1) or secondary unit (option 2)



Example of stake's positioning inside each sampling unit

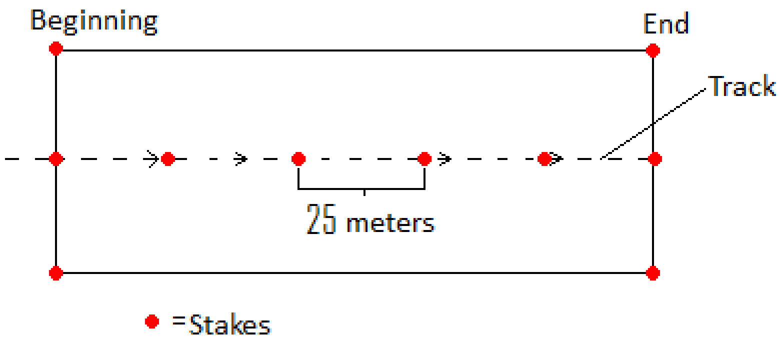


Chart 1 – Illustrative example of the field file

File number				
Name of responsible:			**Hour I:**	**Date:**
Community Name:			**Hour T:**	**Type:**
Coord. X:		**Coord. Y:**	**Plot number:**	**Side:**
N	**DBH**	**Common name**	**Obs.**	

ANNEX XIV – Legal Documents

Figure 01 – Extract of the State Law for Climate Change, that creates a Foundation, to which the environmental services right are passed to

CHAPTER V

FINANCIAL AND TAX INSTRUMENTS

SECTION I

LEGISLATIVE AUTHORIZATION

Art. 6. The Executive Power is authorized to participate in a sole non-profit Private Foundation whose purpose and object are the development and administration of Climate Change, Environmental Conservation and Sustainable Development Programs and Projects as per provisions of Law n.º 3.135, dated June 5, 2007, and of Complementary Law n.º 53, dated June 5, 2007, as well as to manage environmental services and products as defined in this Law.

Sole paragraph. For the purposes under the caput of this article, the Private Foundation Deliberative Council shall be structured as per provided in the Foundation's Bylaws so as to assure that said Council be comprised of 20% to 40% of founding members representing the Public Power.

Art. 7. The State Executive Power is authorized to execute a donation in the amount of up to R$20.000.000,00 (twenty million Reais), to a sole institution in which it is authorized to participate with the purpose of spurring the actions which shall be deemed necessary for the achievement of the Foundation's institutional objectives, under the provisions of article 6 of this Law.

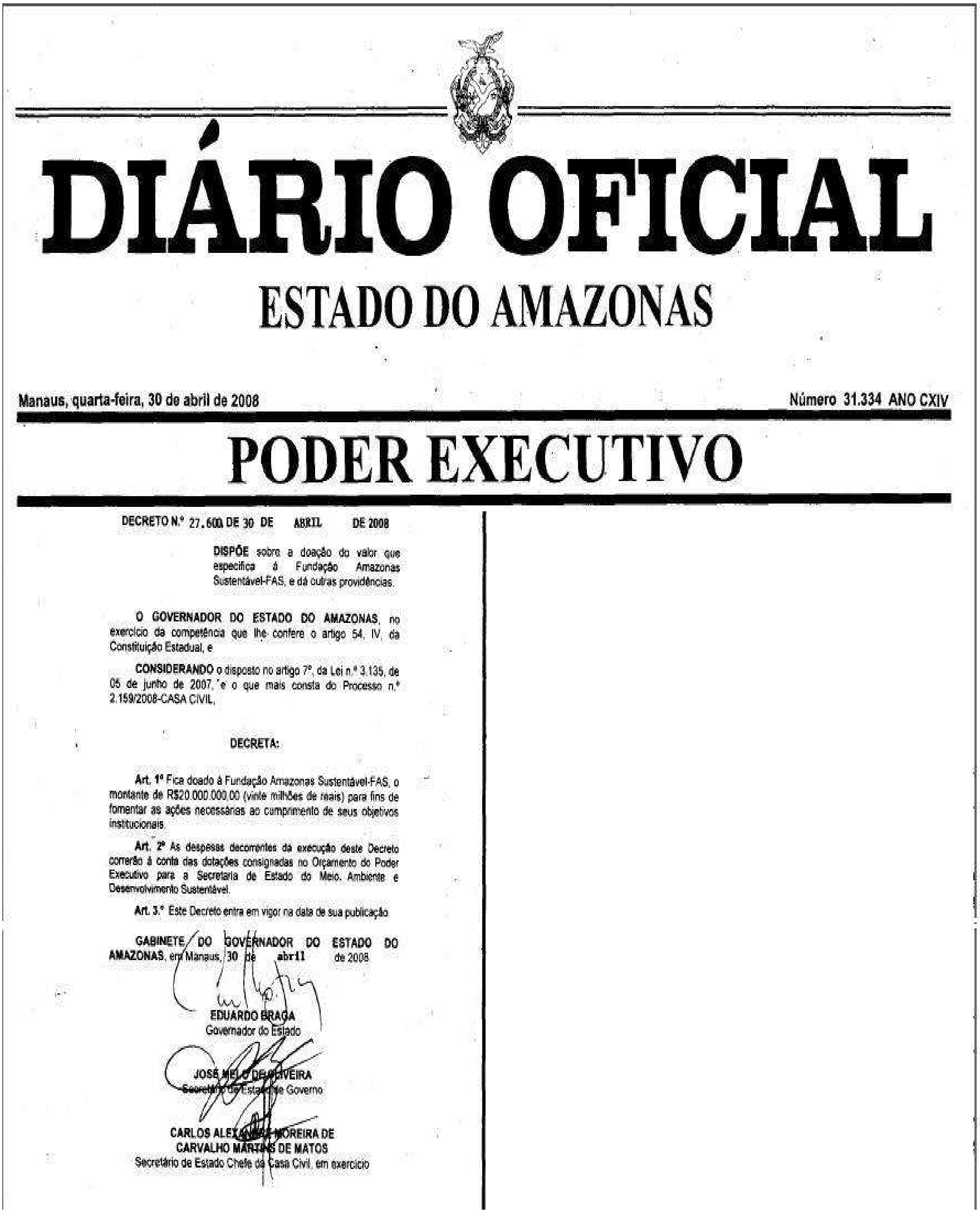
Art. 8. The State Executive Power is authorized to donate to the Private Foundation that is authorized to participate, the environmental services and products as defined in the Complementary Law nº 53, dated June 5, 2007, owned by the State, in the conservation units in compliance with the Sole Annex to this Law, for good and valuable consideration, as foreseen under the sole paragraph of this article.

Sole paragraph. The proceeds resulting from the commercialization of the environmental services and products shall be invested in the implementation of the Conservation Units Management Plans as provided under article 49 of the Complementary Law nº. 53, dated June 5, 2007, and further legal provisions.

Art. 9. The Executive Power is authorized to transfer the right for managing and licensing the seals foreseen under articles 21 and 22 of this Law to the Private Foundation authorized to participate.

Art. 10. The right to manage and license the seals foreseen under the foregoing article shall be granted by the Foundation, by means of a good and valuable consideration contract for an undetermined period of time."

Figure 02 – Law Decree that transfers the R$20.000.000,00 from the Government of the State of Amazonas to the Amazonas Sustainable Foundation - FAS



DIÁRIO OFICIAL

ESTADO DO AMAZONAS

Manaus, quarta-feira, 30 de abril de 2008 — Número 31.334 ANO CXIV

PODER EXECUTIVO

DECRETO N.º 27.600 DE 30 DE ABRIL DE 2008

DISPÕE sobre a doação do valor que especifica à Fundação Amazonas Sustentável-FAS, e dá outras providências.

O GOVERNADOR DO ESTADO DO AMAZONAS, no exercício da competência que lhe confere o artigo 54, IV, da Constituição Estadual, e

CONSIDERANDO o disposto no artigo 7º, da Lei n.º 3.135, de 05 de junho de 2007, e o que mais consta do Processo n.º 2.159/2008-CASA CIVIL,

DECRETA:

Art. 1º Fica doado à Fundação Amazonas Sustentável-FAS, o montante de R$20.000.000,00 (vinte milhões de reais) para fins de fomentar as ações necessárias ao cumprimento de seus objetivos institucionais.

Art. 2º As despesas decorrentes da execução deste Decreto correrão à conta das dotações consignadas no Orçamento do Poder Executivo para a Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável.

Art. 3.º Este Decreto entra em vigor na data de sua publicação.

GABINETE DO GOVERNADOR DO ESTADO DO AMAZONAS, em Manaus, 30 de abril de 2008

EDUARDO BRAGA
Governador do Estado

JOSÉ MELO DE OLIVEIRA
Secretário de Estado de Governo

CARLOS ALEXANDRE MOREIRA DE CARVALHO MARTINS DE MATOS
Secretário de Estado Chefe da Casa Civil, em exercício