

MONITORING REPORT
Version 5

Kamiranga Ceramic Fuel Switching Project

Monitoring period July 01st, 2009 to January 31rd, 2010

CONTENTS

- A. General description of the small scale project activity
- B. Application of monitoring methodology and results

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Kamiranga Ceramic Fuel Switching Project

Monitoring Report Version 5 completed on June 2nd, 2010.

A.2. Description of the small-scale project activity:

Kamiranga Ceramic is a small industry that produces structural ceramic units, mainly for the market in *Belém* and for the northeast of the state of *Pará*. The previous conditions to project activity is the production through inefficient and traditional processes, using native wood without forest management obtained from the Amazon forest to generate thermal energy.

The Amazonian Biome has sufficiently diversified fauna and flora, being inserted in a region of approximately 7 million km². Nowadays, the uncontrolled deforestation is breaking up the firm land forest. Without necessary care, entire regions of fauna and old centers of species have the risk to be disappeared forever¹.

The switching fuel project reduces the greenhouse gases emissions, through substitution of native wood for sawdust, which may be replaced by *açaí* pits, elephant grass and rice husk, for thermal energy generation. This fuel exchange could only be feasible when considering the carbon credits incomes, since the adaptation of kilns to the new biomasses and the purchase of new equipments required considerable investments.

In addition, the climate conditions at the Amazonian biome such as high relative humidity constitute a huge problem for drying the biomasses.

The average relative humidity for the municipality of *Belém* is described in the chart below. *Belém* is the capital of *Pará* State and is 150 km away from *São Miguel do Guamá* municipality. A study carried out by UFPA² points that the average relative humidity at *Belém* is around 80%, and reaches 91% from February to April.

¹Source <http://www.portalsaofrancisco.com.br/alfa/meio-ambiente-mata-atlantica/floresta-amazonica-1.php> Visited on 06/05/2010

²Source <http://www.ufpa.br/beiradorio/arquivo/beira63/noticias/rep4.html> Visited on 06/05/2010

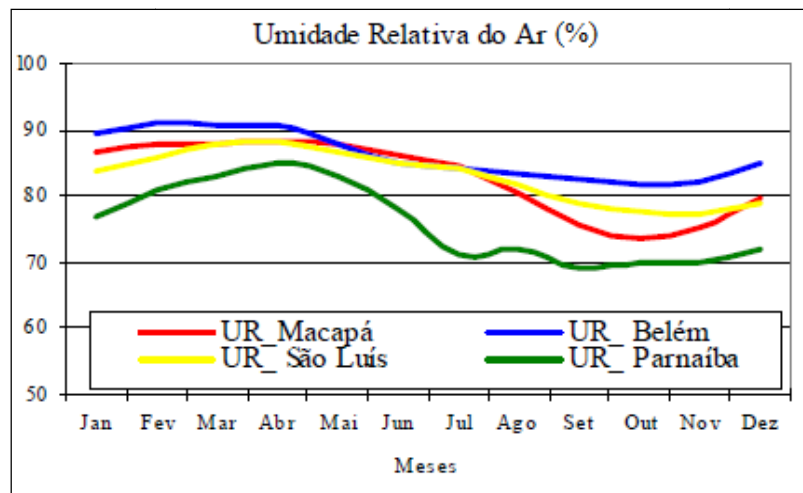


Chart 1. Relative humidity at Belém municipality.

It can be observed that *Belém* presents the highest relative humidity values. Such characteristic represents a huge obstacle when utilizing renewable biomass like sawdust. Under these circumstances, *Kamiranga Ceramic* is storing the sawdust close to the kilns, in order to dry the fuel during its burning cycle.

The main goal of this project activity is to minimize the negative impacts of the deforestation of the Amazonian biome by discouraging the exploitation of the area.

The baseline identified for this project activity is estimated in 23,328 tons of non-renewable native wood per year to provide thermal energy to ceramic kilns.

In opposition to the identified baseline, the project activity will generate thermal energy without stimulating deforestation and will use an abundant renewable biomass.

Before the project was implemented, according to the historical evidence of *Kamiranga Ceramic*, it used nine "Caieiras" kilns, and one "Paulista" kiln. These kilns consumed, together, about 2,251 tons of firewood to produce 2,400 tons of ceramic units fired per month. The wood obtained without a renewable management plan.

Currently, *Kamiranga Ceramic* operates using two "Paulista" kilns, and one "Hoffman" kiln, producing approximately 2,858 tons of ceramic units fired per month, mainly structural bricks with six holes. By the way, the ceramic company can produce structural bricks with eight holes and roof tiles, but only produced through specialized orders.

The technological advance can explain the reduction of biomass needed to maintain the baseline average production. This can be explained due to the higher efficiency of the new kilns.

Caieira kilns have a very low efficiency so the amount of biomass required to produce the same energy is much higher, leading to an increase of costs to acquire biomass. This represents a higher impact to the environment and makes *Hoffman* and *Paulista* kilns a very good technological advance to reduce carbon emissions.

The expected level of activities is to achieve an increase in the burning efficiency due to the use of a dried biomass and its semi-automatic injection. This latter, contributes to reduce the losses, and the air injection considerably helps to increase the burning efficiency.

The Project's contribution for the sustainable development.

The project activity contributes to the reduction of the greenhouse gas (GHG) emissions by diminishing the deforestation of the *Amazonian* biome.

Table 2 shows the approximate area of all the biomes in Brazil, and the area occupied by *Amazonian* biome is highlighted.

Table 1 Brazilian biomes in decreasing order of importance

Brazilian Biomes	Approximate Area (km²)	Area of the biome / Total Brazilian Area (%)
<i>Amazonian</i> biome	4,196,943	49.29
<i>Cerrado</i> biome	2,036,448	23.92
<i>Atlantic Forest</i> biome	1,110,182	13.04
<i>Caatinga</i> biome	844,453	9.92
<i>Pampa</i> biome	176,496	2.07
<i>Pantanal</i> biome	150,355	1.76
Total	8,514,877	100

(Source:

<http://www.ibge.gov.br/home/presidencia/noticias/noticia_visualiza.php?id_noticia=169&id_pagina=1>, visited on March 10th, 2010)

In addition, the project activity will contribute to the level reduction of the greenhouse gas (GHG) emissions and also to the sustainable development of the host country, such as:

- Improving the environmental integrity of the immediate area through a more prudent use of agricultural refuse as biomass for fuel, which in the baseline scenario would be left to decay anaerobically in open dumps;
- Diversifying and improving sources for thermal energy generation;
- Using clean and efficient technologies, which promote the preservation of natural resources in accordance with *Agenda 21* and with Brazilian Sustainable Developments Criteria;
- Acting as a pioneer in demonstrating the viability of implementing innovative technological practices to the ceramic sector as a whole, thus promoting holistic change in the more effective use of renewable biomass and the better realization of more efficient thermal energy generation potential;
- Contributing directly to the conservation of *Amazonian* biome through the use of renewable biomasses.

The *Amazonian* biome occupies around 4,196,943 Km², equivalent to 49.29% of the territory of the country, and is the major tropical forest of the world. The First Brazilian Inventory of Anthropogenic Greenhouse Gas Emissions³ – Background Reports indicates that the major source of GHG emissions in *Brazil* is due to deforestation, mainly occurred in *Amazonian* (59% of the deforestation) and *Cerrado* biomes (26%). Another relevant issue is the concerning deforestation rate in the *Amazonian* biome. Currently, every part of the society sector should be involved in this, and all efforts are necessary to minimize the *Amazonian* biome scenario of degradation and prevent its extinction. Furthermore,

³Available at: <<http://www.mct.gov.br/index.php/content/view/17341.html>>. Last visit on: March 10th, 2010.

this biome is a supply of biodiversity, holding the bigger variety of species in the world; there are still many unknown vegetal and animal species in this magnificent biome⁴.

At the VCS PD version 2.3, October 27, 2009 it was listed that *Kamiranga* Ceramic would utilize sawdust as renewable biomass on its burning process. Moreover, as listed at the same VCS PD section 1.9, “in case of lack of this biomass, the project proponent can use *açaí*, rice husk or elephant grass”. Generally, the amount of renewable biomass may change depending on the harvest, which may occur shortages depending on natural and economic factors. In the specific case of this Monitoring Report, which includes the period from July 1st, 2009 to January 31st, 2010, *Kamiranga* Ceramic utilized sawdust combined with *açaí* pits as renewable fuel.

With the project activity’s implementation, the total spending would be increased if the application of new technology has not been done.

The income from the commercialization of the carbon credits is essential to maintain the costs related to investments of new kilns and fuel switch (According to VCS PD version 2.3, from October 27th, 2009), as this change needs a new process and methodology. This new technology demands more financial resources, making the fuel switching and the continued use of the needed machinery unfeasible without the existence of the carbon markets.

Furthermore as shown on VCS PD the costs related to new kilns acquisition are 289,095.72 BRL for “Hoffmann” kiln and 90,796.00 BRL for “*Paulista*” kiln. Also there are other costs like new sheds, energy systems, dryer systems and all other technological advances listed on VCS PD version 2.3, from October 27th, 2009 to provide the mechanisms to make the fuel switching possible.

Regarding the Financial Barrier, the monitored period also must be considered additional. Therefore, it was made a sensitivity analysis for this period, once the Financial Barrier did not included *açaí* pits on its calculation during validation. The sensitivity analysis was made by summing the amount of sawdust and *açaí* pits that were acquired during the monitored period. This value was compared with the baseline costs, according to VCS PD version 2.3, from October 27th, 2009. As can be verified in the table 2, the project is considered additional.

⁴ Source: PERES, C. A. *Porque precisamos de megareservas na Amazônia. Megadiversidade*, Vol. 1, Número 1, julho 2005. Available at: <http://www.unifap.br/ppgbio/doc/23_Peris.pdf>. Checked at: March 10th, 2010.

[illegible]

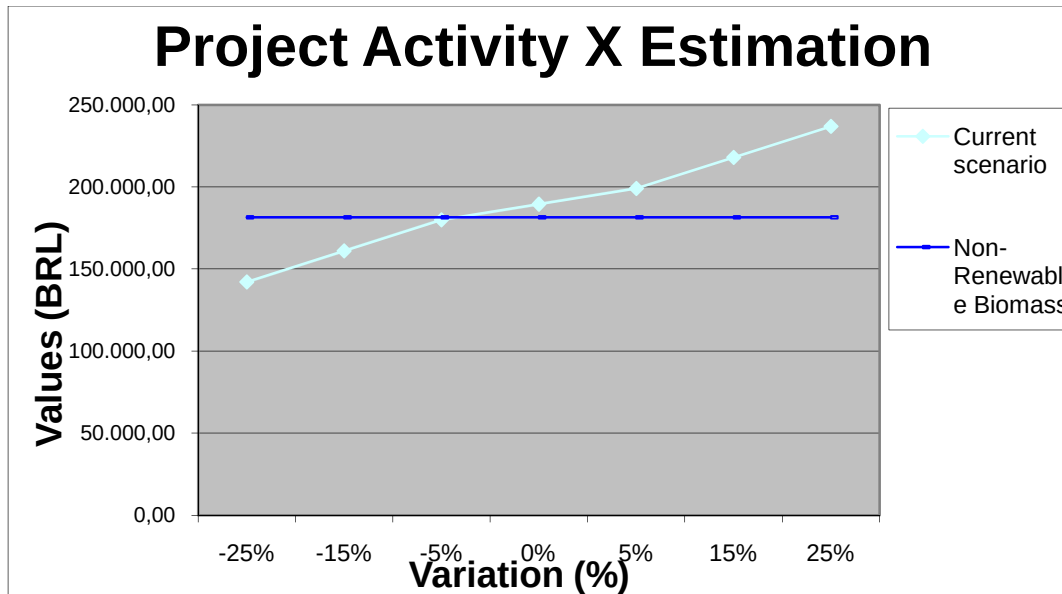


Chart 2 Sensitivity Analysis of Kamiranga Ceramic

With the project activity's implementation, the total spending has increased, as can be verified at the table above. The income from the commercialization of the carbon credits is essential to maintain the fuel switch, as this change needs more resources than previously to maintain operations. This puts the ceramic in a less competitive situation, which would make the fuel switching and the continued use of the needed machinery unfeasible without the existence of the carbon markets.

The monitoring data was kept according to monitoring plan described in VCS PD. The project activity utilizes as renewable biomass sawdust and *açaí* pits. The emissions reductions due to the switching non renewable biomass to renewable biomass resulted in **21,063tCO₂e** during the monitoring period of July 1st, 2009 to January 31st, 2010.

A.3. Current status of the project activity:

VCS PD has been validating by the Designated Operational Entity TÜV Nord Cert GmbH and this present monitoring report will be verified by Designated Operational Entity Bureau Veritas Certification (BVC).

The monitoring data was kept according to monitoring plan described in VCS PD. The project activity in this crediting period employs sawdust and *açaí* pits in the ceramic burning process. The emission reductions due to the switching non-renewable biomass (native wood) to renewable biomass resulted in **21,063 tCO₂equ** during the monitoring period of July 1st, 2009 to January 31rd, 2010.

The main reason the proponent choose to add *açaí* pits as fuel alongside with sawdust, is its high offer in the region during seasonal *açaí* harvest.

In terms of *açaí* pits, the state of *Pará* is the biggest producer of *açaí*⁵ (*Euterpe oleraceae*) in Brazil. The pits are easily found, especially in *Belém*, which is the major consumer of *açaí* in the State of *Pará*.

It is important to add that the fact that the Kamiranga Ceramic started the use of *açaí* pits did not compromised the additionality of the project shown in the VCS PD.

⁵ *Importância Económica do Açaí*. Available at: <http://minhasfrutas.blogspot.com/2008/12/importancia-economica-do-aai.html>. Visited on April 27th, 2009.

SECTION B. Application of monitoring methodology and results

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

Category AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User (Version 01 from February 01 of 2008 onwards)

Reference: Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

B.2. Monitoring period

This report refers to data registered during July 1st, 2009 and January 31rd, 2009.

B.3. Data and parameters applied/fixed:

Data / Parameter:	EF_{projected fossil fuel}
Data unit:	tCO ₂ /TJ
Description:	CO ₂ Emission factor of residual fuel oil
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Available at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf . Page 2.18. Table 2.3. Visited on May 4 th , 2009.
Value applied:	77.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	In the baseline scenario, the probable fossil fuel that would be consumed in the absence of native wood without sustainable forest management would be the heavy oil. This fuel is more expensive than wood, however it can be a more plausible of substitute of wood than natural gas due to risks involving natural gas distribution.
Any comment:	Applicable for stationary combustion in the manufacturing industries and construction. The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel.

Data / Parameter:	NCV_{biomass}
Data unit:	TJ/ton
Description:	Net Calorific Value
Source of data used:	Quirino W. F., Vale A. T.; Andrade A. P. A., Abreu, V. L. S.; Azevedo A. C. S. Calorific Value of Wood and Wood Residues . Biomassa & Energia, v. 1, n. 2, p. 173-182, 2004. Available at: < http://www.renabio.org.br/arquivos/p_poder_lignocelulosicos_11107.pdf >. Visited on April 27 th , 2009.
Value applied:	0.0182
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value provides the energy generated by the amount of wood that would be used in the absence of the project.
Any comment:	The species used to calculate the average value are typical trees of Amazon Biome that are usually employed as fuel in the ceramic industries of the region. IPCC default values shall be used only when country or project specific data are not available or difficult to obtain, according to "Guidance on IPCC default values" (Extract of the report of the twenty-fifth meeting of the Executive Board, paragraph 59).

Data / Parameter:	ρ_{wood}
Data unit:	ton/m ³
Description:	Specific gravity
Source of data used:	Quirino W. F., Vale A. T.; Andrade A. P. A., Abreu, V. L. S.; Azevedo A. C. S. Calorific Value of Wood and Wood Residues . Biomassa & Energia, v. 1, n. 2, p. 173-182, 2004. Available at: < http://www.renabio.org.br/arquivos/p_poder_lignocelulosicos_11107.pdf >. Visited on April 27 th , 2009.
Value applied:	0.67
Justification of the choice of data or description of measurement methods and procedures actually applied :	The amount of wood used in the baseline was measured by volume units, so this data is used to the unity conversion.
Any comment:	The species used to calculate the average value are typical trees of Amazon Biome and usually employed as fuel in the ceramic industries of the region.

Data / Parameter:	BF_y
Data unit:	tons of wood per tons of ceramic units fired
Description:	Baseline consumption of non-renewable biomass per thousand of ceramic devices produced in year y
Source of data used:	Historical data from project proponent
Value of data	0.81
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value was acquired through the average consumption and production of ceramic devices during the years when the ceramic companies used to consume non-sustainable wood. If nowadays the plants still used native firewood their consumption would be around 2.251.8 tons of native firewood per month to produce 2,780 tons of ceramic devices. This value was employed to calculate the real amount of wood displaced to maintain the ceramic production in the baseline scenario.
Any comment:	

B.4. Data and parameters monitored:

Data / Parameter:	PRy																							
Data unit:	Tons of ceramic units fired per month																							
Description:	Production of ceramic devices																							
Source of data to be used:	Controlled by the project proponent.																							
Value of data applied for the purpose of calculating expected emission reductions	Brick weight used to calculate the production in tons: 1.588 kg (9x14x19). <table><tr><th>Year</th><th>Month</th><th>PRy - Production (tons of ceramic units fired)</th></tr><tr><td rowspan="7">2009</td><td>July</td><td>2,858</td></tr><tr><td>August</td><td>2,858</td></tr><tr><td>September</td><td>2,858</td></tr><tr><td>October</td><td>2,858</td></tr><tr><td>November</td><td>2,858</td></tr><tr><td>December</td><td>2,858</td></tr><tr><td>Total 2009</td><td>17,150</td></tr><tr><td rowspan="2">2010</td><td>January</td><td>2,858</td></tr><tr><td>Total 2010</td><td>2,858</td></tr></table>	Year	Month	PRy - Production (tons of ceramic units fired)	2009	July	2,858	August	2,858	September	2,858	October	2,858	November	2,858	December	2,858	Total 2009	17,150	2010	January	2,858	Total 2010	2,858
Year	Month	PRy - Production (tons of ceramic units fired)																						
2009	July	2,858																						
	August	2,858																						
	September	2,858																						
	October	2,858																						
	November	2,858																						
	December	2,858																						
	Total 2009	17,150																						
2010	January	2,858																						
	Total 2010	2,858																						
Description of measurement methods and procedures to be applied:	The measurement was done by an internal control sheet monitored by the project proponent, which was fed daily. The production was calculated in tons ,through the number of units fired times the average weight of the brick type. For a more conservative calculation the average weight was rounded down. The production is a representative sample to ensure that all appliances are still in operation																							
QA/QC procedures to be applied:	The ceramic has an internal control of the quantity of pieces produced. It was rechecked according to the biomass employed and the kiln consumption of renewable biomass.																							
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.																							

Data / Parameter:	Q _{renbiomass}																																						
Data unit:	tons per month																																						
Description:	Amount of renewable biomass used																																						
Source of data to be used:	Measured by the project proponent																																						
Value of data applied for the purpose of calculating expected emission reductions	The project proponent preferentially employed açaí in its burning process during the currently crediting period, as can be verified in the table below. <table><tr><th rowspan="2">Year</th><th rowspan="2">Month</th><th colspan="2">Q_{renbiomass} (tons)</th></tr><tr><th>Sawdust/wood chips</th><th>Açaí pit</th></tr><tr><td rowspan="7">2009</td><td>July</td><td>43.49</td><td>583.46</td></tr><tr><td>August</td><td>90.00</td><td>733.36</td></tr><tr><td>September</td><td>61.89</td><td>545.98</td></tr><tr><td>October</td><td>87.10</td><td>370.42</td></tr><tr><td>November</td><td>71.06</td><td>527.04</td></tr><tr><td>December</td><td>37.60</td><td>609.92</td></tr><tr><td>Total 2009</td><td>391.15</td><td>3493.66</td></tr><tr><td rowspan="2">2010</td><td>January</td><td>46.81</td><td>873.24</td></tr><tr><td>Total 2010</td><td>46.81</td><td>873.24</td></tr></table>				Year	Month	Q _{renbiomass} (tons)		Sawdust/wood chips	Açaí pit	2009	July	43.49	583.46	August	90.00	733.36	September	61.89	545.98	October	87.10	370.42	November	71.06	527.04	December	37.60	609.92	Total 2009	391.15	3493.66	2010	January	46.81	873.24	Total 2010	46.81	873.24
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2010	January	46.81	873.24																																				
	Total 2010	46.81	873.24																																				
Description of measurement methods and procedures to be applied:	The amount of renewable biomass was monitored in accordance to the weight described in the receipts or invoices from the providers. It was utilized the Specific Gravity in order to convert from m³ to tons. Data applied were: <table><tr><th>Biomass</th><th>Sawdust/wood chips</th><th>Açaí pit</th></tr><tr><td>Specific gravity (tons/m³)</td><td>0.35</td><td>0.723</td></tr></table> Sawdust: SIMIONE F. J. Análise Diagnóstica E Prospectiva Da Cadeia Produtiva De Energia De Biomassa De Origem Florestal No Planalto Sul De Santa Catarina – Available at: <http://hdl.handle.net/1884/10294>. Visited on April 24th, 2009. Açaí: PADILHA et al. Avaliação do Potencial dos Caroços de Açaí para a geração de energia. Biomassa & Energia, v. 2, n. 3, p. 231-239, 2005. Available at: <http://www.renabio.org.br/publicacoes.php?l=revista&volume=2&numero=3>. Visited on May 15th, 2009.				Biomass	Sawdust/wood chips	Açaí pit	Specific gravity (tons/m³)	0.35	0.723																													
Biomass	Sawdust/wood chips	Açaí pit																																					
Specific gravity (tons/m³)	0.35	0.723																																					
QA/QC procedures to be applied:	The ceramic has spreadsheets of the quantity of biomass acquired. It was rechecked according to the receipts of purchase.																																						
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.																																						

Data / Parameter:	Origin of Renewable Biomass
Data unit:	Not applicable
Description:	Renewable origin of the biomass
Source of data to be used:	Controlled by the project proponent
Value of data applied for the purpose of calculating expected emission reductions	Renewable biomass
Description of measurement methods and procedures to be applied:	This information was given by the biomasses providers in case of sawdust. As stated in the section 2.2, the biomasses (sawdust, rice husk, elephant grass and açai pits) are considered renewable as fulfilling the options described in the methodology applied.
QA/QC procedures to be applied:	The biomass was considered as renewable if it was according to the definition given by the applied methodology. Furthermore, documents proving the origin of renewable biomass from forested resources were provided.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	Leakage of non-renewable biomass
Data unit:	tCO ₂ e
Description:	Leakage resulted from the non-renewable biomass
Source of data to be used:	Monitored
Value of data	0
Description of measurement methods and procedures to be applied:	The three sources of leakages predicted in methodology applied were monitored. Scientific articles, official statistical data, regional and national surveys were provided in order to ensure that there is no leakage from non-renewable biomass (or to estimate the leakage).
QA/QC procedures to be applied :	Data available regarding the ceramic industry fuel consumption were employed to monitor the leakage.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	Renewable biomass surplus						
Data unit:	tons or m ³						
Description:	Amount of renewable biomass available						
Source of data to be used:	Monitored						
Value of data	<table border="1"> <thead> <tr> <th>Harvest</th><th>2008</th></tr> </thead> <tbody> <tr> <td>Sawdust (m³)</td><td>347,838.7</td></tr> <tr> <td>Açaí Pits (tons)</td><td>90,973.8</td></tr> </tbody> </table> Detailed information in section 4.1 – LEAKAGE.	Harvest	2008	Sawdust (m ³)	347,838.7	Açaí Pits (tons)	90,973.8
Harvest	2008						
Sawdust (m ³)	347,838.7						
Açaí Pits (tons)	90,973.8						
Description of measurement methods and procedures to be applied:	It was used to calculate the leakage of renewable biomass. The sources of leakages predicted in methodology applied were monitored. The measurement of the leakage was based in national and international articles and databases every monitoring period. These sources provided information about the biomass availability in the project activity's region.						
QA/QC procedures to be applied :	Data available regarding the ceramic industry fuel consumption were employed to monitor the leakage.						
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.						

Data / Parameter:	$f_{NRB,y}$
Data unit:	Percentage
Description:	Fraction of biomass (wood) used in the absence of the project activity is established as non-renewable biomass using survey methods
Source of data to be used:	Survey methods.
Value of data applied for the purpose of calculating expected emission reductions	92.28
Description of measurement methods and procedures to be applied:	Before the project activity, wood from areas without forest management was offered with low prices and high viability to the ceramics owner. Thus, the totality of fuel employed in the baseline scenario is from non-renewable origin. However, according to Klink (2005)⁶, Amazonian Biome has only 7.7% of its total area with sustainable use. Furthermore, considering that 0.014% of this biome has been saved by other project activities, thus, 92.28% is considered as a fraction of non-renewable biomass.
QA/QC procedures to be applied:	The monitoring of this parameter was based in national and international articles and database every monitoring period. The sources provided information about the sustainable use of Amazonian biome. Wood saved from projects with same biome and applied methodology developed by <i>Carbano Social Serviços</i>

⁶ KLINK, C. A. ; MACHADO, R. *Conservation of the Brazilian Cerrado*, Belo Horizonte, v. 1, n. 1, p. 147-155, 2005. Available at: <http://faculty.jsd.claremont.edu/emorhardt/159/pdfs/2006/Klink.pdf>. Visited on May 15th, 2009.

	<i>Ambientais LTDA.</i> was considered in this fraction. CDM or VCS registered projects will also be included in this fraction if placed in the same region and methodology.
Any comment:	It was employed in order to estimate the amount of non renewable biomass. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

B.5. Calculation of emission reductions

The Category AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User (Version 01 from February 01 of 2008 onwards) comprises small thermal appliances that displace the use of non-renewable biomass by introducing new renewable energy end-user technologies. The project's emissions from the combustion of native wood are accounted in the same way as fossil fuel combustion, once it is not renewable and emits CO₂. The project activity generates less than the limits of 45 MW_{thermal} for Type I Small scale project activities.

Baseline

$$ER_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossilfuel} \quad (\text{Equation 01})$$

Where:

ER_y :	Emission reductions during the year y in tCO ₂ e
B_y :	Quantity of biomass that is substituted or displaced in tons
$f_{NRB,y}$:	Fraction of non-renewable biomass (wood) used in the absence of the project activity in year y
$NCV_{biomass}$:	Net calorific value of non-renewable biomass in TJ/tons
$EF_{projected\ fossil\ fuel}$:	Emission factor for the projected fossil fuel consumption in the baseline in tCO ₂ /TJ ⁷ .

B_y is determined using the option b of the Methodology:

Calculated from the thermal energy generated in the project activity as:

$$B_y = \frac{HG_{p,y}}{\eta_{old} \times NCV_{biomass}} \quad (\text{Equation 02})$$

Where:

$HG_{p,y}$:	Quantity of thermal energy generated by the renewable energy in the project in year y in TJ.
η_{old} :	Efficiency of the system being replaced

$$HG_{p,y} = SGE \times PR_y \quad (\text{Equation 03})$$

Where:

SGE :	Specific energy which has to be generated in the process to produce a certain amount of ceramic devices in TJ/tons of ceramic units
PR_y :	Amount of product produced in year y in tons of ceramic units fired

$$\eta_{old} = \frac{SGE}{SFE} \quad (\text{Equation 04})$$

Where:

⁷ The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel.

SFE: Specific fuel energy needed for the process to produce a certain amount of ceramic devices in TJ/ tons of ceramic units

$$\text{SFE} = \text{BF}_y \times \text{NCV}_{\text{biomass}} \quad (\text{Equation 05})$$

Where:

BF_y: Consumption of non renewable biomass per tons of ceramic units fired in year y

Using the Equations 3, 4 and 5 in the Equation 2 it results to:

$$\text{B}_y = \text{PR}_y \times \text{BF}_y \quad (\text{Equation 06})$$

B.6. Monitoring results

Leakage (LE)

The methodology AMS-I.E.-Switch from Non-Renewable Biomass for Thermal Applications by the User – version 01 from February 01 of 2008 onwards predicts the following possible three sources of leakage:

A) If the project activity includes substitution of non-renewable biomass by renewable biomass, leakage in the production of renewable biomass must be considered

The leakage from the project activity, was estimated according to the “General guidance on leakage in biomass project activities” (attachment C of appendix B) of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, which identifies different emission sources based on the type of biomass considered (described in the Table 1.

Table 1. Sources of leakage according to the type of the biomass.

Biomass Type	Activity/ Source	Shift of pre project activities	Emissions from biomass generation/ cultivation	Competing use of biomass
Biomass from forests	Existing forests	-	-	X
	New forests	X	X	-
Biomass from croplands or grasslands (woody or non-woody)	In the absence of the project the land would be used as a cropland/wetland	X	X	-
	In the absence of the project the land will be abandoned	-	X	-
Biomass residues or waste	Biomass residues or wastes are collected and used.	-	-	X

Observing Table 1, the source of leakage of the present project activity is the competing use of biomass for biomass residues or waste and the emissions from biomass generation/cultivation in case of biomass from cropland.

Elephant grass

In case of using elephant grass it will be cultivated in pasture or degraded areas, in which there is no vegetation to be deforested. Therefore, this practice will not generate competing use of biomass and it will not deforest a vegetated area, therefore the leakage that would be applicable is the emissions from biomass generation/cultivation. Currently, elephant grass has been acquiring national importance as biomass⁸ to generate thermal energy due to its high productiveness and easy adaptation in almost all climate and soil Brazilian conditions; it also dismisses the use of fertilizers (NPK)⁹. In case of using this kind of biomass, the project developer will cultivate, by himself, elephant grass in abandoned areas, in which there is no vegetation to be deforested. Therefore, this practice will not generate competing use of biomass and it will not deforest a vegetated area, i.e. only the leakage from biomass cultivation will be monitored in case of its use.

⁸ Source: <www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292> Visited on March 20th, 2009.

⁹ Source: <www.cnpqgl.embrapa.br/nova/informacoes/pastprod/textos/17Instrucao.pdf> Visited on March 20th, 2009.

Forest residues

Forest Residues are also a probable fuel to be used for the ceramic units burning. The production of wood generates a large amount of residues, which can be reused to generate thermal energy. As can be observed in the Figure 1, the potential of energy generation in the state of *Pará* is high, which means that there is an enormous availability of this kind of fuel to be employed in the project activity. This way, this biomass does not have potential to generate leakage emissions due to its high availability.

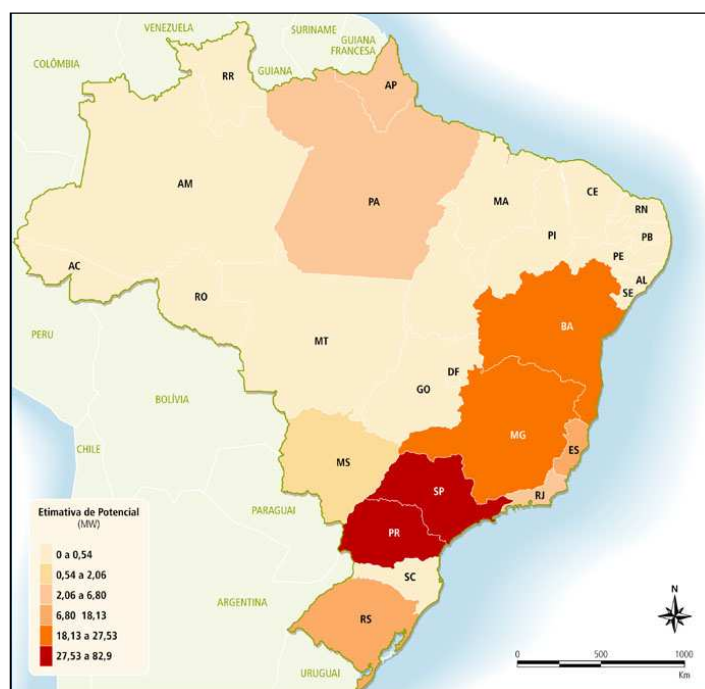


Figure 1. Forest Residues Potential for Energy Generation¹⁰

Considering that around 22% of the wood produced will generate sawdust¹¹, the production of wood in the state of *Pará* was of 1,581,085 m³ in 2008,¹² thus, 347,838 m³ will generate sawdust.

The project activity employed approximately 1,300 m³ of woodchips/sawdust in this seven months of the monitoring period, which represents around 0.38% of the total of these residues generated in the State of *Pará*.

¹⁰ CENTRO NACIONAL DE REFERÊNCIA EM BIOMASSA - CENBIO. *Panorama do potencial de biomassa no Brasil*. Brasília; Dupligráfica, 2003. 80 p. apud ELETROBRÁS 1º Fórum Capixaba de Energia < <http://www.aspe.es.gov.br/PALESTRAS/Renata%20Falc%C3%A3o%20-%20Energias%20Renov%C3%A1veis-Vit%C3%B3ria%20Final.pdf> > Last visit on April 20th, 2010.

¹¹ BRITO EO. *Estimativa da produção de Resíduos na Indústria Brasileira de Serraria e Laminação de Madeira*. Rev. da Madeira. v.4. n.26. 1995, pp. 34-39.

¹² According to IBGE (Geographic and Statistic Brazilian Institute). Available at: <<http://www.ibge.gov.br/estadosat/temas.php?sigla=pa&tema=extracaovegetal2008>>. Last visit on: March 11th, 2010.

This way, this renewable biomass does not have potential to generate leakage emissions due to its high availability.

Açaí Pits

In terms of *açaí* pits, the state of *Pará* is the biggest producer of *açaí* (*Euterpe oleraceae*) in Brazil. The pits are easily found, especially in *Belém*, which is the major consumer of *açaí* in the State of *Pará*. The *açaí* is the basis of the daily alimentation of the population in this state, where is widely cultivated. Nevertheless, its residues are still without adequate economic destination¹³.

The production of *açaí* in the state of *Pará* in the year of 2008 was 107,028 tons¹⁴. The pit corresponds to 85% of the weight of *açaí*¹⁵; therefore the *açaí* pit production was around 90,973 tons in the year of 2008. The project activity would employed approximately 4,250 tons of *açaí* pits in this seven months of the monitoring period,¹⁶ representing around 4.67% of the total of the amount produced. Therefore, the project activity will not disturb in any aspects this renewable fuel market once there is plenty of this kind of biomass available.

This way, these renewable biomasses does not have potential to generate leakage emissions due to its high availability.

Demand of Biomasses

There are no data regarding the demand for the biomasses in the State of *Pará*. However, according to *Barbosa* (2009)¹⁷, it is a common practice in sawmills the generation of methane due to the decay of sawdust in their onsite places. However, currently, there is a very low demand for sawdust in the State of *Pará*. Furthermore, according to *Townsend* (2001)¹⁸, at the place where the *açaí* is processed, there is a lot of *açaí* pits left to decay once they have very low utility. Therefore, the demand for the renewable biomasses used by the ceramic companies is very low.

B) Leakage relating to the non-renewable biomass shall be assessed from ex-post surveys of users and areas from where biomass is sourced.

The following potential sources of this type of leakage were identified:

¹³ SILVA, I. T. et al. *Uso do caroço de açaí como possibilidade de desenvolvimento sustentável do meio rural, da agricultura familiar e de eletrificação rural no estado do Pará*. 2004. Available at: <<http://www.feagri.unicamp.br/energia/agre2004/Fscommand/PDF/Agrener/Trabalho%2059.pdf>>. Last visit in: January 15th, 2009.

¹⁴ Available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=pa&tema=extracaovegetal2008>. Last visit on March 2nd, 2010.

¹⁵ Source: <<http://minhasfrutas.blogspot.com/2008/12/importancia-economica-do-aai.html>>. Last Visit in: January 15th, 2009.

¹⁶ Considering that the monitoring period encompasses 11 months, and it was utilized 2,274.558 tons.

¹⁷ *Barbosa D.* - *Do Globo Amazônia, em São Paulo*. Available at: <<http://portalamazonia.globo.com/noticias.php?idN=77689&idLingua=1%20-%2044k>>. Visited on April 27th, 2009.

¹⁸ *Townsend C. R., Costa N. L., Pereira R. G. A., Senger C. C. D.* *Características químico-bromatológica do caroço de açaí*. Nº 193, ago./01, p.1-5 Available at: http://www.cpafo.embrapa.br/Pesquisa/public/2001/outros/Cot_193.PDF. Visited on May 15th, 2009.

- Use/diversion of non-renewable biomass saved under the project activity by non-project households/users who previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable biomass used by the non-project households/users attributable to the project activity then baseline is adjusted to account for the quantified leakage.
- Use of non-renewable biomass saved under the project activity to justify the baseline of other project activities can also be potential source of leakage. If this leakage assessment quantifies a portion of non-renewable biomass saved under the project activity that is used as the baseline of other project activity then baseline is adjusted to account for the quantified leakage.
- Increase in the use of non-renewable biomass outside the project boundary to create non-renewable biomass baselines can also be potential source of leakage. If this leakage assessment quantifies an increase in use of non-renewable biomass outside the project boundary then baseline is adjusted to account for the quantified leakage.

The carbon credits incomes stimulate the use of renewable biomass to other ceramics presenting a huge possibility for sustainable development in the region. Therefore, the sources of leakages mentioned above are not applicable since the project activity does not displace the use of renewable biomass of a non-project user, due to the likely decrease in the use of non-renewable biomass in the region and there is current great amount of renewable biomasses available locally as described before. The non-renewable biomass employed which would be employed in this project activity is not being saved for other project activity, since other ceramics was already consuming wood from non sustainable forest management (common practice).

It decreases the using of non-renewable biomass, especially due to the incentive of carbon credits.

Therefore, it can be concluded that there is no source of leakage to be considered in this project activity.

C) If the equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered,

The leakage is not applicable for this project activity at Kamiranga Ceramic as there is no transference of equipment, in spite of new equipments had to be acquired,

Due to all the explanations described above, the present project activity does not encompass any type of leakage,

Production – QA/ QC procedure results

Table 2. Production and biomass predicted and monitored at Kamiranga Ceramic

Qrenbiomass - QA/QC Procedure			
Parameter		VCS PD	From July 2009 to January 2010
PRy (tons of ceramic units fired)		19,460	20,009,
Qrenbiomass (tons)	Sawdust	2,338.00	437.96
Qrenbiomass (tons)	Açaí pit	-	4,234.42
Thermal Energy (TJ)		34.37	52.32

Thermal energy per thousand pieces produced (TJ/tons of ceramic units fired)	0.0018	0.0026
Double Check (QA/QC Procedure)	The thermal energy generated per thousand of ceramic devices produced at Kamiranga Ceramic on the monitored period were enough compared to the VCS PD.	

Emission Reductions

Table 3. Production (PRy), quantity of wood that is substituted (By) and emission reductions (ER) during the crediting period per month.

	Month	PRy - Production (tons of ceramic units fired)	By (tons)	ERy (tCO ₂ e)
2009	July	2,858	2,315	3,009
	August	2,858	2,315	3,009
	September	2,858	2,315	3,009
	October	2,858	2,315	3,009
	November	2,858	2,315	3,009
	December	2,858	2,315	3,009
	Total 2009	17,150	13,890	18,054
2010	January	2,858	2,315	3,009
	Total 2010	2,858	2,315	3,009
Emission Reductions from 01.07.2009 to 31.01.2010				21,063

Table 4. Amount of wood that was substituted (By) and emission reductions (ER) during the crediting period per period.

Period	By (tons)	ER (tCO ₂ e)
From July to December – 2009	17,150	18,054
January - 2010	2,858	3,009
Total of Emission Reductions from 01.07.2009 to 31.01.2010		21,063

Therefore, based on Category AMS-I,E: Switch from Non – Renewable Biomass for Thermal Application by the User (Version 01 from February 01 of 2008 onwards) and on monitored data as well considering the high contribution to sustainability, the project proponent request carbon credits due to emissions reductions achieved by the project activity resulted in **21,063 tCO₂e**. The contribution to sustainability will be monitored applying the Social Carbon methodology, which is based in six main pointers: Technology; Natural; Financer; Human; Social and Carbon Resources.

B.7. Date of completion of the monitoring report and the name of the responsible person(s)/entity(ies)

The responsible for project monitoring is *Gladyson Vieira* from Kamiranga Ceramic.

This monitoring report was completed on June 2nd, 2010 by *Raul Pedri Feldmann* from *Social Carbon Company*.