Voluntary Carbon Standard
Kamiranga Ceramic Project Description

19 November 2007

Date of the VCS PD: October 27, 2009

Contents

1 Description of Project:

1.1 Project title

Kamiranga Ceramic Fuel Switching Project

Version 2.3

VCS PD completed on October 27th, 2009.

1.2 Type/Category of the project

The voluntary project activity, although being applied at the voluntary market, encloses the following category of the simplified modalities and procedures, which is described in appendix B, for small scale type I CDM project activities.

- **Category AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User** – Version 01 from February 01 of 2008 onwards.
- This is not a grouped project.

This category comprises small thermal appliances that displace the use of non-renewable biomass by introducing new renewable energy end-user technologies.

1.3 Estimated amount of emission reductions over the crediting period including project size:

The amount of emission reductions are greater than 5,000 tons of CO_2 equivalent and less than 1,000,000 tons of CO_2 equivalent, thus classifying as a project under the VCS 2007.1 size groups (micro project, project, mega project), as can be verified in Table 1.

Table 1. Emission reductions estimate during the crediting period

Year	**Emission Reductions (tCO_2e)**
2008	35,125
2009	35,125
2010	35,125
2011	35,125
2012	35,125
2013	35,125
2014	35,125
2015	35,125
2016	35,125
2017	35,125
Total Emission Reductions (tCO_2e)	351,250
Number of years of the crediting period	10
Annual average of estimated emissions reductions for the 10 years of crediting period (tCO_2e)	35,125

1.4 A brief description of the project:

Kamiranga Ceramic is a small industry that produces structural ceramic units (bricks), mainly for the market in *Belém* and for the northeast of the state of *Pará*. In the past few years the fuel employed to fire the ceramic units was native wood obtained through deforestation of the Amazon forest, which led to the deforestation of this biome.

The Amazonian Biome has sufficiently diversified fauna and flora, representing 60% of all Brazilian territory. 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 completely disappeared[1].

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

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.

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

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

The ceramic facility is located in Brazil, in the state of *Pará*, in the north region of the country. The geographic location is illustrated in Figure 1.

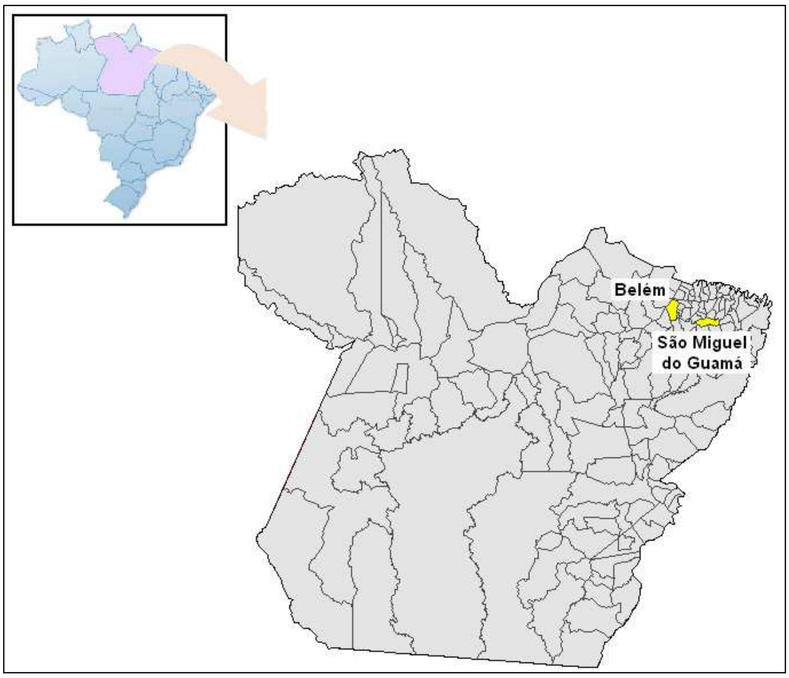

Figure 1. Geographic location of *São Miguel do Guamá* which has the following coordinates: 01º 37' 09.22'' S, 47º 28' 33.68'' W.

The project site has the following geographic locations and postal address:

[1] *Margulis S. Causas do Desmatamento da Amazônia Brasileira. BANCO MUNDIAL. Brasil Julho 2003. Available at: <http://siteresources.worldbank.org/BRAZILINPOREXTN/Resources/3817166-1185895645304/4044168-1185895685298/010CausasDesmatamentoAmazoniaBrasileira.pdf>. Visited on June 23th, 2009.*

Company name: *Kamiranga Indústria e Comércio Ltda*

Address: Estrada Santa Rita da Barreira, km 04 – s/n– Zona Rural – CEP: 68660-000 – São Miguel do Guamá – PA

Ceramic Coordinates: 1°36'53.0"S and 47°26'31.6"W

1.6 Duration of the project activity/crediting period:

- Project start date[2]: September 1st,2007
- Crediting period start date[3]: January 1st, 2008
- Date of terminating the project[4]: December 31st,2017
- VCS project crediting period: 10 years, twice renewable

1.7 Conditions prior to project initiation:

The conditions prior to project activity are the production through inefficient and traditional processes, using wood without forest management to generate thermal energy.

The use of native wood without sustainable management as fuel is a prevalent practice among ceramics industries in Brazil. Wood from deforestation is delivered and utilized in the ceramic facility, and this non-renewable biomass offered at low prices[5].

Although firewood from deforested areas has been used for many decades as fuel in Brazil, it is impossible to define a start date on which this kind of non-renewable biomass began to be applied. Firewood was used as a primary source of energy until the decade of 1970, when petroleum began to supply the majority of Brazilian´s energy needs.[6] Since the 1970s, Brazilian´s Energy and Mine Ministry has been monitoring all energetic sectors of Brazil, and their research indicates that firewood has been a significant source of thermal energy for ceramic sector[7].

Before the project was implemented, according to the historical evidence of Kamiranga Ceramic, it used nine "Caieiras" kilns[8], and one

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[2] *Date on which the project began reducing or removing GHG emissions. The event that establishes this date is the end of the Hoffman kiln construction.*

[3] *Date on which the first monitoring period commences. The event which establishes this date is the complete substitution of native firewood to renewable biomasses.*

[4] *Date on which the project completes 10 years after the date on which the project proponent completed the fuel switch.*

[5] *Seye, Omar. Análise de ciclo de vida aplicada ao processo produtivo de cerâmica estrutural tendo como insumo energético capim elefante (Pennisetum Purpureum Schaum) / Omar Seye. Campinas, SP: [s.n.], 2003. Available at: < http://libdigi.unicamp.br/document/?code=vtls000411276>. Visited on April 22nd, 2009.*

[6] *BRITO, J.O. Energetic use of Wood. Available at: <http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&tlng=ES>. Last visit on: March 9th, 2009.*

[7] *Energy Research Company. National Energy Balance - energy consumption per sector. Available at: <https://ben.epe.gov.br/BEN2007_Capitulo3.aspx>. Visited on April 22nd, 2009.*

[8] *“Caieira” kilns are commonly employed in small ceramic industries. It is a tank shaped kiln with horizontal and vertical or square and rectangular openings through which the wood is fed directly on the floor. This kiln has a very low efficiency rate and is gradually being replaced by more efficient kilns.*

"Paulista" kiln. These kilns consumed, together, about 1,944 tons of native firewood to produce 2,400 tons of ceramic units fired per month.

Therefore, the baseline identified for this project activity is estimated in 27,021 tons of non-renewable native wood per year to provide thermal energy to ceramic kilns. On the other hand, the project activity intends to use *sawdust*, renewable biomass, for the energy supply.

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

Emission reductions will be achieved by a cessation of the use of wood obtained from areas without sustainable forest management plans in the generation of thermal energy. As the combustion of native wood using deforestation methods was not offset by replanting, the use of renewable biomasses with this project does absorb carbon- resulting in a carbon neutral cycle.

1.9 Project technologies, products, services and the expected level of activity:

Currently, Kamiranga Ceramic operates using two "Paulista" kilns, and one "Hoffman" kiln (Figure 2); producing 2,780 tons of ceramic units fired in 38 burning cycles (30 cycles in “hoffman”, and 4 in each “Paulista”).

The “Paulista” is a kind of intermittent kiln with rectangular shape and lateral furnaces. The burning cycle with “Paulista” kilns comprises 6 hours to load the kiln with ceramic units, 40 hours of heating, 8 hours of firing, 24 hours of cooling, 6 hours to download, and approximately 30 minutes to clean. At Kamiranga Ceramic, one “Paulista” kiln produces approximately 43.22 tons of ceramic units per burning cycle, and the other “Paulista” kiln produces approximately 60 tons of ceramic units per burning cycle.

“Hoffman” kilns have parallel chambers where the heat from one chamber is used in the next, therefore recycling the generated heat in the previous chambers. The fuels are fed through entrances located on the top of this kiln. The most common fuels that are used in this type of kiln are fire wood and sawdust. The burning cycle with “Hoffman” kiln comprises 1 hours to load the kiln with ceramic units, 16 hours of heating, 40 minutes of firing, few hours of cooling, 1 hours to download, and approximately 30 minutes to clean. The “Hoffman” kiln at Kamiranga Ceramic produces approximately 78.86 tons of ceramic units per burning cycle.

Figure 2."Hoffman" kiln at Kamiranga Ceramic.

The kilns achieve the temperature of about 900ºC as described in Table 2.

Table 2 Technical parameters in which situation

Situation	Baseline		Project Activity	
Kilns	*Caieira*	*Paulista*	*Paulista*	*Hoffman*
Number of Kilns	9	1	2	1
Type of biomass	Non-renewable Native firewood		Renewable sawdust	
Monthly Production (tons of ceramic units fired)	2,400		2,780	
Consumption of biomass[9] (tons of biomass per tons of units produced)	0.81		0.12	
Clay's consumption (m^3 per month)	2,590		3,000	
Maximum Temperature of kiln (°C)	900		900	
Average Production per burning cycle (tons of ceramic units)	44.06		73.13	

[9] *Measured by the project proponent.*

The amount of ceramic units produced can present a small variation each month, however the number described herein (2,780 tons of ceramic units per month due to the increase of demand) was adopted to estimate the baseline emissions in this VCS PD.

Initially, the products to be manufactured in project activity scenario are 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 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. Furthermore, the use of a biomass with a smaller size and bigger surface area contributes to a better distribution of the energy inside the kilns. Therefore, it is expected to maintain the standard or even raise the production quantity and quality even with the barriers further detailed in section 2.5 of this document.

The sawdust employed in the project activity will be acquired from legal saw mills (http://www.sectam.pa.gov.br/seiamlic) [10] . The enterprises listed in this website have all the necessary licenses which ensures that the saw mills utilize wood from areas with sustainable forest management. The purpose is to use approximately 100% of sawdust which may be replaced by açaí pits, elephant grass and rice husk.

The main biomass providers are listed at the Table 3; nevertheless, it does not exclude the possibility of buying renewable biomass from others.

Table 3. Main renewable biomass providers

Biomass	Providers	City
Sawdust	Cikel	*Belém – PA*
	Madeportes	*Benevides – PA*

Due to the project activity, a set of new technologies was necessary. The ceramic facility had to adjust its “Paulista” kiln as well as to construct two new kilns (Hofmann and Paulista) to replace the “Caieiras” (Figure 3), which had to be disabled once they were unfeasible to adapt them for the use of renewable biomass. Furthermore, a new electrical system and its substation had to be constructed to operate the new kilns and their system of injection which operates with six mechanic burners and other motors to inject air.

These new technologies require new services and new employees, for example, to supply the kilns gradually not to clog the mechanic burners.

Furthermore, there were new services in order to as adjustments in the kiln entrances of the “Paulista” kiln to work with the mechanic burners.

It is very gainful for the ceramic the opportunity of using other kinds of biomasses because when there is a lack of one of them, the ceramic can use others such as açaí pits, rice husk and elephant grass, depending on their availability.

[10] Environmental Information System of the state of Pará. According to Environmental Legislation of the State of Pará, the industries which use forested material raw have to ensure the sustainable management of their forested resources to be able to get their licenses. More information available at: http://www.belem.pa.gov.br/semma/paginas/Lei-5_887.htm. Visited on April 22nd, 2009.

Currently, elephant grass has been acquiring national importance as biomass to generate thermal energy due to its high productiveness and easy adaptation in almost all climate and soil Brazilian conditions[11].

All of these changes were made counting on this project approval.

Figure 3. "Caiera" kiln being disabled at Kamiranga Ceramic.

1.10 Compliance with relevant local laws and regulations related to the project:

This project is in accordance to the CONAMA[12] Resolution, no. 237/97 which establishes that clay extraction activities and ceramic production must be supported by specific licenses, such as operational license, clay extraction license, environmental licenses and the permission of the Environmental Secretary of *Pará* (SEMA[13]) which must run under the valid time.

The project is also in accordance to Federal Constitution, Article 20, which establishes the payment of a Financial Compensation by the Mineral Resources Exploitation. This financial compensation is annually performed to DNPM (National Department of Mineral Production[14]) due to the clay exploitation.

[11] *EMBRAPA, Intrução Técninca para o Produtor de Leite- Formação e utilização de pastagemd e capim elefante. Available from: <www.cnpgl.embrapa.br/nova/informacoes/pastprod/textos/17Instrucao.pdf>. Visited on April 23rd, 2009.*

[12] *CONAMA (National Environmental Council), created in 1981 by Law 6.938/81, is the Brazilians' department responsible for deliberation and consultation of the whole national environmental policy and it is chaired by the Minister of Environment. It is responsible for the establishment of standards and criteria relating to licensing of potentially polluting companies. More information is available at http://www.mma.gov.br/port/conama/estr.cfm. Visited on April 22nd, 2009.*

[13] *SEMA is the Environment Secretary in the State of Pará, responsible to issue the environmental licenses according to CONAMA resolution 237/97. More information at: www.sema.pa.gov.br. Visited on April 23rd, 2009*

[14] *The objectives of the National Department of Mineral Production are: to foster the planning and promotion of exploration and mining of mineral resources, to*

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

- Price of the renewable biomasses

The thermal energy generation through the combustion of biomasses is an innovation in the ceramic industry. The future demand of this alternative fuel e.g. by other consumers is not easy to foresee. There is currently a great amount of these types of biomasses available locally, however, it is possible that the demand and the prices would increase as well. If this scenario occurs, the carbon credit income will make the continue use of renewable biomasses feasible.

- Availability of the renewable biomasses

The current abundant amount of the biomasses available locally was already described herein, however if a non-foreseeable reason affect the availability of the biomasses, the ceramic owner will seek to other types of renewable biomasses, such as elephant grass and rice husk.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

Kamiranga Ceramic used to supply the kilns with native wood, to generate thermal energy in order to fire ceramic units, for more than ten year, since the beginning of its operation in 1997.

Thus, Kamiranga *Ceramic's* previous production methods used native wood; clearly confirming that the project was not implemented to create GHG emissions for the purpose of its subsequent removal or destruction.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates.

The project is not creating any other form of environmental credit under any specific program.

Social Carbon Methodology[15] is being applied only as a Sustainability tool in association with VCS 2007.1 Standard.

supervise geological and mineral exploration and the development of mineral technology, as well as to ensure, control and monitor the exercise of mining activities throughout the national territory, in accordance with the Mining Code, the Mineral Water Code and respective legislation and regulations that complement them. Available at: http://www.dnpm.gov.br/enportal/conteudo.asp?IDSecao=168&IDPagina=222. Visited on April 23rd, 2009.

[15] *Social Carbon Methodology was developed by Ecológica Institute (www.ecologica.org.br). It was founded on the principle that transparent assessment and monitoring of the social and environmental performance of projects improves their long-term effectiveness. The methodology uses a set of analytical tools that assess the social, environmental and economic conditions of communities affected by the project, and demonstrates through continuous monitoring the project's contribution to sustainable development.*

1.14 Project rejected under other GHG programs (if applicable):

This project was not rejected under any formal GHG reduction or removal program. The project report was produced to make the project public and available to voluntary measures or other opportunities in the carbon market.

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

Project Proponent

The project proponents contributed to the current report by assigning the following roles and responsibilities to two members of its team:

Mr. *Sigifério Alves de Oliveira*, Director and owner: Information about the ceramic company, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramics units market challenges.

Mr. *Márcio Monteiro*, monitoring responsible: General data and information on inputs and outputs of the ceramic company, detailed information on the acquisition of renewable biomasses and how this data is kept by the controller's office.

Other information on the project's proponent:

Contact:

- Company name: Kamiranga Indústria e Comércio Ltda

Address: Estrada Santa Rita da Barreira, km 04 – s/n– Zona Rural – CEP: 68660-000 – São Miguel do Guamá – PA

Ceramic Coordinates: 1°36'53.0"S and 47°26'31.6"W

phone number: +55 (91) 3446 1206

Project Developer

Carbono Social Serviços Ambientais Ltda: Project participant, project idealizer and responsible for preparing VCS PD and Social Carbon Report.

The assessor directly involved is:

Thales Andrés Carra: Project Design Document writer, direct contact between *Carbono Social Serviços Ambientais Ltda* and the ceramic facility, and are responsible for collecting the necessary information for the project.

Coordinated by:

Flávia Yumi Takeuchi and *Rafael Ribeiro Borgheresi*.

Other information on the project's developer's contact:

Phone number: +55 (11) 2649 0036

Address:

R. Borges Lagoa, 1065 – Conj. 144 – Vila Clementino

CEP: 04038 032, São Paulo – SP, Brasil

Web site: http://www.socialcarbon.com

Email: thales@socialcarbon.com

flavia@socialcarbon.com

rafael@socialcarbon.com

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information):

The project is eligible according to:

- Legislative: the project attends all legal requirements;
- Technical: alterations/adaptations required are technically feasible;
- Economic: fuel switching project requires high investments;
- Sectoral: incentive of good practices to the sector;
- Social: social carbon methodology will be applied which will improve long term sustainability. The culture of burning wood as fuel will be slowly mitigated;
- Environmental: the project attends all legal requirements and no environmental impacts are predicted;
- Geographic /site specific: the plant can be uniquely geographically identified with no barriers regarding logistic;
- Temporal information: the project will not double count the GHG emissions during the ten years renewable of the crediting period.

Furthermore, there is no information relevant for its eligibility which is not already described in this VCS PD.

1.17 List of commercially sensitive information (if applicable):

None of the information exposed to the validator was withheld from the public version of the report.

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

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

The amount of non-renewable biomass (B_y) will be determined according to the option "b" of the applied methodology once option "a" is designed for really small appliances like household stoves and does not fit for the kind of projects in question.

The project's emissions from the combustion of native wood are accounted in the same way as fossil fuel combustion, as it is not renewable and emits CO_2.

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The methodology applied is Category *AMS-I.E: Switch from Non–Renewable Biomass for Thermal Applications by the User* – Version 01 from February 01 of 2008 onwards; which is applicable for project activities that avoid greenhouse gas emissions by using renewable biomass in order to generate thermal energy.

This category comprises small thermal appliances that displace the use of non-renewable biomass by introducing new renewable energy end-user technologies. The end-user technology in the case of this project can be established as the project proponent, who utilizes the thermal energy generated by the new renewable energy technology.

There are no similar registered small-scale CDM project activities in the region of *São Miguel do Guamá* once Social Carbon Company conducted a research and did not find any registered small–scale CDM Project activity in the region. The sources of registered small-scale CDM project activity consulted were the United Nations Framework Convention on Climate Change (UNFCCC)[16] and Brazilian´s Technology and Science Ministry[17]. Therefore, the proposed project activity is not saving the non-renewable biomass accounted for by the other registered project activities.

The utilization of firewood from area without any kind of management can not be considered a renewable source of biomass, since it involves a decrease of carbon pools and increases the carbon emissions to the atmosphere. Moreover, the native wood provided from areas without a reforestation management plan does not fit any of the options of UNFCCC definition of renewable biomass in Annex 18, EB 23.

Furthermore, firewood has been used for many decades as fuel in Brazil[18]. Although, it is impossible to define a start date on which

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[16] *CDM activities registered by CDM Executive board are Available at:< http://cdm.unfccc.int/Projects/registered.html>. Visited on April 23rd, 2009.*

[17] *Brazilian´s Technology and Science Ministry is responsible for registry and approval of all CDM activities within Brazilian boundaries. CDM activities submitted to the Brazilian Inter-Ministerial Commission of CDM Activities are available at: http://www.mct.gov.br/index.php/content/view/47952.html. Visited on May 15th, 2009.*

[18] *UHLIG, A. Lenha e carvão vegetal no Brasil: balance oferta-demanda e métodos para estimação de consumo, tese de doutorado, Universidade de São Paulo, São Paulo, 2008. 156 p. Available at:*

this kind of non-renewable biomass began to be applied, there are many documents to prove that wood has been used for thermal energy generation before 1989 as requested in the applied methodology. Firewood used to be the most employed source of primary energy until de decade of 1970, when the petroleum started to supply the majority of Brazilian's energy needs[19]. Moreover the Brazilian's Energy and Mine Ministry has been monitoring every energetic sectors of Brazil since 1970, and firewood appears over the years monitored as a significant source of thermal energy for ceramic sector[20]. Especially in the ceramic sector, the use of firewood is visible non-renewable and unsustainable, involving negative environmental impacts associated[21].

This way, it can be concluded that non-renewable biomass has been used since 31 December 1989.

Sawdust/wood chips are forest residues while açaí pits and rice husk are agro-industries residues, so they are considered renewable according to option V of methodology definition of renewable biomass: "The biomass is the non-fossil fraction of an industrial or municipal waste". Besides, sawdust, açaí pits and rice husk are common residues in the region generated.

The elephant grass is considered renewable according to option III, as soon as it fit all the assumptions below:

"The biomass is non-woody biomass and originates from croplands and/or grasslands where:

(a) The land area remains cropland and/or grasslands or is reverted to forest; and

(b) Sustainable management practices are undertaken on these land areas to ensure in particular that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and

(c) Any national or regional forestry, agriculture and nature conservation regulations are complied with."

Moreover, the project activity will annually generate less than 45 MWThermal.

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

According to the applied methodology, the project boundaries for the project are the physical, geographical areas of the use of biomass or the renewable energy, thus, the ceramic facility limits.

In the baseline scenario, there is use of non-renewable biomass to burn ceramic goods in the ceramics' kilns. This practice is responsible to discharge in the atmosphere the carbon that was stored inside of the wood (well-known by a carbon sink). Table 4 shows gases included in the project boundary and a brief explanation.

<http://www.teses.usp.br/teses/disponiveis/86/86131/tde-14052008-113901/>. Visited on April 23rd, 2009.

[19] *Brito, J.O."Energetic use of Wood". Available at: <http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&tlng=ES>. Visited on April 23rd, 2009.*

[20] *National Energy Balance- energy consuption per sector. Available at: <http://www.mme.gov.br/download.do?attachmentId=16555&download>. Visited in March 24th, 2009.*

[21] *UHLIG, A. Lenha e carvão vegetal no Brasil: balance oferta-demanda e métodos para estimação de consumo, tese de doutorado, Universidade de São Paulo, São paulo, 2008. 156 p. Available at: <http://www.teses.usp.br/teses/disponiveis/86/86131/tde-14052008-113901/>. Visited on March 24th, 2009.*

Table 4 Gases included in the project boundary and brief explanation.

	Gas	Source	Included?	Justification/ Explanation
Baseline	CO_2	Emission from the combustion of non-renewable biomasses	Yes	The major source of emissions in the baseline
	CH_4	-	No	Deforestation rates will probably decay. Excluded for simplification. This is conservative.
	N_2O	-	No	Possibly emissions from wood burning will be excluded for simplification. This is conservative.
Project Activity	CO_2	-	No	Excluded for simplification. This emission source is assumed to be very small.
	CH_4	-	No	Excluded for simplification. This emission source is assumed to be very small.
	N_2O	-	No	Excluded for simplification. This emission source is assumed to be very small.

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

Observing Table 5, the common fuels employed and therefore, the baseline candidates are: natural gas, charcoal, wood, other recuperations, diesel oil, fuel oil, liquefied petroleum gas, others from petroleum, piped gas, electricity and others none specified.

A probable baseline scenario would be the use of Natural Gas. However, there is no distribution/gas pipe in the region [22], excluding this possibility.

The most probably scenario in the absence of native wood would be the use of fuel oil, which is not viable considering its higher prices when compared with non-renewable biomass. Even tough, fuel oil presents a higher Net Calorific Value when compared with non-renewable firewood; the costs with Fuel Oil are higher because of their expensive prices. Fuel Oil presents an average price of 0,895R$/Kg and the firewood used to present an average price of 19.40 R$/ton in the baseline scenario. These values lead us to conclude that the price of oil fuel around 0.000090587R$/Kcal[23] as long as the price of this kind of wood is around 0.00000754R$/Kcal [24] utilizing the Net Calorific Value of both fuels. Therefore, the cost with the employment of oil fuel is higher than the

[22] *Source : http://www.gismaps.com.br/gasnatural/gasnatural.htm. Visited on April 24th, 2009.*

[23] *According to data values and facts from "Estudo Comparativo da Queima de Óleo BPF e de Lenha em Caldeiras". Available at: <http://www.abcm.org.br/xi_creem/resumos/TE/CRE04-TE01.pdf>. Visited on April 24th, 2009.*

[24] *According to the values of native wood paid at Kamiranga Caramic before the project activity (33.58 BRL per ton) . The values of NCV and density utilized are the same utilized in monitoring parameters (NCV=0.0182 TJ/t and specific gravity=0,67 ton/m^3).*

utilization of firewood. Besides, the fuel oil requires more technology to be inserted. The conclusion is that use of fuel oil is not attractive at all.

Table 5 Distribution of fuel employed on the ceramic sector in Brazil.

BRAZILIAN ENERGY BALANCE 2008[25] - CERAMIC SECTOR EVALUATION Unit: 10^3 Tone of oil equivalent			
FUEL	**2005**	**2006**	**2007**
Natural Gas	831	901	960
Charcoal	70	42	33
Wood	1,710	1,762	1,885
Other recuperations	36	32	35
Diesel Oil	9	8	7
Fuel Oil	268	285	313
Liquified Petroleum Gas	148	151	153
Others from Petroleum	71	76	170
Piped gas	0	0	0
Electricity	270	276	284
Others non specified	0	0	0
TOTAL	**3,412**	**3,533**	**3,841**

The baseline is identified as the amount of non-renewable wood displaced with the fuel switch. The overall characteristics of the ceramic goods production are used to obtain the real amount of non-renewable biomass used in the baseline scenario.

The identified baseline for this project activity nowadays would employ 1,944 tons of native wood per month, the fuel most commonly employed in Brazilian ceramic industries, to provide thermal energy to the ceramics' industries kilns and obtain an approximate temperature of 900ºC, in order to produce 2,780 tons of ceramic units fired per month. The wood consumption of the kiln in the baseline scenario is around 0.81 tons of wood per tons of pieces produced.

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

The methodology applied is Category *AMS-I.E: Switch from Non – Renewable Biomass for Thermal Applications by the User* – Version 01 from February 01 of 2008 onwards which is applicable for project activities that avoid greenhouse gas emissions by using renewable biomass in order to generate thermal energy.

Furthermore, the project activity will annually generate less than 45 MWthermal.

To demonstrate that the project is additional it will be used the test 1 of section 5.8 of the Voluntary Carbon Standard - Specification for the project-level quantification, monitoring and reporting as well as validation and verification of greenhouse gas emission reductions or removals.

Test 1 – The project test

Step 1: Regulatory Surplus

[25] *Brazilian Energy Balance, Available at: http://www.mme.gov.br/download.do?attachmentId=16555&download. Visited on May 15th, 2009.*

The project is not mandated by any enforced law, statute or other regulatory framework in Federal, State and Municipal levels in the survey performed.

Step 2: Implementation Barriers

The project faces distinct barriers compared with barriers faced by alternative projects.

- **Financial barrier**

Due to the implementation of the project activity, the ceramic had to purchase machines to automatically inject the biomass with air inside the kilns, once when using wood, the fuel was manually inserted by operators in the kilns, a procedure which is unfeasible when employing sawdust. The project proponent also acquired thermocouples and constructed sheds.

When the new production techniques were introduced at the ceramic plant, there was an adaptation period and a testing period. For the adaptation of the kilns a still period of a burning cycle for each kiln had to be considered. Also the testing period of approximately six months, required in order to identify the correct burning curve, lead to waste of considerable amount of biomass (average 25%) in each burning cycle. All this resulted in prejudice for the company financial profit and loss balance.

Due to all mentioned reasons the ceramic industry had to deal with a high investment that made the ceramic responsible think about stopping the fuel switching project.

The demonstration of the main investments due to the project activity can be checked in Table 6.

Table 6. Investments due to the project activity

Investment	
Costs with mechanic burner and semi-injection system acquisition (including freight) (BRL)	33,966.44
Costs with monitoring system acquisition (including freight) (BRL)	12,475.00
Costs with Hoffman Kiln Construction (BRL)	289,095.72
Costs with the New *Paulista* Kiln Construction (BRL)	90,796.00
Costs with dryer system constructed (BRL)	68,729.72
Costs with the new electrical system construction (BRL)	49,223.16
Loss of revenues - period for adaptation of the kiln for biomass (BRL)	18,000.00
Waste of products in the testing period (6 months) (BRL)	54,000.00
New sheds construction (BRL)	1,078,315.40
Total Invested (BRL)	**1,694,601.44**

- **Technological barrier**

As affirmed before, the use of wood from areas without sustainable forest management is a traditional and well-known process, and as a result of the sudden change, a lot of effort from each employee in the ceramic facility was necessary. The main technological barriers were the non-availability of human knowledge to operate and maintain the new technology, the internal logistic modification, and the employee's resistance to the new technology.

Before the project activity, the process was noticeably different; native wood was inserted in the kilns by the employees and it was not necessary any machine experience or logistic modification, e.g., nowadays, the new biomass must be stored in cover sites and needs to be dried in order to achieve a better burn efficiency.

The operators did not have knowledge of the ideal amount of renewable biomass that was necessary to achieve the temperature of about 900ºC for the ceramic goods firing, to acquire the final product with the same quality and to maintain the optimal process as they did when using native wood, adding a significant amount of insecurity to the production process.

The employees must be careful not to supply the kilns with large amounts of biomass, which can clog the new entrance of the kiln, designed especially for the project activity, and consequently, cause disorder in the burning process. So, the kiln's supplying has to be done gradually, demanding even more time and labor from the employees.

The ashes produced from the burning of sawdust, which form a crystallized solid, force the ceramic facility employees to clean the kilns at the end of every burning process. As a result there have been some new openings once the biomass requires more labor, like to clean the kilns and transport by shed to the kilns.

Furthermore, there was a lack of infrastructure to utilize the new technology. The region of *São Miguel do Guamá* is well known for not being updated with new technologies in the Ceramic sector and very resistant to changes or improvements to its work process and general practices. This way, a set of adaptations were necessary, such as adjustments in the "Paulista" kiln entrances, the construction of a shed to keep the biomass away from the rain and to maintain it dried in order to increase its efficiency in the burning process; and the construction of a "Hoffman" and another "Paulista" kiln since the "Caieras" had to be disabled.

Moreover, the use of new biomasses represented a high risk to the project proponent once, although, there is currently a great amount of these types of biomasses available locally, it is possible the unavailability of the biomasses. It may happen because thermal energy generation through the combustion of biomasses is an innovation in the ceramic industry and their future demand (e.g. by other consumers) is not easy to foresee.

This means that *Kamiranga* Ceramic had to find the best procedure to handle with the new technology, i.e. the new biomass, logistic and machines.

All these changes were made counting on this project approval in order to the ceramic facility become able to receive the biomass to be used. *Kamiranga* Ceramic, with this project activity, intends to develop its burning process in order to reduce losses.

The ceramic sector is very resistant to changes and improvements in its work process. The modifications required for the fuel switch are an innovation in the region and represent a first step in the sector to revert this situation. This way, it will also stimulate regional development.

- ***Institutional barrier***

Since the kilns had to be constructed to burn the new biomasses, and there was a lack of qualified work force to manage these new logistic, it was necessary to submit some workers to training and capacitating.

The new biomass presented a larger volume changing the established logistic system of the ceramic facility.

These arrangements require the ceramic's facility employees to have or get specific expertise and knowledge where such experience is lacking. Because of this, promoting the new arrangement involves a significant institutional barrier.

Step 3: Common Practice

According to the GHG Protocol for Project Accounting, common practice analysis shall be carried out following:

1. Define the product or service provided by the project activity.

The product of the project activity is ceramic blocks.

2. Identify possible types of baseline candidates.

Observing
Table 7, the common fuels employed in the ceramic sector and therefore, the baseline candidates are: natural gas, charcoal, wood, other recuperations, diesel oil, fuel oil, liquefied petroleum gas, others from petroleum, piped gas, electricity and others non-specified. Other possible baseline candidate would be the use of renewable biomass without the carbon credits support.

Table 7. Distribution of fuel employed on the ceramic sector in Brazil in percentage.

BRAZILIAN ENERGY BALANCE 2008[26] - CERAMIC SECTOR EVALUATION			
FUEL	**2005**	**2006**	**2007**
Natural Gas	24%	26%	25%
Charcoal	2%	1%	1%
Wood	50%	50%	49%
Other recuperations	1%	1%	1%
Diesel Oil	0%	0%	0%
Fuel Oil	8%	8%	8%
Liquified Petroleum Gas	4%	4%	4%
Others from Petroleum	2%	2%	4%
Piped gas	0%	0%	0%
Electricity	8%	8%	7%
Others non specified	0%	0%	0%

3. Define and justify the geographic area and the temporal range used to identify baseline candidates.

Brazil was identified as the geographic area of the baseline candidates because Energy Research Company[27] from Mines and Energy Ministry of Brazil is the most representative and reliable source of information about the ceramic sector and its fuel employed. Furthermore, there was no local data regarding to the ceramic sector and its energy source in the State of *Pará*. Therefore, data from table above were provided by a reliable source and it was considered 3 years of its historical data, including the most recent available data and the period when *Kamiranga* Ceramic started its fuel switch.

4. Define and justify any other criteria used to identify baseline candidates.

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[26] Brazilian Energy Balance, Available at: <http://www.mme.gov.br/download.do?attachmentId=16555&download>). Visited on May 15th, 2009.

[27] Energy Research Company is a national entity which intended to provide services and researches to subsidize the energy sector planning, in areas as electric Power; oil, natural gas and their derivatives; coal; wood; renewable energy sources and energy efficiency; among others.

The other types of criteria used to identify baseline candidates were the common practice, the costs of fuel and the local availability of technology and fuel.

The criteria common practice was used to identify baseline candidates because if a kind of fuel has already been employed with success in the ceramic sector it is an obvious baseline candidate.

Besides, the fuel cost was criteria once if a kind of fuel has high costs it will discourage the scenario of investing in this type of fuel, for example.

Equally important, the local availability of technology and fuel were pieces of criteria because the lack of technology and fuel in the region excludes them as baseline candidates. An example may be the lack of natural gas distribution in some regions.

There are legal requirements constraints regarding the use of non-renewable biomass as exposed in Decree N.5,975 of November 30th,2006. However, it is not enforced namely due to the lack of control[28]. The consumption of non-renewable biomass by ceramic industry was related by several authors (NERI, 2003[29]; ALBUQUERQUE et al, 2006[30]; BRASIL, 2001[31]; VIANA, 2006[32]; CARDOSO, 2008[33]). This is also observed in other industries as in the production of steel (BRASIL, 2005[34]), which has a much better structure and internal organization when compared with ceramic industries that are generally small and familiar enterprises. BRASIL (2001) suggests that it is important to stimulate the miner sector, especially who are respecting the environment. The incomes from carbon credits can be this incentive which would contribute to avoid the consumption of non-renewable biomass illegally. Therefore laws and

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[28] *Corte e poda de árvores pelo Dnit na BR-158 é considerado crime ambiental, Jornal Grande CPA, Available at: http://www.grandecpa.com.br/?p=noticia&id_noticia=129. Visited on April, 24th 2009.*

Desmatamento avança sobre reservas de Cerrado, Eco & Ação: Ecologia e Responsabilidade. Jornal da Ciência, Amazônia e cerrado - interrogações, artigo de Washington Novaes. Available at: http://www.ecoeacao.com.br/index2.php?option=com_content&do_pdf=1&id=5617. Visited on April 25th, 2009.

[29] *NERI, J.T. Energia Limpa, Sustentável ou de Subsistência?* ***Cerâmica Industrial,*** *Rio Grande do Norte;V,8, n.1,35 -6,2003.*

[30] *ALBUQUERQUE, J.L.B. et al. Águia-cinzenta (Harpyhaliaetus coronatus) e o Gavião-real-falso (Morphnus guianensis) em Santa Catarina e Rio Grande do Sul: prioridades e desafios para sua conservação.* ***Revista Brasileira de Ornitologia,*** *v.14, n.4, p. 411 – 415, dez. 2006.*

[31] *BRASIL. Ministério de Ciências e Tecnologias.* ***Levantamento da Situação e das Carências Tecnológicas dos Minerais Industriais Brasileiros****: com enfoque na mineração de: Argila para cerâmica, Barita, Bentonita, Caulim para carga, Talco / Agalmatolito e Vermiculita. Brasília, 2001. Available at: < http://www.cgee.org.br/prospeccao/doc_arq/prod/registro/pdf/regdoc710.pdf>. Visited on April, 24th 2009.*

[32] *VIANNA, F.M.A.* ***Participação Pública em Programas Ambientais: Um Estudo em Área Suscetível a Desertificação no Estado do Rio Grande do Norte.*** *2006, 109f. Dissertação (Mestrado em Engenharia de Produção) – Universidade Federal do Rio Grande do Norte, Natal, 2006. Available at: < http://bdtd.bczm.ufrn.br/tedesimplificado//tde_busca/arquivo.php?codArquivo=571>. Visited on April, 24th 2009.*

[33] *CARDOSO, C.F.R.* ***Panorama do Setor Florestal: o que tem sido feito na esfera do Governo Federal****., Rio de Janeiro, 03 Set. 2008. Report presented in 1º SEMINÁRIO DE MADEIRA ENERGÉTICA, 2008.*

[34] *BRASIL.* ***Diagnóstico do Setor Siderúrgico nos Estados do Pará e do Maranhão****. Brasília: Ministério do Meio Ambiente, 2005. 76 p.*

regulations will not be considered as criteria to excluded baseline candidates and to constraint the geographical area and temporal range of the final list of the baseline candidates.

The project activity implementation without the carbon credits incomes is also a criteria once there was biomass availability.

5. Identify a final list of baseline candidates.

Table ***7*** provides the percentage of the level of penetration of each fuel employed in the ceramic sector during the average of the three last years available (2005, 2006 and 2007). Baseline candidates are the use of:

a) **Wood:** The fuel most employed, which would be the scenario of highest GHG emissions, once its emission factor is the highest according to IPCC 2006[35].

b) **Natural gas:** The Brazilian Energy Balance results showed significant percentage of natural gas consumption especially due to the production of ceramic tiles (used to finish floor or wall). Furthermore, in the case of structural ceramic, the use of natural gas is restricted by the absence of pipes, its high costs[36] and the lack of availability[37]. The risk of lack of offering and higher costs when compared with other fuels discourages the scenario of investing in this type of fuel even in local with piped gas. The distribution of gas is preferentially performed to thermal power plants, increasing the risk of blackout of natural gas.

c) **Fuel oil:** This fuel is more expensive than wood, however it can be a more probable of substitute of wood than natural gas. The risks involving natural gas distribution are so considerable that PETROBRÁS[38] was offering subsidy to the consumption of fuel oil in spite of natural gas in the State of *São Paulo*. However, in the baseline scenario, the use of fuel oil is not feasible due to the high costs associated to atomization system required to its burn, which demands frequent maintenance[39].

d) **Renewable biomass:** despite the high biomass availability, the main problems concerning the use of renewable biomass are related to the high investments, technological and institutional barrier, mainly the risk of changing for a biomass not consolidated as fuel for ceramic industries[40].

[35]Source: IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Source: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf>. Page 2.18. Visited on April 24th, 2009.

[36]Revista Brasil Energia Percalços do gás natural na indústria. Available at: <http://www.dep.fem.unicamp.br/boletim/BE31/artigo.htm>. Visited on April 24th, 2009.

[37]Source: <http://www.gismaps.com.br/gasnatural/gasnatural.htm>. Visited on April 24th, 2009.

[38] PETROBRÁS performs in oil and oil byproduct exploration, production, refining, marketing, and transportation, both in Brazil and abroad. More information available at: <http://www2.petrobras.com.br/ingles/ads/ads_Petrobras.html>. Visited on April 24th, 2009

[39] CTGAS. PROJETO CERÂMICAS: SUBSTITUIÇÃO DOS ATUAIS FORNOS INTERMITENTES À LENHA, COM EFICIÊNCIA DE FORNO CONTÍNUO A GÁS NATURAL. Available at: <http://www.ctgas.com.br/template04.asp?parametro=155>. Visited on April 24th, 2009.

[40] The use of renewable biomass was not included in

Table 7 which shows the fuel most employed in the ceramic sector according to Brazilian Energy Balance.

6. Identify baseline candidates that are representative of common practice (for the project-specific baseline procedure).

In Brazil, the red ceramic units are produced through an inefficient and traditional process using wood without forest management to generate thermal energy technologies[41]. In this industry segment the use of wood represents about 98% of the total fuel employed stimulating the increase in Brazilian deforestation and desertification rates. It happens because wood without forest management is offered with lower prices than wood from areas with forest management[42].Furthermore, using non-renewable wood is a simple procedure and well known by the kiln operators.

The native forest without any kind of sustainable management has always been a source of firewood in the ceramic sector [43], which seemed inexhaustible, due to the amount generated in the expansion of the agriculture frontier bringing forward environmental impacts, with regard to the degradation of soil, change in the regime of rainfall and consequent desertification.

The ceramic industry sector has practically not evolved compared to the past, mainly due to the simplified techniques of manufacture. Moreover, the major equipments (chiefly kilns) of the production process were not improved significantly. Most of these companies still use non-renewable wood in their kilns and the drying process occurs naturally, without the utilization of energy. On the other hand, the influence of the market by improvements in this sector is very insignificant[44].

Thus, the common practice is the use of wood and its non-renewable fraction, which is the fuel most employed and with less risk associated.

Therefore, the project activity is not a common practice.

Impact of project approval

Nowadays, the ceramic industrial segment of the state of *Pará* is constituted by small industrial units that still use the most diverse technological models. The productive chain of ceramics in the city is composed of 31 companies, the main economy to the city. The fuel used in almost all companies is the native firewood from Amazonian Biome, and it has some technological restrictions such as the energy exploitation and the efficiency of the machinery.

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[41] ABREU, Y. V.; GUERRA, S. M. G. Indústria de Cerâmica no Brasil e o Meio Ambiente. Chile: IV Congreso Nacional de Energía, 2000. Available at: <http://www.nuca.ie.ufrj.br/bgn/bv/abreu2.htm>. Visited on April 24th, 2009

[42] Seye, Omar. Análise de ciclo de vida aplicada ao processo produtivo de cerâmica estrutural tendo como insumo energético capim elefante (Pennisetum Purpureum Schaum) / Omar Seye. Campinas, SP: [s.n.], 2003.Available at: <http://libdigi.unicamp.br/document/?code=vtls000411276>. Visited on April 24th, 2009.

[43] UHLIG, A. Lenha e carvão vegetal no Brasil: balance oferta-demanda e métodos para estimação de consumo, tese de doutorado, Universidade de São Paulo, São Paulo, 2008. 156 p. Available at: <http://www.teses.usp.br/teses/disponiveis/86/86131/tde-14052008-113901/>. Visited on April 24th, 2009.

[44] PAULETTI, M. C. Modelo para Introdução de Nova Tecnologia em Agrupamentos de Micro e Pequenas Empresas: Estudo de Caso das indústrias de Cerâmica Vermelha no Vale do Rio Tijucas. 2001. Available at: <http://biblioteca.universia.net/html_bura/ficha/params/id/597230.html>. Visited on April 24th, 2009.

Brazil is the third major contributor[45] to the carbon dioxide emissions in the year of 2003, though contemporary studies generally place Brazil fourth in the ranking of the countries that emit the most GHGs.

The Amazonian Biome deforestation, which can be observed in Table 8 and Graph 1, aggravates because of the grazing practice, agriculture and site preparation which involves extraction and burning of wood and firewood commercialization[46].

The First Brazilian Inventory of Anthropogenic Greenhouse Gas Emissions[47] – 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 rise in deforestation rates in the Amazonian biome, which achieves more than 14,206,000 hectare per year of the Brazilian Legal Amazonian[48]. 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. The Amazonian Rainforest is the major tropical forest of the world. Furthermore, 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 biome[49].

The party will also implement the social carbon methodology, which was developed by *Instituto Ecológica*, and focuses on a sustainable development and better social conditions for the communities where it is implemented.

Therefore it can be concluded that measures should be taken to preserve these biomes and the project activity represents an example that can be followed by other activities.

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[45] Goldemberg & Moreira. Política Energética no Brasil. Estudos Avançados 19 (55), 2005. Available at: <http://www.scielo.br/pdf/ea/v19n55/14.pdf>. Visited on April 24th, 2009.

[46] FERREIRA, Leandro Valle; VENTICINQUE, Eduardo and ALMEIDA, Samuel. O desmatamento na Amazônia e a importância das áreas protegidas. Estud. av. [online]. 2005, v. 19, n. 53 [cited 2009-01-14], pp. 157-166. Available at: <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-40142005000100010&lng=en&nrm=iso>.Visited on April 24th, 2009.

[47]Available at: <http://www.mct.gov.br/index.php/content/view/17341.html>. Visited on April 24th, 2009.

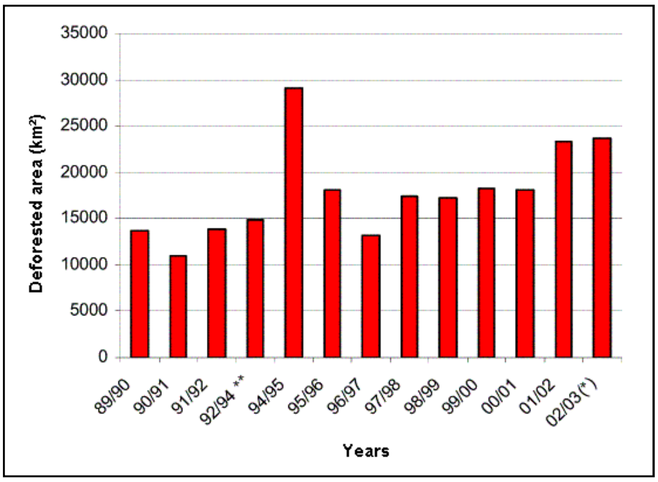
[48]PRODES – Program for Deforestation Assessment in the Brazilian Legal Amazonian. Available at: <http://www.obt.inpe.br/prodes/>. Visited on April 24th, 2009.

[49] 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_Peres.pdf>. Checked at: September 10th, 2008.

Table 8. Area and total deforestation proportion observed in the states of Amazonian

Years	**2001**		**2002**		**2003**	
States	km²	%	km²	%	km²	%
MT	7.703	42	7.578	33	10.416	44
PA	5.237	29	8.697	37	7.293	31
RO	2.673	15	3.605	15	3.463	15
MA	958	5	1.33	6	766	3
Total	**16.571**	**91**	**21.21**	**91**	**21.938**	**92**
Other States	1.594	9	2.056	9	1.812	8
Brazilian Legal Amazonian	**18.165**		**23.266**		**23.750**	

(Available at: http://www.scielo.br/scielo.php?pid=S0103-40142005000100010&script=sci_arttext&tlng=en. Visited on May 15th, 2009.)



Graph 1. Total area deforested in Brazilian Legal Amazonian between 1989 and 2003 (Available from: <http://www.scielo.br/scielo.php?pid=S0103-40142005000100010&script=sci_arttext&tlng=en>. Visited on May 15th, 2009.

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

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

This category 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 CO_2.

The project activity will generate less than the limits of 45 MWthermal for Type I small scale project activities.

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

The monitoring will be done with the aim of determining the most approximate quantity of non-renewable wood that, in the absence of the project, would be used in the Ceramic's facilities and, consequently, the amount of GHG that would be emitted in tons of CO_2e.

Table 9. Data reported in monitoring estimation.

Parameters	Description	Units	Origin	Frequency
$Q_{renbiomass}$	Amount of renewable biomass	tons	Measured by the project proponent	Monthly
Origin of Renewable Biomass	Renewable origin of the biomass	Not applicable	Controlled by the project proponent	Annually
PR_y	Production of ceramic pieces	Tons of units produced	Controlled by the project proponent.	Monthly
Renewable Biomass Surplus	Amount of renewable biomass available	tons or m^3	Monitored by articles and database.	Annually
Leakage of Non-Renewable Biomass	Leakage resulted from the non-renewable biomasses	tCO_2e	Monitored by articles and database.	Annually
$EF_{projected\ fossil\ fuel}$	CO_2 Emission factor of residual fuel oil	tCO_2/TJ	IPCC[50]	Not monitored
$NCV_{biomass}$	Net Calorific Value of non-renewable biomass	TJ/ton of Wood	Bibliography	Not monitored
ρ_{wood}	Specific gravity of non-renewable biomass	ton/m^3	Bibliography	Not monitored
$f NRB_{,y}$	Fraction of biomass (wood) used in the absence of the project activity in year y can be established as non-renewable biomass using survey methods	Percentage	Bibliography and Project Developer	Annually
BF_y	Consumption of non-renewable biomass per thousand of ceramic units produced per year	Tons of wood/ tons of ceramic units fired	Data from project proponent	Function of PRy

In the monitoring plan, the amount of non-renewable biomass (**B_y**) will be determined using the option 'b' of the applied methodology, i.e. it will be calculated from the thermal energy generated in the project activity as:

$$B_y = \frac{HG_{p,y}}{\eta_{old} \times NCV_{biomass}}$$

The responsible to monitor data provided in

[50] IPCC. ***IPCC 2006 Guidelines for National Greenhouse Gas Inventories***. Page 2.18. Table 2.3. Available at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf. Visited on May 15th, 2009.

Table 9 will be Mr. *Marcio Monteiro.* Internal audit will guarantee data quality.

3.3 Data and parameters monitored / selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Monitored Parameters

<table>
<tr><td>Data / Parameter:</td><td>PRy</td></tr>
<tr><td>Data unit:</td><td>tons of ceramic units fired per month</td></tr>
<tr><td>Description:</td><td>Production of ceramic units</td></tr>
<tr><td>Source of data to be used:</td><td>Controlled by the project proponent.</td></tr>
<tr><td>Value of data applied for the purpose of calculating expected emission reductions</td><td>2,780</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>The amount was acquired by counting the total production of one year. The measurement will be done by an internal control sheet monitored by the project proponent, which will be fed daily. The production is a representative sample to ensure that all appliances are still in operation
It will be utilized the weight of the ceramic unit in order to convert from units to tons.
Data to be applied are:
<table>
<tr><th>Biomass</th><th>Brick 6 holes</th></tr>
<tr><td>weight (tons/thousand of ceramic units fire)</td><td>1,54362</td></tr>
</table>
</td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>The ceramic facility has an internal control of the quantity of pieces produced. It will be rechecked according to the biomass employed and the kiln consumption of renewable biomass.</td></tr>
<tr><td>Any comment:</td><td>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.</td></tr>
</table>

<table>
<tr><td>Data / Parameter:</td><td>$Q_{renbiomass}$</td></tr>
<tr><td>Data unit:</td><td>tons per month</td></tr>
<tr><td>Description:</td><td>Amount of renewable biomass used</td></tr>
<tr><td>Source of data to be used:</td><td>Measured by the project proponent</td></tr>
<tr><td>Value of data applied for the purpose of calculating expected emission reductions</td><td>The project proponent will preferentially employ sawdust in its burning process, as can be verified in the table below.
<table><tr><th>Biomass</th><th>Sawdust</th></tr><tr><td>$Q_{renbiomass}$</td><td>334</td></tr></table></td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>The amount of renewable biomass will be monitored in accordance to the weight described in the receipts or invoices from the providers.

It will be utilized the Specific Gravity in order to convert from m^3 to tons.
Data to be applied are:
<table><tr><th>Biomass</th><th>Sawdust/wood chips</th></tr><tr><td>Specific gravity (tons/m^3)</td><td>0.35</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.</td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>The ceramic facility has spreadsheets of the quantity of biomass acquired. It will be rechecked according to the receipts of purchase.</td></tr>
<tr><td>Any comment:</td><td>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.</td></tr>
</table>

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 will be given by the biomasses providers or checked at http://www.sectam.pa.gov.br/seiamlic (Visited on May 15th, 2009.) in case of sawdust. As stated in the section 2.2, the biomasses (sawdust, rice husk, elephant grass and açaí pits) are considered renewable as fulfilling the options described in the methodology applied.
QA/QC procedures to be applied:	The biomass will be considered as renewable if it is according to the definition given by the applied methodology. Furthermore, documents proving the origin of renewable biomass from forested resources will be 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_2e
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 will be monitored. Scientific articles, official statistical data, regional and national surveys will be 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 will be 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)[51], 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 will be based in national and international articles; database and data monitored by the project developer such as project activities at the same region. The sources will provide information about the sustainable use of Amazonian biome. Wood saved from projects with same biome and applied methodology developed by *Carbono Social Serviços Ambientais LTDA*. 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 will be 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.

[51] 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.

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><tr><th>Harvest</th><th>07/08</th></tr><tr><td>Forest Residues (m³)</td><td>9,090,150</td></tr><tr><td>Rice Husk (tons)</td><td>84,734.3</td></tr><tr><td>Açaí Pits (tons)</td><td>79,715.5</td></tr><tr><td>Elephant Grass</td><td>Not measured</td></tr></table> Detailed information in section 4.1 – LEAKAGE.
Description of measurement methods and procedures to be applied:	It will be used to calculate the leakage of renewable biomass. The sources of leakages predicted in methodology applied will be monitored. The measurement of the leakage will be based in national and international articles and databases every monitoring period. These sources will provide 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 will be 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.

Fixed Parameters

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. Source: 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 15th, 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 27th, 2009.
Value applied:	0.0182
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value will provide 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 27th, 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 de 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 units 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 units during the years when the ceramic facilities used to consume non-sustainable wood. This value is in accordance with the data acquired in other ceramics that employ the same type of kiln. If nowadays the plants still used native firewood their consumption would be around 1,944 tons of native firewood (per month to produce 2,780 ceramic units. These values are employed to calculate the real amount of wood displaced to maintain the ceramic units' production in the baseline scenario.
Any comment:	Values from 2004, 2005, 2006 and 2007 were applied to estimate the baseline consumption of non-renewable biomass.

3.4 Description of the monitoring plan

The party responsible for implementing the monitoring plan will be the owner of *Kamiranga* Ceramic. The project proponent will also be responsible for developing the forms and registration formats for data collection and further classification. Data monitored will be kept during the crediting period and 2 years after. For this purpose, the authority for the registration, monitoring, measurement and reporting will be Mr. *Sigifério Alves de Oliveira*. All the monitored parameter will be checked annually as requested at the methodology AMS-I.E. - Switch from Non-Renewable Biomass for Thermal Applications by the User – Version 01 from February 01 of 2008 onwards.

The management structure will rely on the local technicians with a periodical operation schedule during the project. The technical team will manage the monitoring, the quality control and quality assessment procedures.

In order to complement the monitoring of the production of ceramic units, equipments from *Alutal* will monitor each burning cycle of the kilns through graphics of the temperature reached in the kiln versus time.

Social Carbon Company will also implement the sustainability report following the Social Carbon methodology, which was developed by *Instituto Ecológica* and focus in implementing the environmental and social activities within the fuel switching project. Social Carbon follows the Social Carbon Guidelines available at: <http://www.socialcarbon.org/Guidelines/>.

In addition, the Social Carbon Reports will be available at TZ1/Social Carbon Registry (http://www.tz1market.com/socialpublic.php) once the project is registered.

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

This category 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 CO_2.

Emission Reductions

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

Where:

ER_y: Emission reductions during the year y in tCO_2e

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/ton

$EF_{projected\ fossil\ fuel}$: Emission factor for the projected fossil fuel consumption in the baseline in tCO_2e/TJ[52].

B_y is determined using the following option:

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

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

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

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

Where:

SGE: Specific energy which has to be generated in the process to produce a certain amount of ceramic units in TJ/thousand of ceramic device.

PR_y: Amount of product produced in year y in tons of ceramic units fired

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

Where:

[52] *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 units in TJ/ thousand of ceramic device

$$\mathbf{SFE = BF_y \times NCV_{biomass}} \qquad \text{(Equation 05)}$$

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:

$$\mathbf{B_y = PR_y \times BF_y} \qquad \text{(Equation 06)}$$

As shown in the calculations above, the η_{old} is not required to calculate the Emission Reductions, thus it was excluded.

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 biomass projects, like the project activity, shall also be 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 10).

Table 10. 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 use.	-	-	X

Observing Table 10, the sources of leakage of the present project activity are 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 biomass[53] 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)[54]. In case of using this kind of biomass, the ceramic facility will cultivate, by itself, 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.

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 4, the potential of energy generation in the

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[53] *Osava M. Energia: Capim elefante, novo campeão em biomassa no Brasil. Available at:<www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292>. Visited on April 27th, 2009.*

[54] *Embrapa. Formação e Utilização de Pastagem de Capim-Elefante. Instrução Técninca para o produtor de Leite. Available at:< www.cnpgl.embrapa.br/nova/informacoes/pastprod/textos/17Instrucao.pdf>. Visited on April 27th, 2009.*

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.

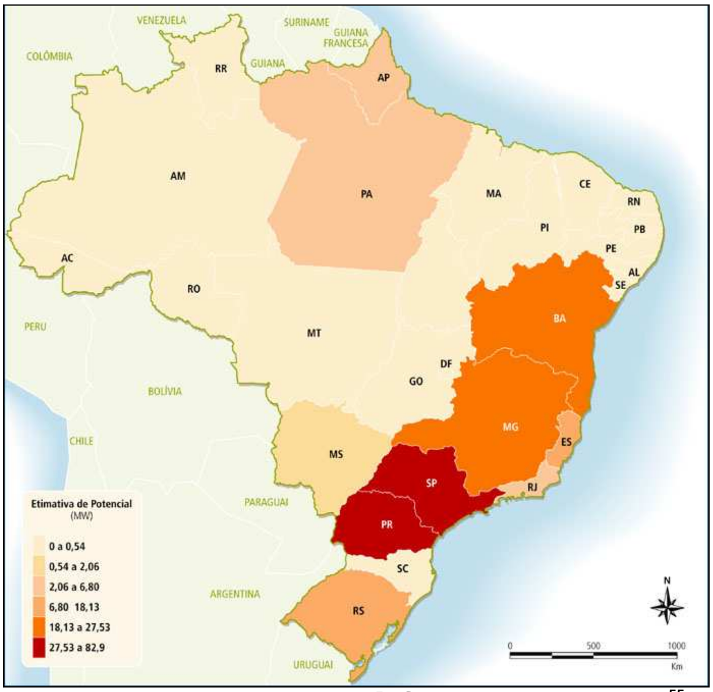

Figure 4.Forest Residues Potential for Energy Generation[55]

Considering that around 22% of the wood produced will generate sawdust[56], the production of wood in the state of *Pará* was of 9,090,150 m^3 [57] in 2007, thus, 1,999,833 m^3 will generate sawdust.

The project activity will employ approximately 4,008 tons, thus 11,451 m^3 of woodchips/sawdust per year which represents 0.57% of the total of these residues generated in the State of *Pará*.

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

Rice Husk

In the case of rice husk, the state of *Pará* produced 368,410 tons of rice in husk in the year of 2007[58]. The husk corresponds to 23% of the weight of rice in husk[59]. Therefore, the production of rice husk in the state of Para was 84,734.3 tons.

[55] *CENTRO NACIONAL DE REFERÊNCIA EM BIOMASSA - CENBIO. Panorama do potencial de biomassa no Brasil. Brasília; Dupligráfica, 2003. 80 p.*

[56] *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.*

[57] *IBGE. Extração Vegetal e Sivicultura 2007. Available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=pa&tema=extracaovegetal2007>. Visited on April 27th, 2009*

[58] *IBGE. Produção Agrícola Municipal - Cereais, Leguminosas e Oleaginosas 2007. Available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=pa&tema=pamclo2007>. Visited on April 27th, 2009.*

[59] *GAIDZINSKI, R. Utilização da casca de arroz como sorvente alternativo para o tratamento de efluentes da Região Carbonífera Sul Catarinense. 2007. Available*

Kamiranga *C*eramic would consume around 7,200 tons of rice husk, considering that the ceramics production would only depend on this type of renewable biomass. Thus, the rice husk consumption would represent around 8.5% of the total of the amount produced. Therefore, the project activity would not disturb in any aspects this renewable fuel market once there is plenty of this kind of biomass available.

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 Sate 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 destination[60].

The production of açaí in the state of *Pará* in the year of 2007 was 93,783 tons[61]. The pit corresponds to 85% of the weight of açaí[62]; therefore the açaí pit production was around 79,715.5 tons in the year of 2007.

The project activity would employ approximately 12,000 tons of açaí pits per year, representing around 15% 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.

Demand of Biomasses

There are no data regarding the demand for the biomasses in the State of *Pará*[63]. However, according to *Barbosa* (2009)[64], it is a common practice in sawmills the generation of methane due to the decay of sawdust in their on site places. However, currently, there is a very low demand for sawdust in the State of Pará. Furthermore, according to *Townsend* (2001)[65], at the place where the açaí is processed, there is a

at: <http://www.cetem.gov.br/publicacao/serie_anais_I_jpci_2007/Roberta_Gaidzinski.pdf>. Visited on April 27th, 2009.

[60] *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>. Visited on April 27th, 2009.*

[61] *IBGE. Extração vegetal e silvicultura 2007. Available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=pa&tema=extracaovegetal2007>. Visited on April 27th, 2009.*

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

[63] *Embrapa. Características Químicas de Composto Orgânico Produzido com Lixo Orgânico, Caroço de Açaí, Capim e Serragem. Belém , PA. Dezembro, 2004.. Available at: http://www.cpatu.embrapa.br/publicacoes_online/comunicado-tecnico/2004/caracteristicas-quimicas-de-composto-organico-produzido-com-lixo-organico-caroco-de-acai-capim-e-serragem-com-tec-105/at_download/PublicacaoArquivo. Visited on June 23th, 2009.*

[64] *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.*

[65] *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.cpafro.embrapa.br/Pesquisa/public/2001/outros/Cot_193.PDF. Visited on May 15th, 2009.*

lot of açaí pits left to decay once they have very low utility. Therefore, the demand for the renewable biomasses used by the ceramic company 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:

- 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.

It is expected that the carbon credits incomes will stimulate the use of renewable biomass to other ceramic companies presenting a huge possibility for sustainable development in the region. Therefore, the sources of leakages mentioned above will probably not be applicable as it is predicted the project activity will 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 will not being saved for other project activity, since other ceramics was already consuming wood from non-sustainable forest management (common practice).

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

Therefore, it can be concluded that this source of leakage, until the date of the project approval, is not 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.*

This 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, until the date of the project approval, does not encompass any type of leakage.

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

The applied methodology does not predict project emissions; therefore, the baseline emissions are equivalent to emission reductions, which is demonstrated below, and shown in Table 11:

$$\mathbf{ER_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel}}$$

By,total = 33,360 tons of ceramic units fired per year x 0.810 tons of wood/tons of ceramic units fired = 27,021 **tons of wood per year**

ERy, total = 27,021 tons of wood x 0.9228 x 0.0182 TJ/tons x 77.4 tCO2/TJ = **35,125 tCO_2e**

Table 11. Baseline Emissions of the project.

Year	**Baseline Emissions (tCO_2e)**
2008	35,125
2009	35,125
2010	35,125
2011	35,125
2012	35,125
2013	35,125
2014	35,125
2015	35,125
2016	35,125
2017	35,125
Total Baseline Emission (tCO2e)	351,250
Average	35,125

4.3 Quantifying GHG emissions and/or removals for the project:

The applied methodology does not predict project emissions and leakage was considered to be zero.

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

Table 12 shows Baseline Emissions, Leakage and Emission Reductions

Table 12. Emission Reductions of the project.

Year	Baseline Emissions (tCO_2e)	Leakage (tCO_2e)	Emission reductions (tCO_2e)
2008	35,125	0	35,125
2009	35,125	0	35,125
2010	35,125	0	35,125
2011	35,125	0	35,125
2012	35,125	0	35,125
2013	35,125	0	35,125
2014	35,125	0	35,125
2015	35,125	0	35,125
2016	35,125	0	35,125
2017	35,125	0	35,125
Total(tCO_2e)	351,250	0	351,250
Number of years of the crediting period	10	0	10
Annual average for the 10 years of crediting period (tCO_2e)	35,125	0	35,125

5 Environmental Impact:

Table 13. Summary of the environmental impacts

Environmental Factor	Environmental Impact	Classification
Soil	Improvement of soil conditions because of the vegetation conservation	Positive
Climate	GHG emission reduction	Positive
Water/ hydric resources	Preservation of ground water quality	Positive
Water/ hydric resources	Preservation of the water cycle renewal	Positive
Energy	No more use of non-renewable biomass as fuel for energy production	Positive
Fauna	Biodiversity preservation	Positive
Flora	Biodiversity preservation	Positive

As shown in Table 13, there is no negative impact identified due to the project activity.

The burning of the new biomasses also emits particulate material and CO_2, as well as when using wood. However, the emission reductions of GHG will improve since they are renewable biomasses.

This way the project does not cause any additional negative impacts as all generated energy is a result of the best and unique exploitation of the natural resources available. On the contrary, the Project will improve the local environmental conditions by establishing proper treatment for the renewable biomasses and also by contributing to the reduction of the deforestation rate.

Environmental Laws related to the plant activities

The Environmental National Policy, *Política Nacional do Meio Ambiente* - PNMA, instituted by the Brazilian Law 6.938/81, establishes that the construction, installation, amplification and operation of any enterprise or activity which may exploit natural resources, and are considered potentially pollutant, or capable of degrading the environment, will be possible only if they obtain a previous environmental permission; according to the Brazilian Constitution of 1988. One of the tools settled by the PNMA, in order to monitor and study the potential impacts generated by these kinds of enterprises, is the Environmental Impact Assessment (EIA).

An EIA was not required due to the project activity.

6 Stakeholders comments:

The main stakeholders considered in this project are the ceramic sector syndicate and the ceramic facility employees. A letter was sent to the stakeholders informing about the project and in the ceramic´s facilities the letter was posted on the employee´s board, which is a visible place with high circulation of employees. The letter was available during 7 days and the comments were expected for a period of 7 days after the letter has been posted.

Moreover, having the ceramic sector syndicate being aware of the project, other local stakeholders will be able to be informed about the proposed project activities, because the ceramic sector association has great visibility trough different parts of the community, public entities on different levels, like Municipality, State and Federal organizations.

The ceramic sector syndicate keeps relationships to local developing agencies, like SEBRAE (Brazilian Service to support Micro and Small size companies), SENAI (Brazilian Service to support technically Manufacturing Companies), among others so it will help in the diffusion of project results and practices.

Till validation time, comments were not received.

However, São Miguel do Guamá Industries Syndicate (SICOM) sent a letter on December 19, 2008, certifying that they are aware of the activities related to the project. The syndicate demonstrated to recognize the importance of this practice, supporting and encouraging the divulgation of these projects.

In relation to the contact procedures and the involvement of the Stakeholders, an informal public consultation was realized (Figure 5 and Figure 6), inviting environmental organs, non governmental organizations, the syndicate of the ceramic sector in the region, some ceramics from *São Miguel do Guamá* and Brazilian Service for Support of Micro and Small Companies.

The consultation explained the activities of the projects developed in the ceramic facilities of São Miguel do Guamá pole, and also the Social Carbon Methodology. In the end of the lectures, the participants could give their comments and resolved their doubts concerning the issue. The doubts were mainly about the Social Carbon methodology and its applicability. Furthermore, positive comments concerning the project were received.

Figure 5. Stakeholders Consultation

Figure 6. Stakeholders Consultation

7 Schedule:

- Project start date: September 1^{st},2007
- Crediting period start date: January 1^{st},2008
- Date of terminating the project: December 31^{h},2017
- Validation Report predicted to: August,2009
- First Verification Report predicted to August,2009
- VCS project crediting period: 10 years renewable
- Monitoring and reporting frequency: preferentially from 6 to 12 months, since the beginning of the crediting period.

8 Ownership:

8.1 Proof of Title:

Ceramic's article of incorporation and the contract between *Carbono Social Serviços Ambientais* – project developer – and *Kamiranga* Ceramic will proof the title, demonstrating the rights to the GHG emissions reductions and the ownership of the project. These proofs of title will be checked by TÜV Nord Cert GmbH and are in power of *Kamiranga* Ceramic and available to consultation.

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

Not applicable.