Panorama Ceramic Fuel Switching Project
Voluntary Carbon Standard
Project Description

19 November 2007
Date of the VCS PD: 30rd September 2009

Contents

1 Description of Project:

1.1 Project title

Panorama Ceramic Fuel Switching Project
Version 04
VCS PD completed in: September 30rd, 2009.

1.2 Type/Category of the project

The project activity, although being a voluntary carbon credit project, encloses the following categories of the simplified modalities and procedures for small-scale clean development mechanism project activities, 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 Applications by the User*** *– Version 01 from February 01 of 2008 onwards.*

This is not a group project.

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

The amount of emission reductions are greater than 5,000 tonnes of CO_2 equivalent and less than 1,000,000 tonnes of CO_2 equivalent, thus classifying as a project under the VCS 2007 size groups (micro project, project, mega project).

Table 1. Emission reductions estimated during the crediting period.

Year	Annual estimated of emission reductions per ton of CO2e
August to December - 2006	3,217
2007	7,720
2008	7,720
2009	7,720
2010	7,720
2011	7,720
2012	7,720
2013	7,720
2014	7,720
2015	7,720
January to July - 2016	4,503
Total of estimated reductions (tonnes of CO_2e)	73,983
Number of years of the crediting period	10
Annual average of estimated reductions for the 10 year crediting period (tonnes of CO_2e)	7,398

1.4 A brief description of the project:

The purpose of this project activity is to utilize renewable biomass[1] (like wood chips /Sawdust and sugar cane bagasse) available in the region for effective generation of thermal energy for captive consumption. The project activity will indirectly help in reducing the Brazilian deforestation rates, Brazil's main source of greenhouse gas emissions.

The project activity consists of a fuel-switch at *Panorama* ceramic, which produces bricks with eight holes, for the local market of *Panorama* and its surroundings in the state of *São Paulo*. Each brick weighs 1.995 Kg.

In the baseline scenario, the ceramic company utilized wood from areas without sustainable forest management, which was a pioneer practice in the region. This type of wood is considered a non-renewable biomass, once it does not originate in areas with reforestation activities.

The fuel switch was only feasible when considering the income derived from the commercialization of Carbon Credits, since it was unattractive due to the high investments on the adaptation of the machineries to the new biomass, among other barriers.

Panorama ceramic would consume an average quantity of 5,472 tonnes of wood per year to feed the kilns and maintain a temperature of 850 ºC for 30 hours to produce around 500,000 ceramic devices per month (997.5 tons of ceramic units monthly).

By diverging significantly from the identified baseline scenario, the ceramic will generate thermal energy while promoting the conservation of biomes with the implementation of this project activity.

The Project's contribution to sustainable development

This project activity aims to minimize the deforestation of the *Cerrado* biome by discouraging the commercialization of the native firewood.

In addition the project activity will contribute to mitigate greenhouse gas (GHG) emissions and also to the sustainable development of the host country, by:

- Diversifying and improving sources for thermal energy generation;

- Using clean and efficient technologies, which promote the preservation of natural resources in accordance with Agenda 21 and with Brazilian Sustainable Developments Criteria;

- Contributing directly to the conservation of *Cerrado* biome through the use of 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 project activity is located in *Panorama*, state of *São Paulo*, which is indicated in Figure 1. The project site has the following geographic location and postal address:

- Indústria Cerâmica Panorama LTDA.

Estrada Aldo Bruno, S/N - km 5 - CEP 17980-000 - Panorama - SP, Brasil.

[1] The renewable biomass mainly employed in the project activity is sawdust; however other biomasses such as sugar cane bagasse and peanut shells can also be employed in harvest periods.

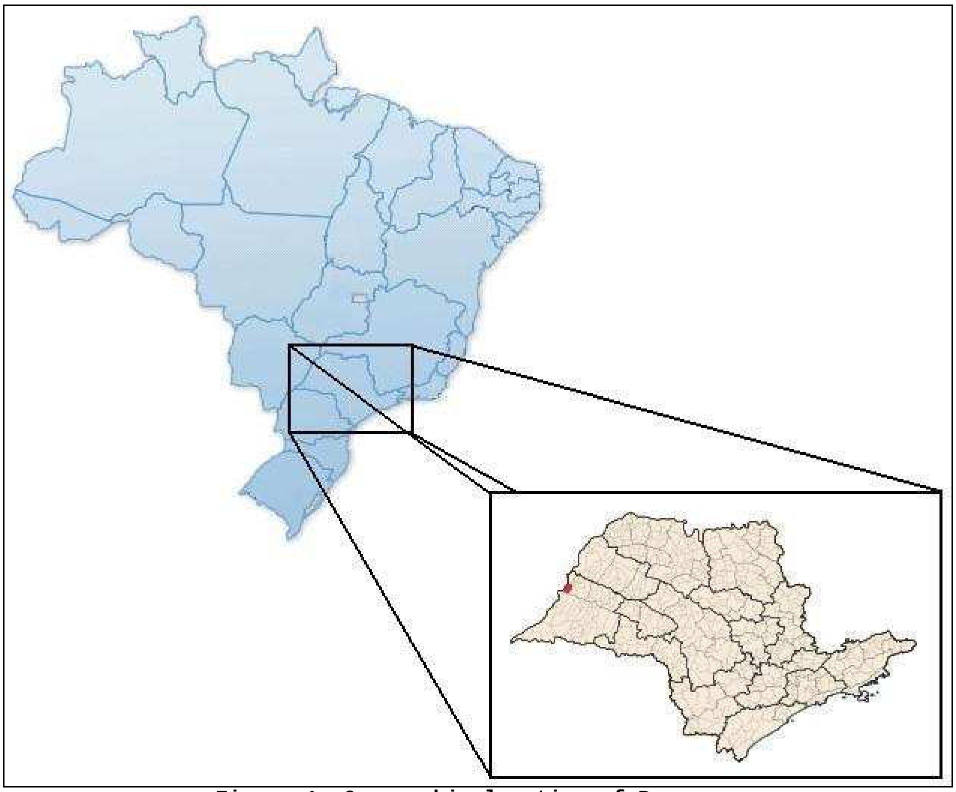

Figure 1. Geographic location of Panorama

Figure 2. Panorama Ceramic Boundaries: 21° 23′ 17″ S; 51° 53′ 45″ W; 264 m; 21° 23′ 20″ S; 51° 53′ 48″ W; 266 m; 21° 23′ 16″ S; 51° 53′ 52″ W; 264 m; 21° 23′ 14″ S; 51° 53′ 49″ W; 259 m

1.6 Duration of the project activity/crediting period:

- Project start date[2]: May of 2006
- Date of initiating the project activity[3]: August, 1st 2006

[2] *Date on which the project began reducing or removing GHG emissions*

[3] *Date when the project proponent began employing 100% of renewable biomass.*

- Date of terminating the project[4]: July, 31 st 2016
- VCS project crediting period: 10 years, twice renewable

1.7 Conditions prior to project initiation:

Although firewood 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 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[5]. 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[6].

According to *Seye* (2003)[7], in Brazil, the red ceramic devices are produced through an inefficient and traditional process using wood without forest management to generate thermal energy. 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 widely offered at low prices.

The baseline identified for this project activity is the employing of 5,472 tonnes of wood per year to provide thermal energy to feed the ceramic's kilns.

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

The emission reductions will be achieved by displacing the use of wood from areas with unsustainable forest management that provide thermal energy to ceramic companies. The emissions launched during the combustion of non-renewable wood are not compensated by any replanting activity.

An opposite scenario occurs with the renewable biomasses employed in this project activity, which have carbon neutral cycle.

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

The products to be manufactured in project activity scenario are the same products of the baseline scenario. These products are structural bricks with eight holes.

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 in this document.

Due to the project activity, a set of new technologies were necessary, such as the use of mechanic burners, machines responsible to inject the biomasses inside the kilns, as well as the construction of one shed , to store the biomasses, keep them dry and improve their burning efficiency.

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[4] *Date on which the project completes 10 years after the date of initiating project activities*

[5] *Brito, J.O. "Energetic use of Wood". Available at: <http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&tlng=ES>. Last visited on April 02nd, 2009.*

[6] *Energy Research Company. National Energy Balance - energy consumption per sector. Available at: <https://ben.epe.gov.br/BEN2007_Capitulo3.aspx> Last visited on April 02nd, 2009.*

[7] *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.*

These new technologies require new services, for example, clean the kilns more frequently due to the increasing of the generation of ashes using sawdust, and 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 “Round” kilns to work with the mechanic burners.

Panorama ceramic utilize three “Round kilns” in its production processes. The “Round Kilns” are intermittent kilns with round shape and lateral furnaces. Its internal diameter is about 9 meters. It is usually employed to burn roofs and bricks.
Without the project activity, *Panorama* Ceramic would consume around 456 tonnes of wood per month (or 5,472 tonnes per year) to feed its kilns to obtain a temperature of 850ºC during 30 hours.

Table 2. Technical parameters of the *Panorama´s* Round kiln.

Technical parameters	Round kiln
Consumption of firewood (tons of wood per tons of ceramic units)	0.457
Number of Round kilns	3
Features	Intermittent with a round shape and lateral furnaces. 9 meters of internal diameter
Maximum Temperature	850°C
Average Production per burning cycle (tons of ceramic goods)	49.875
Average supposed capacity of each kiln (MW)	1.9
Hours of burning	60
Hours of Cooling	40
Hours of Loading	10
Hours of Unloading	10
Production per month per kiln (tons of ceramic goods per month)	331.17

In the current scenario, *Panorama* Ceramic consumes 175 tonnes of sawdust and 75 tonnes of sugar cane bagasse to maintain the production of 500,000 ceramic devices per month (997.5 tons of ceramic units monthly). Therefore, the burning efficiency with the new biomasses is 0.50 tonnes per thousand of devices produced.

Table 3. Ceramic´s conditions with renewable biomass

	Wood chips /Sawdust	**Sugar Cane Bagasse**
Amount of biomass (tonnes/per month)	175	75
Total Amount of biomass (tonnes/per month)	250	
Monthly production (devices per month)	500,000	

Kiln Efficiency (tonnes of biomass per thousand of devices)	0.50

The ceramic company is currently and will preferentially employ 70% of wood chips / sawdust and 30% of sugar cane bagasse as renewable biomass, but other renewable biomasses such as peanut shells can be employed due to seasonal harvest reasons. The ceramic owner also showed interest in elephant grass. 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.

The state of *São Paulo* is the biggest producer of peanut of Brazil. Peanut shells may be utilized in small amounts, mainly during its two harvest periods that go from January to February and through June.

The main biomass providers are listed in table 4, which does not exclude the possibility of buying biomass from others:

Table 4 . The main biomass providers

	Provider	**Location**
Wood Chips/Sawdust	*Tatiane Muniz Madeiras ME*	*São José do Rio Preto - SP*
Sugar Cane Bagasse	*Usina Alta Paulista*	*Junqueirópolis - SP*
	Viralcool Açúcar e Álcool Ltda	*Castilho – SP*
	Usina Ipê - Pedra Agroindustrial S/A	*Nova Independência - SP*

The kilns alimentation is made semi- automated. The employees are responsible for feeding the equipments which will inject the fuel in the kilns entrance.

The implementation of the project activity will save energy due to the following modifications:

• Use of biomass smaller than wood increasing the surface area;

• Insertion of air with the new fuels, increasing the oxygenation;

• Reduction of thermal energy loss since the entrances will be kept closed or connected to the equipment.

• Injection of biomass controlled by equipment, avoiding wastage of fuel that often occurred when using wood.

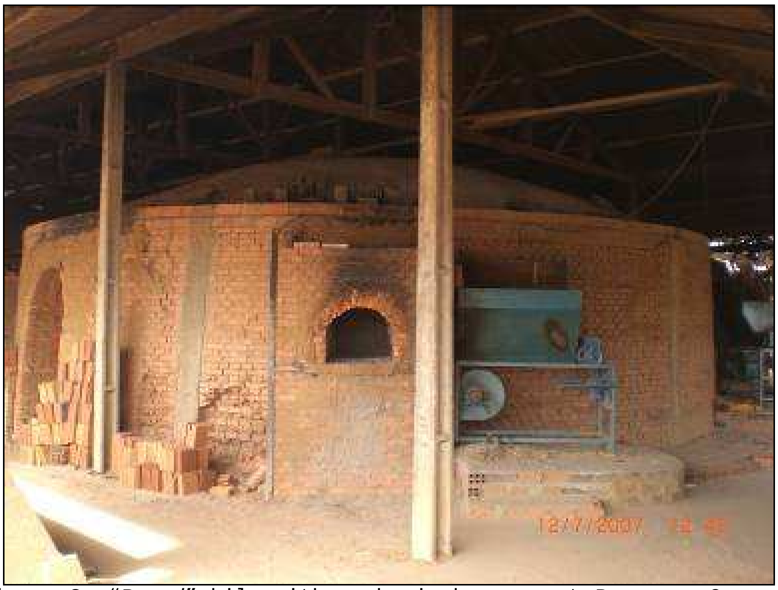

Figure 3. *"Round"* kiln with mechanic burners at *Panorama* Ceramic

Figure 4. Sawdust/wood chips and sugar cane bagasse which are currently being used by the ceramic as fuel

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

This project is in accordance to the CONAMA[8] 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 CETESB[9] which must run under the valid time.

[8] *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>. Last visited on April 02nd, 2009.*

[9] *CETESB (Technology Environmental Sanitation Company) is the São Paulo State government agency responsible for the control, surveillance, monitoring and license of potentially polluting companies. More information is available at : <http://www.cetesb.sp.gov.br/>. Last visited on April 02nd, 2009.*

However, *Panorama* Ceramic does not need clay extraction license once it receives that from CESP[10] as compensation due to the inundation of many clay exploration areas caused by the construction of the *"Engenheiro Sérgio Mota"* hydroelectric power station.

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 prices can increase. If this scenario occurs, the carbon credit income will make the continued use of renewable biomasses feasible.

- Availability of the renewable biomasses

The current great amount of the biomasses available locally was already described herein, however if a non foreseeable reason affects the availability of the biomasses, the ceramic owner will search for other types of renewable biomasses, such as peanut shell and elephant grass.

- Difficulty related to the abrupt change.

As affirmed before, the ceramic used wood in its kilns for many years, the sudden change claimed a lot of effort from each employee in the ceramic; the main challenges are the reconfiguration of the internal logistic and the employees' resistance to the new situation.

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.

The historical of *Panorama´s* activities using non-renewable biomasses since 1986, as fuel clearly confirms that the project activity 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 is being applied only as a Sustainability tool in association with Voluntary Carbon Standard 2007.

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 asses 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):

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[10] CESP – São Paulo Energy Company – is the producer of energy in the State of São Paulo. More information about CESP and "Engenheiro Sérgio Mota" hydroelectric power station are available at:< http://www.cesp.com.br/>. Last visited on April 02nd, 2009.

Panorama´s project was not rejected to any GHG reduction or removal program. The project report was produced to make the project public and available to voluntary measures or other opportunities of the carbon markets.

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 one member of its team:

Mr. *Luiz Roberto Bessegato*, Director and owner: Information about the ceramic, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, and ceramic devices market challenges.

Mr. *Luiz Roberto Bessegato* is also the monitoring responsible: General data and information on inputs and outputs of the ceramic, 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:

Indústria Cerâmica Panorama LTDA

CNPJ: 66.090.366/0001-07

Address: Estrada Aldo Bruno, S/N - km 5 - CEP 17980-000 - Panorama - SP, Brasil.

Ceramic phone number: +55 (18) 3871 6159

Project Developer

Social Carbon Company: Project participant, project idealizer, responsible for preparing the present project report and of accompanying the proponent until the end of the crediting period.

The assessors directly involved are:

1-*Silvia Regina Stuchi Cruz,* Technical Analyst: Project Design Document writer, elaboration of GHGs Emissions' Inventory;

2- Anselmo Couto, direct contact between Social Carbon Company and the ceramic and responsible for collecting necessary information.

3- *Rafael Ribeiro Borgheresi*, Technical Analyst;

4- *Flávia Yumi Takeuchi*, Technical Coordinator.

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

Carbono Social Serviços Ambientais Ltda

Address: *R. Borges Lagoa, 1065 – Conj. 146 – Vila Clementino Zip Code: 04038-032 São Paulo – SP, Brazil.*

Phone number: +55 (11) 5083 3252

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

Email to contact about the project:

1- silvia@socialcarbon.com

2- anselmo@socialcarbon.com

3- rafael@socialcarbon.com

4- flavia@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 the 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.

However 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 disclosed 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 (By) 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. Thus, monitoring via option "a" is not recommended as it does not serve the purpose for accurate monitoring.

The project's emissions from the combustion of non-replaced native wood are accounted in the same way as fossil fuel combustion, once 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 *Panorama* once Social Carbon Company made 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) [11] and Brazilian's Technology and Science Ministry[12]. Therefore, the proposed project activity is not saving the non-renewable biomass accounted 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, turning green house effect even worse. 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. Although, it is impossible to define a start date on which 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[13]. Moreover the Brazilian's Energy

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[11] *CDM activities registered by CDM Executive board are Available at:<http://cdm.unfccc.int/Projects/registered.html>. Last visited on April 02nd, 2009.*

[12] *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>. Last visited on April 02nd, 2009.*

[13] *Brito, J.O."Energetic use of Wood". Available at: <http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&tlng=ES>. Last visited on April 02nd, 2009.*

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[14]. Especially in the ceramic sector, the use of firewood is visible non-renewable and unsustainable, involving negative environmental impacts associated[15].

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

The biomasses utilized in the project, sugar cane bagasse and wood chips /sawdust, are common residues in the region generated. Bagasse is generated by industries to produce alcohol. Each tonne of sugar cane used for alcohol production generates around 140 kg of sugar cane bagasse, which can be either compacted into briquettes or utilized *in natura* for thermal energy generation[16]. Sawdust/wood chips are resulted from wood manufacturing.

São Paulo is a huge peanut producer and the peanut shell is a residue generated from this production.

Sawdust, wood chips, peanut shells and sugar cane bagasse are all industries residues coming from large scale reforestation or agroindustrial projects, so it is 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”.

The elephant grass is considered renewable according to option III, as soon as it fits 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.”

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

According to the applied methodology, the project boundary is the physical, geographical area of the use of biomass or the renewable energy, thus, the ceramic limits.

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[14] *National Energy Balance- energy consumption per sector. Available at: <http://www.mme.gov.br/download.do?attachmentId=16555&download>. Last visited on April 02nd, 2009.*

[15] *Source: 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 December 12th, 2008*

[16] *Source: <www.herbario.com.br/atual2005_4/cana_energia.htm>. Last visited on April 02nd, 2009.*

Table 5. 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 and possible emissions from anaerobic decay of stored wood will be avoided. 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 6, 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 non specified.

Therefore, a probable baseline scenario would be the use of Natural Gas. However, there is no distribution/gas pipe in the region[17], 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 its expensive prices. Fuel Oil presents an average price of 0.895R$/Kg and the firewood used to present an average price of 15.78 R$/tonne in the baseline scenario. These values lead us to conclude that the price of oil fuel around 0.000090587R$/Kcal[18] as long as the price of this kind of wood is around 0.0000071R$/Kcal[19] utilizing the Net Calorific Value of both fuels. Therefore, the cost with the employment of oil fuel is higher than the 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.

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[17] *Source: <http://www.gasbrasiliano.com.br/institucional/concessao_sp.asp>. Last visited on April 02nd, 2009.*

[18] *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>. Last visited on April 02nd, 2009.*

[19] *According to the values of native wood paid in the Por-do Sol Ceramic before the project activity (21 BRL per m3) . The values of NCV and density utilized are the same utilized in monitoring parameters (NCV=0.0186 TJ/tonnes /Tonne and Density=0,5702 Tones/m3).*

Table 6. Distribution of fuel employed on the ceramic sector in Brazil.

BRAZILIAN ENERGY BALANCE 2008 - 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**

(Brazilian Energy Balance, Available at: <http://www.mme.gov.br/download.do?attachmentId=16555&download> accessed in: March 23rd, 2009)

This way, without the project activity, *Panorama* Ceramic would consume around 456 tonnes of native fire wood per month to feed its kilns to obtain an approximate temperature of 850°C with a burning cycle of 30 hours, in order to produce 500,000 ceramic devices. The efficiency of the "round" kiln is between 1.0 and 1.5 m^3 per thousand of pieces[20].

The number of ceramic devices produced can present a small variation each month, however the number described herein will be adopted as the fixed parameter to estimate the baseline emissions. The real amount will be monitored according to the ceramic production control.

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 5.70MW thermal which is 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

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

[20] *Source: TAPIA, R. E. C. et al.* ***Manual para a indústria de cerâmica vermelha.*** *Rio de Janeiro: SEBRAE/RJ, 2005. (Série Uso Eficiente de Energia).*

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

- ***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 was necessary. The main technological barriers were the non-availability of human knowledge to operate and maintain the new technology, the internal and external logistic modification and the employee's resistance to the new technology.

In the baseline scenario, using the wood, the operators fed the kilns manually, procedure unfeasible when applied to the new biomasses. Diverging from the baseline scenario, in the project activity, the wood chips /sawdust and other renewable biomasses must be fed to the kilns by automatic machineries and mechanic burners. Also, the machineries needed some adjustments in order to use the new biomasses, fuels that differ from the original propose of the machines.

The operators did not have knowledge of the ideal amount of renewable biomass that was necessary to achieve the temperature of about 850ºC for its ceramic devices cooking, to acquire the final product with 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 fill the devices with large amounts of biomass, which can clog the mechanic burner and consequently, cause disorder in the burning process and that was one of the causes of the production losses throughout the adaptation period. So, the mechanic burner's feeding has to be done gradually, demanding even more time and labor from the employees.

As a result of the fuel switch, some training courses from SEBRAE [21] were required for the staffs in order to clarify new measures linked to the machinery, sustaining the quality of the final product.

Furthermore, there was a lack of infrastructure to utilize the new technology, the region of Panorama 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 kiln entrances to embed mechanic burners and some adaptations in the trucks that carry the biomass, elevating the trucks axle, in order to avoid their loss and allow a great amount to be transported at once.

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 ceramic industry and their future demand (e.g. by other consumers) is not easy to foresee.

This means that *Panorama* 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 become able to receive the biomass to be used. *Panorama* Ceramic, with this project activity, intends to develop its burning process and its machineries in order to reduce losses, thus increasing both the system efficiency as the production.

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.

In addition to the alterations in the machineries, the kilns entrances needed some adaptations due to the fuel change and the new mechanic burners.

[21] *Sebrae, the Brazilian Service of Support for Micro and Small Enterprises, offers supporting to the opening and the expansion of small business.*

The ceramic possesses its own trucks and in order to transport the new fuel used to feed the kilns they also needed some adaptations, such as increasing the trucks' body sizes and purchasing tarpaulins to avoid losses. Furthermore, the fuel substitution represented some extra months to get adapted to the burning process with the wood chips /sawdust and get the final product up to the same quantity and quality than in the baseline scenario.

Some adaptations were also required in order to store the wood chips /sawdust, namely the enlargement of a shed to protect the biomass that would latter on be used in the process. This protection is essential to keep the biomass away from the rain and maintain it dry. This is important because when the biomass is dry, its efficiency increases considerably.

Other barriers are listed below:

- Variation in the color of the final ceramic devices, which affects the quality of the products;
- Cracks on the ceramic devices and the explosion of some of them;

Cracks along the kilns

Thus, *Panorama* Ceramic had to find the best procedure to handle with the new biomass, which is far different when compared with the use of wood.

- ***Financial barrier***

With the project implementation, the ceramic company had to withstand higher costs rather than if it had continued employing native wood as fuel. The most important additional costs are related to biomass transportation, once the non-renewable biomass was delivered by lumberjacks and renewable biomass must be identified, loaded and transported by the ceramic, increasing the costs with drivers, loading, diesel, freight and truck maintenance.

Furthermore, there are spending with electrical energy and with the equipment maintenance, so the mechanic burners can operate. Besides, the fuel was manually inserted by operators in the kilns, a procedure which is unfeasible when employing sawdust and sugar cane bagasse. The project proponent also acquired 6 thermocouples, 3 thermometers and 3 temperature monitoring panels.

When the new production techniques have been introduced in 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 three 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 the above mentioned reasons the ceramic industry had to deal with higher production costs. That made the ceramic responsible think about stopping the fuel switching project.

The demonstrations of the main costs after and before the project activity can be checked in the table of costs below.

Table 7. Main Costs before and after the project activity

Scenario	Non renewable biomass		Renewable biomass		
			Wood chips/ Sawdust	Sugar Cane Bagasse	Unit
Variable Costs					
Monthly consumption of the fuel	456	Tonnes of wood per month	175	75	Tonnes of biomass per month

Price of biomass	15.78	BRL per ton	28.57[22]	6.00[23]	BRL per tonne
Total acquisition biomass cost	7,195.68		4,999.75	450.00	BRL per month
Costs of tranportation	-		10,814.00[24]		BRL per month
Costs of truck maintenance	-		2,778.40[25]		BRL per month
Energy Costs (with mechanic burner)	-		2,744.65		BRL per month
Total variable cost per month	**7.195,68**	**BRL per month**	**21,786.80**		**BRL per month**
Investment					
Cleans and reforms of the kilns	-	BRL	4,030.00		BRL
Costs with equipment acquisition (including freight)	-	BRL	13,900[26]		BRL
Loss of revenues - period for adaptation of the kiln for biomass	-	BRL	15,000.00		BRL
Waste of products in the testing period (3 months)	-	BRL	15,000.00		BRL
Waste of Biomass in the testing period	-	BRL	4,087.31		BRL
New biomass storage shed (BRL)	-	BRL	2,923.45[27]		
Total Invested	**-**	**BRL**	**54,940.76**		**BRL**

- ***Institutional Barriers:***

Since the kilns were adapted to burn the new biomass, and there was a lack of qualified work force to manage these new equipments, it was necessary to submit some workers to training and capacitating courses.

The new biomass presented a larger volume, which in turn required the enlargement of the storage shed, changing the established logistic system of the ceramic. The shed, moreover, contributes to keeping the biomass dry, increasing the burning efficiency.

The trucks that used to transport the old fuel had to be adapted to transport the new biomass, by increasing the trucks' body sizes and purchasing tarpaulins to avoid losses and to help keep the biomass away from the rain.

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[22] According to "Tatiane Muniz - ME" invoices

[23] According to "Alta Paulista indústria e comércio" invoices

[24] According to: "Edinho" invoices and "oficina Trick" invoices.

[25] According to "Joninho Ferreiro" invoices; "Metalmaq" invoices; "Mecânica de máquinas Tonhão" invoices; and "Cia & Óleo" invoices.

[26] According to "Raça Máquinas e Equipamentos Ltda"

[27] According to "Jose Carlos Oliveira" invoices

Since it is a new load, both the drivers and the assistants to the unloading process, transportation and storage, had to adapt to the changes and cautions with the new biomass.

These arrangements require the ceramic 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.

Risks of the project

The project activity implementation presented a risk to the project proponent, once the use of a new type of fuel and its machines added a significant amount of insecurity to the production process, while the use of native firewood is a traditional and well-known process. Furthermore, the ceramic can overgrow a period in which there is possibility that there is lack of biomass, representing another risk period.

It must be re-emphasized that there is no direct subsidy or support from the government for this project, and without the income from the commercialization of the carbon credits, the fuel switch at *Panorama* Ceramic would not be feasible or attractive to the project proponent.

Barrier due to the price of the biomass

The thermal energy generation through the combustion of wood chips /sawdust and sugar cane bagasse is an innovation in the ceramic industry. The future demand of these alternative fuels e.g. by other consumers is not easy to foresee.

Although there is currently a great amount of these types of biomasses available locally, there is a possibility that the prices would increase as well, especially between harvests periods, when the problem with biomass disposal is mitigated. If the price of the biomass increases, the ceramic can not re-pass it, once the ceramic would not have competitive prices in relation to others which did not made the fuel switch.

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 8, 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.

Table 8 . Distribution of fuel employed on the ceramic sector in Brazil in percentage.

BRAZILIAN ENERGY BALANCE 2008 - 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%

(Brazilian Energy Balance, Available at: http://www.mme.gov.br/download.do?attachmentId=16555&download <accessed in: March 23, 2009).

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[28] 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 *São Paulo*. 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 *Panorama Ceramic* did its fuel switch.

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

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[29]. The consumption of non-renewable biomass by ceramic industry was related by several authors (NERI, 2003[30]; ALBUQUERQUE et al, 2006[31]; BRASIL, 2001[32]; VIANA, 2006[33]; CARDOSO, 2008[34]). This

[28] *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.*

[29] *Prunes and cuts of tree by Dnit at BR-158 are considering an environmental crime,"Grande CPA" Journal, Available at: http://www.grandecpa.com.br/?p=noticia&id_noticia=129. Visited in: December, 12th 2008. And Desmatamento avança sobre reservas de Cerrado, Eco & Ação: Ecologia e Responsabilidade. Available at: http://www.ecoeacao.com.br/index2.php?option=com_content&do_pdf=1&id=5617. Visited on December 12th, 2008. 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 December 12th, 2008.*

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

[31] *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*

is also observed in other industries as in the production of steel (BRASIL, 2005[35]), 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 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 a criteria once there was biomass availability.

5. Identify a final list of baseline candidates.

Table 8 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[36].

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[37] and the lack of availability[38]. 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[39] was offering

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*desafios para sua conservação. **Revista Brasileira de Ornitologia,** v.14, n.4, p. 411 – 415, dez. 2006.*

*[32]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 June 1st, 2008.*

*[33] 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://www.pep.ufrn.br/publicacoes.php?enviou=1>. Visited on 15 May, 2008.*

*[34]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.*

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

[36] 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.

[37]Source:< http://www.dep.fem.unicamp.br/boletim/BE31/artigo.htm>. Last visited on April 02nd, 2009.

[38]Source: <http://www.gasnet.com.br/novo_entrevistas.asp?cod=145>. Last visited on April 02nd, 2009.

[39] 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>.

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[40].

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[41].

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

In Brazil, the red ceramic devices are produced through an inefficient and traditional process using wood without forest management to generate thermal energy technologies[42]. 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[43].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[44], 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[45].

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.

The acquiring of new equipment and the overall costs of the fuel switch represented a risk to the project proponent since the baseline practice was already established and well-known by the laborers. The operators had the knowledge of the ideal amount of wood, without any technical restriction, in order to achieve the approximate temperature of 850°C to fire the ceramic and then, optimize this process. The fuel switch required a capacitating course for the staff in order to clarify new procedures related to the machineries implanted to maintain the final product quality.

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[40] *Source: <http://www.ctgas.com.br/template04.asp?parametro=155>. Last visited on April 02nd, 2009.*

[41] *The use of renewable biomass was not included in table 10 which shows the fuel most employed in the ceramic sector according to Brazilian Energy Balance.*

[42] *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: November 20th, 2008*

[43] *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.*

[44] *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 in: December, 12th 2008*

[45] *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://www.spg.sc.gov.br/menu/desenv_economico/camara_apls/estudos/Trabalhos_sobre_economia_catarinense/Ceramica_estrutural/2001_Tecnologia_ceram_verm_vale_tijucas_dissertacao.pdf >. Visited on: November 20th, 2008.*

Thus, the project activity is not a common practice.

Impact of project approval

Presently, the ceramic industrial segment of state of São Paulo is comprised mostly of small industrial units that still use very diverse technological models. There are 96 ceramic industries in *Presidente Epitácio, Ouro Verde, Panorama, Paulicéia and Teodoro Sampaio* and the majority of them use native firewood from areas without sustainable forest management. These industries have some technological restrictions in the areas of energy exploitation and the efficiency of the machinery, but the project's approval can dramatically improve the development of this sector

The fuel used in the absence of the project activity is the native firewood from *Cerrado* Biome.

The First Brazilian Inventory of Anthropogenic Greenhouse Gas Emissions – Background Reports indicates that the major source of GHG emissions in Brazil is due to deforestation, mainly occurred in *Amazônia* (59% of the deforestation) and *Cerrado* biomes (26%).

The *Cerrado* Biome deforestation was intensified due to the grazing practice and site preparation which involves extraction and burning of firewood and firewood commercialization.

Another relevant issue is how fast deforestation occurs in the *Cerrado* biome, representing 1.5% or 3 million ha/year. It is equivalent to 2.6 soccer fields/minute.

A study performed by the non-governmental institution, Conservation International of Brazil, indicates that by 2030 the *Cerrado* biome will disappear maybe even sooner since the areas that are earmarked for official protection are also being destroyed. From a total of 204 million acres of the original biome, 57% has been completely destroyed, as shown in figures 4 and 5. The main areas that are being most affected by the alarming *Cerrado* deforestation are the states of *Mato Gross do Sul, Goiás, Mato Grosso, Triângulo Mineiro* and the western portion of *Bahia*. These concerning deforestation rates are due to the expansion of the agricultural frontier, unregulated burnings and due to the disorderly growth of the urban zones[46].Brazil is the third major contributor[47] to the carbon dioxide emissions in the year of 2003, as is shown at table 7. Contemporary studies generally place Brazil in the fourth position in the ranking that emit the most GHGs.

Table 9. Estimate GHG emissions proceeding from energy (fossil fuel and non-renewable biomass – based in Marland et al. 2003), deforestation and modifications in the use of the soil (based in UNFCCC, 2005, and FAQ, 2003).

Ranking	Country	Fossil fuel emissions (MtC) 2002	Emissions due deforestation and modifications in the use of soil (MtC) 2002	Total emissions (MtC) 2002
1	United States of America	1,891	-188	1,703
2	China	762	-160	601
3	Brazil	84	347	431
4	Russia	392	-12	380
5	Japan	363	0	363
6	India	363	0	363
7	Germany	277	4	281
8	Canada	199	-6	194
9	Indonesia	74	117	190

[46] *AmbienteBrasil. Study performed by a partnership between Conservation International of Brazil and the Oréades NGO situated in Mineiros (GO). Available at:<http://www.cenargen.embrapa.br/cenargenda/noticias2006/atrativos130606.pdf>*

[47] *Goldemberg, J.. Moreira J. R. **Política Energética no Brasil**. Estudos Avançados 19 (55), 2005. Available at: <http://www.scielo.br/pdf/ea/v19n55/14.pdf>. Visited on: August 14th, 2008.*

10	England	173	1	174

Therefore, Brazil occupies a top position between the emitters of carbon dioxide mainly because of its high deforestation rates. In this way, the state of *São Paulo* where the project activity takes place, seeks to control deforestation in areas with no sustainable forest management through the application of different actions. The creation of the Sector Board of Biofuels in 2004 was an important initiative to stimulate the use of renewable biomass instead of non-renewable biomasses such as fossil fuels and wood from areas without sustainable forest management in various types of industries.

The *Cerrado* biome is the second largest Brazilian biome located in the central portion of Brazil which can be observed in table 8. The flora and fauna of this biome is extremely rich once it shares frontiers with the main Brazilian biomes to its north with Amazonian, to the northeast with *Caatinga*, to the southwest with *Pantanal* and to the southeast with *Mata Atlântica*. In spite of the size and importance of this biome, the *Cerrado* is one of the most endangered habitats. The original biome had over 2 million km^2 of native vegetation. Now 20% is left and the growing of grazing practice and site preparation is intensifying deforestation rates[48].

Table 10 . Brazilian biomes in decreasing order of size.

Brazilian Biomes	Approximate Area (km^2)	Area of the biome / Total Brazilian Area (%)
Amazonian biome	4,196,943	49.29
Cerrado biome	2,036,448	23.92
Mata Atlântica biome	1,110,182	13.04
Caatinga biome	844,453	9.92
Pampa biome	176,496	2.07
Pantanal biome	150,355	1.76
Total Brazilian Area	**8,514,877**	**100**

(Source: IBGE – Brazilian Institute of Geography and Statistic[49])

Another relevant issue is how fast deforestation occurs in the *Cerrado* biome, representing 1.5% or 3 million ha/year. It is equivalent to 2.6 soccer fields/minute[50].

A study performed by the non-governmental institution, Conservation International of Brazil, indicates that by 2030 the *Cerrado* biome will disappear maybe even sooner since the areas that are earmarked for official protection are also being destroyed. From a total of 204 million acres of the original biome, 57% has been completely destroyed, as shown in figure 5 and figure 6. The main areas that are being most affected by the alarming *Cerrado* deforestation are the states of *Mato Gross do Sul, Goiás, Mato Grosso, Triângulo Mineiro* and the western portion of *Bahia*. These concerning deforestation rates are due to the expansion of the agricultural frontier, unregulated burnings and due to the disorderly growth of the urban zones[51].

[48] *Brazilian International Conservation. Available at: <http://www.conservation.org.br/onde/cerrado>. Visited on August 14th, 2008.*

[49] *Available at: <http://www.ibge.gov.br/home/presidencia/noticias/noticia_visualiza.php?id_noticia=169&id_pagina=1>. Last visited on April 02nd, 2009.*

[50] *Conservation Intenational of Brazil.* ***Estimativas de perda da área do Cerrado brasileiro.*** *Available at: <http://www.conservacao.org/noticias/noticia.php?id=31>. Visited on September, 10th, 2008*

[51] *AmbienteBrasil. Study performed by a partnership between Conservation International of Brazil and the Oréades NGO situated in Mineiros (GO).Available at:*

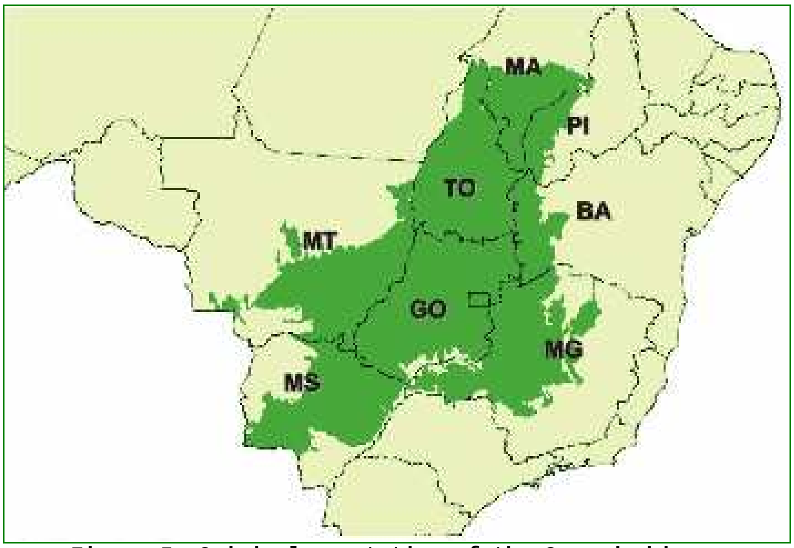

Figure 5. Original vegetation of the Cerrado biome.
(Source: *Conservação Internacional Brasil*[52]).

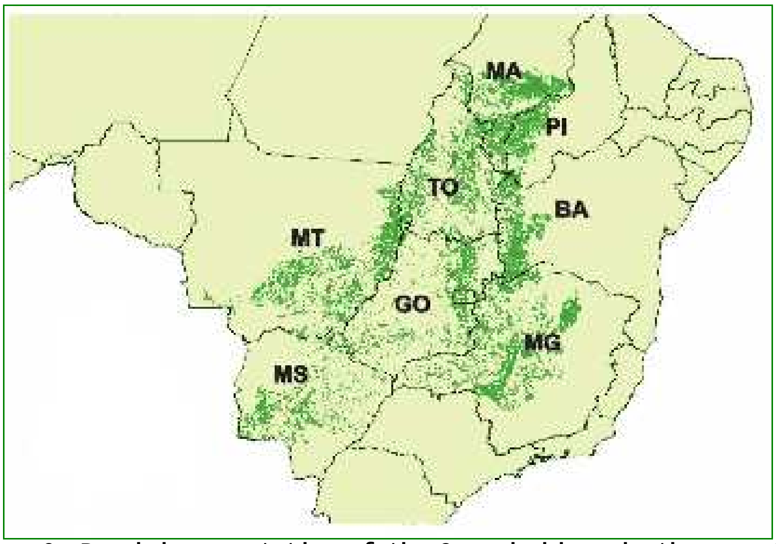

Figure 6. Remaining vegetation of the Cerrado biome in the year 2002
(Source: *Conservação Internacional Brasil*)

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.

<http://www.cenargen.embrapa.br/cenargenda/noticias2006/atrativos130606.pdf>. Last visited on April 02nd, 2009.

[52] *Available at: <http://www.conservation.org.br/arquivos/Mapa%20desmat%20Cerrado.jpg>. Last visited on April 02nd, 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.

Source data used in this report is based on real outputs from *Panorama* ceramic. This section will focus on information management related to production.

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 11 . Data reported in monitoring estimation.

Parameters	Description	Units	Origin	Frequency
$\mathbf{Q_{renbiomass}}$	Amount of renewable biomass	Tonnes	Measured by the project proponent	Monthly
Origin of Renewable Biomass	Renewable origin of the biomass	Not applicable	Controlled by the project proponent	Annually
$\mathbf{PR_y}$	Production of ceramic pieces	tons of ceramic units	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
$\mathbf{EF_{projected\ fossil\ fuel}}$	CO_2 Emission factor of residual fuel oil	tCO_2/TJ	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.	Not monitored
NCVbiomass	Net Calorific Value of non-renewable biomass	TJ/tonne of Wood	Bibliography	Not monitored
ρ biomass	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 data from project proponent	Annually
BFy	Consumption of non-renewable biomass per thousand of ceramic devices produced per year	tones of wood per tones of ceramic unit	Data from project proponent	Not monitored

In the monitoring plan, the amount of non-renewable biomass ($\mathbf{B_y}$) 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 Table 11 will be Mr. Luiz Roberto Bessegato. 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>$Q_{renbiomass}$</td></tr>
<tr><td>Data unit:</td><td>Tonnes per month</td></tr>
<tr><td>Description:</td><td>Amount of renewable biomass employed</td></tr>
<tr><td>Source of data to be used:</td><td>Measured by the project proponent</td></tr>
<tr><td>Value of data</td><td>The project proponent will preferentially employ sawdust and sugar cane bagasse in its burning process, as can be verified in the table below.
<table>
<tr><th>Biomass</th><th>Sugar Cane Bagasse</th><th>Wood chips /Sawdust</th></tr>
<tr><td>$Q_{renbiomass}$</td><td>75</td><td>175</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 ton.

The data to be applied are:
<table>
<tr><th>Biomass</th><th>Wood chips/ Sawdust</th><th>Sugar Cane Bagasse</th></tr>
<tr><td>Specific gravity (tonnes/m3)</td><td>0.35</td><td>0.15</td></tr>
</table>
Source:

Bagasse - http://www.nuca.ie.ufrj.br/infosucro/biblioteca/bim_Ribeiro_ExcedenteAcucar.pps

Sawdust/Wood chips - Tractebel Energia S.A, 2006 – Checked at: <http://hdl.handle.net/1884/10294>. Last visited on April 02nd, 2009.</td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>Amount of biomass will be checked according to the receipts of purchase.</td></tr>
<tr><td>Any comment:</td><td>The project proponent will preferentially employ wood chips / sawdust and sugar cane bagasse in its burning process.</td></tr>
</table>

Data / Parameter:	**PR_y**
Data unit:	Tons of ceramic units/ month
Description:	Production of ceramic devices
Source of data to be used:	Controlled by the project proponent.
Value of data	Approximately 977,5 tons
Description of measurement methods and procedures to be applied:	The measurement will be done by an internal control sheet monitored by the project proponent, which will be filled daily. The production is a representative sample to ensure that all appliances are still in operation.
QA/QC procedures to be applied:	As the ceramic must have an internal control of the production and sale at the end of every month, the PRy value cannot be manipulated. A double check will be done with the value of the biomass utilized.
Any comment:	

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	Renewable biomass
Description of measurement methods and procedures to be applied:	This information will be given by the biomasses providers. The guarantee of acquiring sawdust/wood chips from renewable wood will be achieved by invoices from the providers, as well as the sawdust and wood chips will be tracked until its afforestation origin.
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.
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.

<table>
<tr><td>Data / Parameter:</td><td>Renewable biomass surplus</td></tr>
<tr><td>Data unit:</td><td>ton or m^3</td></tr>
<tr><td>Description:</td><td>Amount of renewable biomass available</td></tr>
<tr><td>Source of data to be used:</td><td>Monitored</td></tr>
<tr><td>Value of data</td><td>
<table>
<tr><th>Harvest</th><th>04/05</th><th>05/06</th><th>06/07</th><th>07/08</th></tr>
<tr><td>Peanut shells (in thousand of tonnes)</td><td></td><td></td><td>62.34</td><td>56.49</td></tr>
<tr><td>Sugar Cane Bagasse (in tonnes)</td><td>32,239,262</td><td>34,127,429</td><td>36,941,820</td><td>41,483,954</td></tr>
<tr><td>Wood residues (m^3)</td><td></td><td></td><td></td><td>7,674,619</td></tr>
</table>
Detailed information in section 4.1 – LEAKAGE.</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>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.</td></tr>
<tr><td>QA/QC procedures to be applied :</td><td>Data available regarding the ceramic industry fuel consumption will be employed to monitor the leakage.</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:	***$f_{NRB,y}$***
Data unit:	Fraction or percentage of biomass
Description:	Fraction of biomass (wood) used in the absence of the project activity in year y established as non-renewable biomass using survey methods
Source of data used:	Survey methods
Value of applied:	0.9804 or 98.04%
Justification of the choice of data or description of measurement methods and procedures actually 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) [53], Cerrado Biome has only 1.9% of its total area with sustainable use. Furthermore, considering that 0.058% of this biome has been saved by other project activities, thus, 98.04% 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 internal articles and database every monitoring period. The sources will provide information about the sustainable use of *Cerrado* biome.
Any comment:	It will be employed in order to estimate the amount of non-renewable biomass.

[53] 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>.

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.
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:	**$NCV_{biomass}$**
Tonne of wood/TJ	TJ/tonne
Description:	Net Calorific Value
Source of data used:	Brazilian study carried out with Cerrado wood: Vale, A.T; Brasil, M.A.M; Leão, A.L. *Quantificação e caracterização energética da madeira e casca de espécies de Cerrado*. Ciência Florestal, Santa Maria; v.12, n.1, p. 71-80; 2002. Available at: <http://www.ufsm.br/cienciaflorestal/artigos/v12n1/A8V12N1.pdf>
Value applied:	0.0186
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 *Cerrado* 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 biomass
Data unit:	ton/m3
Description:	Specific gravity of non-renewable biomass
Source of data used:	Brazilian study carried out with *Cerrado* wood: Vale, A.T; Brasil, M.A.M; Leão, A.L. *Quantificação e caracterização energética da madeira e casca de espécies de Cerrado. Ciência Florestal*, Santa Maria; v.12, n.1, p. 71-80; 2002. Available at: <http://www.ufsm.br/cienciaflorestal/artigos/v12n1/A8V12N1.pdf>. Last visited on April 02nd, 2009.
Value applied:	0.5702
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 *Cerrado* Biome and usually employed as fuel in the ceramic industries of the region.

Data / Parameter:	BFy
Data unit:	tones of wood per tones of ceramic unit
Description:	Consumption of non-renewable biomass per thousand of ceramic devices produced
Source of data used:	Historical data from project proponent
Value of data	0.457
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value was acquired through the average consumption and production of ceramic devices during the years when the ceramic used to consume non-sustainable wood. This value is in accordance with the data acquired in other ceramics that employ the same type of kilns. The value is employed to calculate the real amount of wood displaced to maintain the ceramic production in the baseline scenario.
Any comment:	Data is in accordance with TAPIAS, 2005[54], which estimates an approximate value for this kind (*"Round"*) of 0.8553 - 1.1404 tonnes/thousand of pieces.

3.4 Description of the monitoring plan

The party responsible for implementing the monitoring plan will be the owner company *Panorama* Ceramic Ltd. 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 two years after. For this purpose the authority for the registration, monitoring, measurement and reporting will be Mr. *Luiz Roberto Bessegato.*

All the monitored parameter will be checked annually as requested in the methodology AMS-I.E. - Switch from Non-Renewable Biomass for Thermal Applications by the User – version 01.

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.

With the carbon credits income, in order to complement the monitoring of the production of ceramic devices, *Panorama Ceramic* intend to acquire electronic equipments with the purpose of monitor each burning cycle of the kilns through graphics of the temperature reached in the kiln versus time.

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[54] *TAPIA, R. E. C. et al. Manual para a indústria de cerâmica vermelha. Rio de Janeiro: SEBRAE/RJ, 2005. (Série Uso Eficiente de Energia).*

4 GHG Emission Reductions:

4.1Explanation 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.

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

Where:

ER_y: Emission reductions during the year y in tCO_2e

B_y: Quantity of biomass that is substituted or displaced in tonnes

$f_{NRB,y}$: 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/tonne

$EF_{projected\ fossil\ fuel}$: Emission factor for the projected fossil fuel consumption in the baseline in tCO_2e/TJ[55].

B_y is determined using the following option:

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

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

Where:

$HG_{p,y}$: Quantity of thermal energy generated by the renewable energy in the project in year y in TJ.

η_{old} : Efficiency of the system being replaced

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

Where:

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

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

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

Where:

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

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

Where:

BF_y: Consumption of non renewable biomass per tones of ceramic units produced in year y

[55] *The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel.*

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

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

As shown in the calculations above, the parameters η_{old} and the $NCV_{biomass}$ are not required to calculate the Emission Reductions, thus they were 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 12).

Table 12. 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 12, the source of leakage of the present project activity is the competing use of biomass for biomass residues or waste and the emissions from biomass generation/cultivation in case of biomass from cropland.

Elephant grass

This biomass is from cropland in abandoned areas, therefore the leakage that would be applicable is the emissions from biomass generation/cultivation.

Currently, elephant grass has been acquiring national importance as biomass[56] 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)[57]. In case of using this kind of biomass, the project proponent will cultivate, by himself, elephant grass in abandoned areas, in which there is no vegetation to be deforested. Therefore, this practice will not generate competing use of biomass and it will not deforest a vegetated area, i.e. only the leakage from biomass cultivation will be monitored in case of its use.

Forest Residues (Sawdust/wood chips)

Forest Residues are also a probable fuel to be used for the ceramic devices 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 7, the potential of energy generation in the state of *São Paulo* is extremely 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.

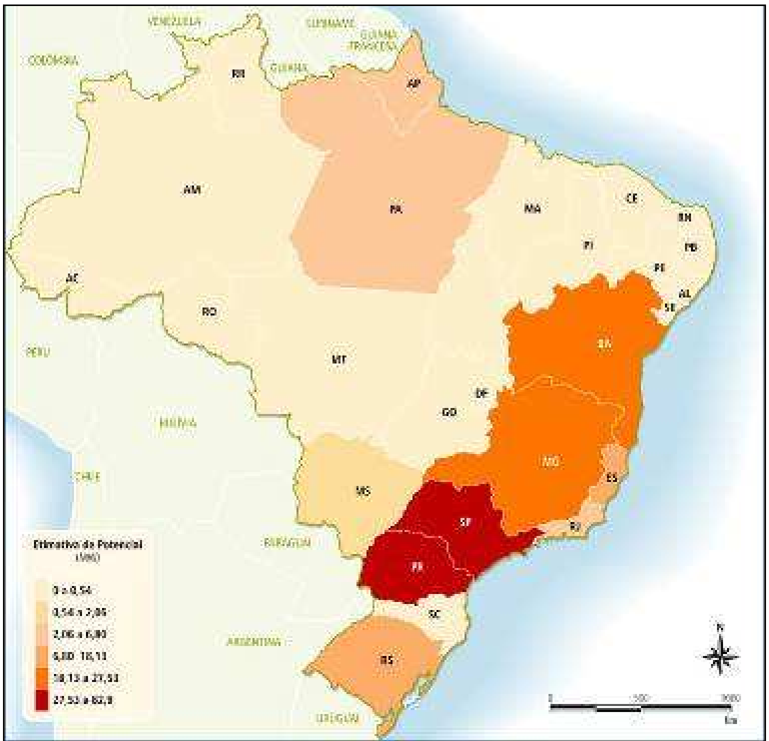

Figure 7. Forest Residues Potential for Energy Generation[58]

According to IBGE 2007, the production of log of wood and firewood in the State of *São Paulo*[59] and *Mato* Grosso do Sul[60] totalizes 34.8 millions of wood which will generate more than 7.5 millions of residues, considering that around 22% of this total will generate wood chips /sawdust[61].

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[56] *Source: <www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292>. Last visited on April 02nd, 2009.*

[57] *Source: <www.cnpgl.embrapa.br/nova/informacoes/pastprod/textos/17Instrucao.pdf>. Last visited on April 02nd, 2009.*

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

[59] *Available in: http://www.ibge.gov.br/estadosat/temas.php?sigla=sp&tema=extracaovegetal2007. Access in 14 December 2008.*

[60] *Available in: http://www.ibge.gov.br/estadosat/temas.php?sigla=ms&tema=extracaovegetal2007. Access in 14 December 2008.*

[61] *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.*

Table 13. Production of log of wood and firewood

Production \ State	*São Paulo*	*Mato Grosso do Sul*	**Residues Generated**
Log of wood (m^3)	25,966,464	1,042,639	5,942,003
Firewood (m^3)	7,407,385	468,143	1,732,616
Total (m^3)	34,884,631		7,676,619

The project activity will employ approximately 6,000 m^3 of woodchips/sawdust per year which represent 0.078% of the total of residues generated in both States.

Sugar Cane Bagasse

Sugar Cane Bagasse is another probable biomass to be utilized in the project activity. A study made by *Universidade Estadual de Campinas* and *Universidade de São Paulo* (two of the most respected universities in Brazil) showed that in Brazil there are around three hundred sugar cane plants. Only in the state of São Paulo, there are located more than 40% of this total. Each plant produces around 1.5 million tonnes of cane yearly[62]. One tonne of sugar cane produces about 140 kilograms of sugar cane bagasse and finally 90% of this amount can be used to energy production.[63]

According to the table 15, the consumption of sugar cane bagasse (900 tonnes per year) represents 0.0021% of the total of sugar cane bagasse produced in the year of 2007. Therefore, this leakage will not be considered.

Table 14. Production of Sugar Cane in the State of São Paulo.

Harvest	04/05	05/06	06/07	07/08
Production of Sugar Cane (tonnes)	230,280,444	243,767,347	263,870,142	296,313,957
Sugar Cane Bagasse (tonnes)	32,239,262	34,127,429	36,941,820	41,483,954

Text adapted from: <http://www.unica.com.br/downloads/estatisticas/processcanabrasil.xls>.

Sugar cane bagasse is also employed for cogeneration systems. However figure 8 presents the excess of energy in Brazil from sugar cane bagasse. Please observe that the State of *São Paulo* has the largest surplus of this biomass.

[62] *Triangulo Mineiro.com - Universidades unem pesquisas sobre biomassa da cana. Avaliable at: <http://www.triangulomineiro.com/noticia.aspx?catNot=59&id=3097&nomeCatNot=Ci%C3%AAncia>. Visited on March22nd,, 2009.*

[63] *Source: <www.cgee.org.br/arquivos/estudo003_02.pdf> Last visited on April 02nd, 2009.*

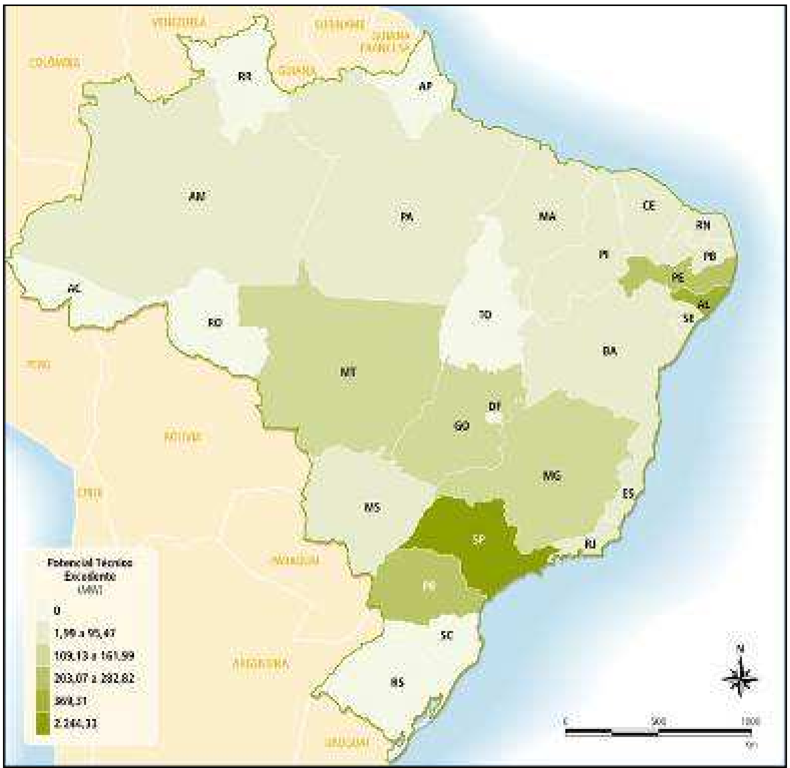

Figure 8. Sugar Cane Residue Potential for Energy Generation[64]

Peanut Shell

Peanut Shell can also be used in the project activity in case of sawdust/wood chips and sugar cane bagasse lack. The state of *São Paulo* is the biggest producer of peanut of Brazil. Table 13 shows the total amount of peanut produced between the years 2005 and 2007 in the state of *São Paulo* and Brazil.

According to IBGE (Geographic and Statistic Brazilian Institute), the shell represents thirty percent of peanut's weight[65].

Table 15. Peanut Production in the state of São Paulo.

Peanut production in *São Paulo* State		
First and Second Harvest		
Harvest	2005/2006	2006/2007
Peanut production (in thousand of tonnes)	207.8	188.3
Peanut shells (in thousand of tonnes)	62.34	56.49

Source: www.iica.org.br/Docs/Publicacoes/PublicacoesAgricolas/Lev03_Safra20062007.pdf

Peanut shells may be utilized in small amounts, mainly during its two harvest periods that go from: January to February and through June. The amount of peanut shells produced in the state is much larger than the quantity that would be employed in the project activity. Considering that 200 tonnes per month of this biomass would be used in the project activity, it will represent 0.042% of the total available in the harvest of 2006/2007.

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

[65] *Source: <cenbio.iee.usp.br/download/metodologiabiomassa.pdf>. Last visited on April 02nd, 2009.*

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 ceramics presenting a huge possibility for sustainable development in the region. Therefore, the sources of leakages mentioned above will probably not 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 there is no source of leakage to be considered in this project activity.

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

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

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

4.2Quantifying 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.

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

By,total = 11.970 tons of ceramic units per year x 0.457 ton of wood/ tons of ceramic units = **5,470 tonnes of wood per year**

ERy, total = 5,470 tonnes of wood x 0.9804 x 0.0186 TJ/Tonne x 77.4 tCO2/TJ = **7,720 tCO2**

Table 16. Emission reductions without considering the project emissions and leakage.

Year	Baseline Emission Reductions (tons CO2eq)
August to December - 2006	3,217
2007	7,720
2008	7,720
2009	7,720
2010	7,720
2011	7,720
2012	7,720
2013	7,720
2014	7,720
2015	7,720
January to July - 2016	4,503
Total	73,983
Average	7,398

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 17. Estimation of overall emission reductions

Year	*Panorama* Total Emission Reductions (tonnes CO2eq)
August to December - 2006	3,217
2007	7,720
2008	7,720
2009	7,720
2010	7,720
2011	7,720
2012	7,720
2013	7,720
2014	7,720
2015	7,720
January to July - 2016	4.503
Total	73,983
Average	7,398

5 Environmental Impact:

Summary of the environmental impacts

Table 18. Summary of the environmental impacts

Environmental Factor	Environmental Impact	Classification
Soil	Improvement of soil conditions because of the vegetation conservation	Positive
Air	Production of ash	Negative
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 a polluting residues as fuel for energy production	Positive
Fauna	Biodiversity preservation	Positive
Flora	Biodiversity preservation	Positive

The only negative impact identified is that the project activity will generate ashes due to the burning of the biomass, but this impact will be mitigated by incorporating the ashes into the clay used as thermal insulator in the kilns entrance.

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 national association and the ceramic company employees. A letter was sent to the stakeholders informing about the project and in the ceramic's facilities the letter was posted on the employees' board, which is a visible place with high circulation of employees. The letter was available during seven days and the comments were expected for a period of seven days after the letter has been posted.

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

Beside consultation with employees and the INCOESP[66] (Cooperative of the West of São Paulo State), this kind of emission reductions projects have the CCB support. CCB[67] sent a letter supporting the Voluntary Carbon Project in the Red Ceramic Sector, which in their judgment is a very important action to the Civil Construction in Brazil, due to environmental and social benefits as well as quality improvement in their products.

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[66] INCOESP is a cooperative association that aims the development of Presidente Prudente ceramic sector.

[67] CCB (Brazilian Ceramic Center is a non-profit organization accredited by INMETRO for Quality Management System and Products Certification. More information is available at: < www.ccb.org.br>. Last visited on April 02nd, 2009.

7 Schedule:

- Project start date: May of 2006
- Date of initiating project activities: 01/August/2006
- Date of terminating the project: 31/July/2016
- Validation Report predicted to: 20/july/2009[68]
- First Verification Report predicted to 20/july/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.

[68] *The gap between the project start and the Validation report date occurs as an adaptation period due to the use of new biomass and its technology encompassing, for example, tests using the new biomasses and technological adaptations such as the modification in the kiln entrances. Furthermore, this gap encompasses a period to get the necessary information and document to validate the project activity.*

8 Ownership:

8.1 Proof of Title:

Ceramic’s article of incorporation and the contract between Social Carbon – project developer – and *Panorama* 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 *Panorama* 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.