Voluntary Carbon Standard Project Description

19 November 2007

Date of the VCS PD: 20th February 2009

1 Description of Project:

1.1 Project title

Cenol and *Telha Forte* Ceramics Switching Fuel Project

Version 05

VCS PD completed in: February 20th of 2009

1.2 Type/Category of the project

This is a voluntary grouped project activity that encompasses two small ceramic industries: *Cenol* and *Telha Forte* Ceramics. The voluntary project activity, although being applied at the voluntary market, encloses the following category of the simplified modalities and procedures, which is described in appendix B, for small scale type I CDM project activities.

- **Category AMS-I.E: Switch from Non - Renewable Biomass for Thermal Application by the User** - Version 01 from February 01 of 2008 onwards.
- This is a grouped project

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

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

The amount of emission reductions are greater than 5,000 tonnes of CO2 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 estimate during the crediting period

Year	Annual estimation of overall emission reductions (tCO_2e)
November to December-2007	9,622
2008	57,729
2009	57,729
2010	57,729
2011	57,729
2012	57,729
2013	57,729
2014	57,729
2015	57,729
2016	57,729
January to October-2017	48,108
Total Emission Reductions (tCO_2e)	577,290
Number of years of the crediting period	10
Annual average of estimated emission reductions for the 10 years of crediting period (tCO_2e)	57,729

1.4 A brief description of the project:

The project activity encompasses *Cenol* and *Telha Forte* Ceramics, which are two small and prototypical ceramic industries that produce structural ceramic devices like bricks, destined for the local market in *São Miguel do Guamá*, in the state of *Pará*. The ceramic pieces produced in *Cenol* and *Telha Forte* ceramics obey the ABNT [1] norms. The fuel employed in the baseline scenario to cook the ceramic devices was native wood from Amazonian biome.

The Amazonian Biome has sufficiently diversified fauna and flora, being inserted in a region of approximately 7 million km². Nowadays, the uncontrolled deforestation is breaking up the firm land forest. Without necessary care, entire regions of fauna and old centers of species have the risk to be disappeared forever[2].

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

The main goal of this project activity is to minimize the negative impacts of the deforestation of the Amazonian biome by discouraging the exploitation of the area through limiting the interested parties in acquiring the proper legal documents for the commercialization of the native fire wood.

[1] *Brazilian Association of Technical Standards (ABNT) is the body responsible for technical standardization in Brazil, providing the necessary basis for the Brazilian technological development.*

[2]*Source: text adapted from: < http://www.colegiosaofrancisco.com.br/alfa/meio-ambiente-floresta-amazonica/floresta-amazonica1.php >*

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

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

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

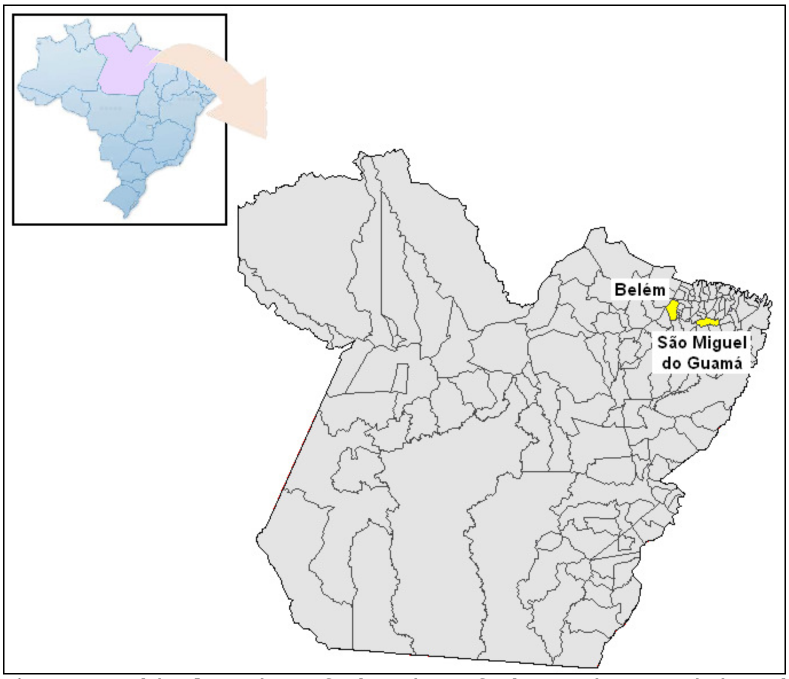


Figure 1. Geographic location of the city of the project activity that has the following coordinates *Pará* State: *São Miguel do Guamá*: 01º 37' 09.22'' S, 47º 28' 33.68'' W.

Table 2. Localization of the ceramics

Ceramic	*City*	*State*	*Ceramic Company Coordinates*
Cenol	*São Miguel do Guamá*	*Pará*	*1°32'12.06"S* *47°30'48.59"W*
Telha Forte	*São Miguel do Guamá*	*Pará*	*1°32'12.41"S* *47°30'48.65"W*

The project sites have the postal addresses:

- *Cenol* and *Telha Forte* Ceramics

  Rodovia BR 010 – km 1808 – Bairro Industrial, *São Miguel do Guamá – PA, Brazil*. Postal Code: 68660-000

1.6 Duration of the project activity/crediting period:

- Project start date[3]: 1st march 2007
- Date of initiating project activities[4]: 1st November 2007
- Date of terminating the project[5]: 31st October 2017
- VCS project crediting period: 10 years, twice renewable

1.7 Conditions prior to project initiation:

The use of native wood without sustainable management as fuel is a prevalent practice among the ceramics industries in Brazil. Wood from deforestation is delivered and utilized in the ceramic facilities and this non renewable biomass is offered with low prices.

Although firewood from deforested areas used has been 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[6]. 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[7].

According to *Seye* (2003)[8], 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

Therefore, the employment of this fuel stimulates the increase in Brazilian deforestation rates. The baseline identified for this project activity is the employing of a total of 44,400 tonnes of native wood per year for both ceramic companies to provide thermal energy to the ceramics' kilns.

The project activity focuses on the use of sawdust and açaí pits as renewable biomasses for energy supply.

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 no sustainable forest management to provide thermal energy in the ceramic companies. Therefore, the emissions launched during the combustion of wood were not compensated by the replanting. An opposite scenario occurs

---

[3] *Date on which the project began reducing or removing GHG emissions, i.e. when the project proponent began employing renewable biomass.*

[4] *Date on which the project proponent completed the fuel switch, thus, when the ceramics stopped employing native wood.*

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

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

[7] *Energy Research Company. National Energy Balance – energy consumption per sector. Available at <http://www.mme.gov.br/download.do?attachmentId=16555&download>*

[8] *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.*

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:

Cenol and *Telha Forte* ceramics companies utilize two different types of kilns in their burning process. *Telha Forte* ceramic uses eight "Round"[9] kilns and five "Paulistinha"[10] kilns and *Cenol* Ceramic uses three "Paulistinha" kilns and seven "Round" kilns, in order to dry and cook their products. The following table shows the technical parameters of "*Paulistinha*" and "*Round*" kilns.

Table 3. Technical parameters of "*Paulistinha*" and "*Round*" kilns.

Technical Parameter	*Paulistinha*	*Round*
Consumption of firewood[11] (ton of wood per thousand of devices)	1.00	1.00
Features	*Intermittent with rectangular shape and lateral furnaces*	*Intermittent with round shape and lateral furnaces*
Maximum Temperature	900	900°
Average Production per burning cycle (thousand of ceramic devices)	35,000	35,000
Average supposed capacity of each kiln (MW)	1.5	1.5
Hours of burning	60	60

Without the project activity, according to the historical experience of the ceramics, *Telha Forte* Ceramic would consume around 2,500 tonnes of native firewood per month and *Cenol* Ceramic would consume about 1,200 tonnes of native firewood per month to feed their kilns to obtain a temperature of 900°C with a burning of approximately 60 hours. The ceramics monthly productions are around 2,500,000 ceramic devices from *Telha Forte* Ceramic and 1,200,000 ceramic devices from *Cenol* Ceramic.

The sawdust employed in the project activity will be acquired from legal saw mills (http://www.sectam.pa.gov.br/seiamlic)[12]. The enterprises listed in this website have all the necessary licenses which ensures that the saw mills utilize wood from areas with sustainable forest management. The purpose is to use approximately 80% of sawdust and 20% of açaí pits in volume which may be replaced by elephant grass and rice husk.

The main biomass providers are listed at the table 4; nevertheless, it does not exclude the possibility of buying renewable biomass from others.

---

[9] *The "Round" kiln is a kind of intermittent kiln with round shape and lateral furnaces. Its internal diameter is about 9 meters. It is usually employed to burn tiles and bricks.*

[10] *The "Paulistinha" is a kind of intermittent kiln with rectangular shape and lateral furnaces. It is usually employed to burn tiles.*

[11] *Measured by the project proponent.*

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

Table 4. Main renewable biomass providers

Biomass	Providers	City
Sawdust	Madenave	*Benevides – PA*
	Júlio de Seixas Campos Ltda	*Benevides – PA*
	R.S. Lima Ind. e Comércio	*São Miguel do Guamá – PA*
Açaí pits	Bela Iaça	*Castanhal – PA*
	Castanhal Comércio de Polpas ME	*Castanhal – PA*

Due to the project activity, a set of adaptations were necessary, such as alterations to the kilns as well as the construction of a shed where the biomass must be stored so the ceramics can operate with the açaí pits and sawdust. It is very gainful for the ceramic the opportunity of using two kinds of biomasses because when there is a lack of one of them, the ceramic can use the other one as rice husk and elephant grass, depending on its availability. All of these changes were made counting on this project approval in order for the ceramics to become able to receive the biomass to be used.

Before the project activity, the process was noticeably different; the wood was inserted in the kilns by the employee and it was not necessary any logistic modification.

The following table shows the scenario of each of the ceramics. It is important to observe that each ceramic has its own kind of biomass already specified above in section 1.4.

Table 5. Scenario of each ceramic

	Cenol	***Telha Forte***
Production at baseline (devices per month)	1,200,000	2,500,000
Non-renewable wood consumption without the project activity (tons per month)	1,200	2,500
Actual production (devices per month)	1,200,000	2,500,000
Sawdust Consumption (tons/month)	791	1,000
Açaí Pits consumption (tons/month)	167	208
Total Biomass Consumption (tons/month)	958	1,208

The following figures show some of the changes at the ceramic companies.

Figure 2. Shed where the sawdust is stored at *Cenol* Ceramic.

Figure 3. "Paulistinha" Kiln at *Telha Forte* Ceramic.

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

This project is in accordance to the CONAMA[13] Resolution, no. 237/97 that establishes that clay extraction activities and ceramic production must be supported by specific licenses, such as operational license, clay extraction

---

[13] *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.*

license, environmental licenses and the permission of the Environmental Secretary of *Pará* (SEMA[14]) which must run under the valid time.

The project is also in accordance to Federal Constitution, Article 20, which establishes the payment of a Financial Compensation by the Mineral Resources Exploitation. This financial compensation is annually performed to DNPM (National Department of Mineral Production[15]).

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 industries. 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 regionally, however, an increase on their demand has already been reported. 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 affect the availability of the biomasses, the ceramic owner will search for other type of renewable biomasses, such as rice husk and elephant grass.

– Closing of the ceramic business

If the ceramic companies close, they may substantially affect the project's GHG emission reductions, once other ceramic would probably supply the products consuming native wood which is the common practice of the region. However, there are currently good perspectives in the ceramic market and in the organization of the administrations verified at Cenol and Telha Forte Ceramics, avoiding this possibility.

– Difficulty related to the abrupt change

As affirmed before, the ceramics used native wood from deforestation areas in their kilns for at least seven years. The sudden change claimed a lot of effort from each employee in the ceramics to make the adaptation successfully. The main challenges were the reconfiguration for 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.

---

[14] SEMA is the Environment Secretary in the State of Pará, responsible to issue the environmental licenses according to CONAMA resolution 237/97. More information at: www.sema.pa.gov.br.

[15] The objectives of the National Department of Mineral Production are: to foster the planning and promotion of exploration and mining of mineral resources, to supervise geological and mineral exploration and the development of mineral technology, as well as to ensure, control and monitor the exercise of mining activities throughout the national territory, in accordance with the Mining Code, the Mineral Water Code and respective legislation and regulations that complement them. Source: http://www.dnpm.gov.br/enportal/conteudo.asp?IDSecao=168&IDPagina=222.

The fact that the two ceramics have historically operated using wood without sustainable management as fuel, clearly confirms the project was not implemented to create GHG emissions for the purpose of its subsequent removal or destruction.

Cenol and *Telha Forte* ceramics had used non-renewable fuel to produce their pieces since the beginning of its operations, which mean 15 and 7 years, respectively. This is evidence that guarantees the integrity of this project activity.

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

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

Q27 Standard[16] was initially applied to perform validation and verification of the project, however it was switched to VCS 2007 standard which is currently being applied. The crediting period of the verified carbon credits Q27 Standard are not being considered in this VCS PD. Please see letter attached from BRTUV, which was responsible to validate and verify the projects under Q27 Standard.

Social Carbon Methodology is being applied only as a Sustainability tool in association with VCS 2007 Standard.

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

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

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

The project proponent contributed to the current report by assigning the following roles and responsibilities to:

Cenol and *Telha Forte* Ceramics:

Mr. *Francisco Valdir*, Director and monitoring data responsible: Information and visit of the ceramic, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramic devices market challenges, detailed information and numbers on sales, how output data is handled, and how data is stored and kept by the *Cenol's* office.

Other information on the project's proponent:

Address: Rodovia BR 010 – km 1808 – Bairro Industrial, *São Miguel do Guamá – PA, Brazil*. Postal Code: 68660-000

[16] *Standard developed by BRTUV – Avaliações da Qualidade, Brazilian Subsidiary of TÜV NORD CERT GmbH*

Phone number: +55 (91) 3446-2341

Carbono Social Serviços: Project participant, project idealizer and responsible to prepare the project report and accompany the proponent until the end of crediting period.

Marcelo Hector Sabbagh Haddad and Thales Andrés Carra, Technical Analysts: Project Design Document writers, elaboration of GHGs Emissions' Inventory, direct contact between Social Carbon Company and the ceramic companies, and responsibles for collecting the necessary information. Coordinated by:

Flávia Yumi Takeuchi, Technical Coordinator and Rafael Ribeiro Borgheresi, Technical Analyst.

Other information on the pr project developer contact:

Address:

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

Postal Code: 04038 032

São Paulo – SP, Brazil

Phone number: +55 11 2649 0036

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

Email: marcelo@socialcarbon.com

thales@socialcarbon.com

flavia@socialcarbon.com

rafael@socialcarbon.com

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

The project is eligible according to:

- Legislative: the project attends all legal requirements;
- Technical: alterations/adaptations required are technically feasible;
- Economic: carbon credits will make the project feasible;
- Sectoral: incentive of good practices to the sector;
- Social: social carbon methodology will be applied which will improve long tern 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 (B_y) will be determined according to the option "b" of the applied methodology once option "a" is designed for really small appliances like household stoves and does not fit for the kind of projects in question.

The project's emissions from the combustion of native wood are accounted in the same way as fossil fuel combustion, 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 *São Miguel do Guamá* 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) [17] and Brazilian´s Technology and Science Ministry [18] . Therefore, the proposed project activity is not saving the non-renewable biomass accounted for by the other registered project activities.

The utilization of firewood from area without any kind of management can not be considered a renewable source of biomass, since it interferes in the carbon pools and increases the carbon emissions to the atmosphere, turning greenhouse 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 centuries as fuel in Brazil[19]. Although, it is impossible to define a start date on which this kind of non-

---

[17] *CDM activities registered by CDM Executive board are Available at:< http://cdm.unfccc.int/Projects/registered.html>.*

[18] *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.*

[19] *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*

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 [20] . 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[21]. Especially in the ceramic sector, the use of firewood is visible non-renewable and unsustainable, involving negative environmental impacts associated[22].

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

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

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

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

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

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

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

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[23]. In case of using elephant grass it will be cultivated in pasture or degraded areas, in which there is no vegetation to be deforested. Therefore, this practice will not generate competing use of biomass and it will not deforest a vegetated area.

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

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

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

---

[20] *Brito, J.O."Energetic use of Wood". Available at: http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&tlng=ES*

[21] *National Energy Balance- energy consuption per sector. Available at: <http://www.mme.gov.br/download.do?attachmentId=16555&download>*

[22] *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*

[23] *According to EMBRAPA (Brazilian Agricultural Research Corporation's). Source: http://www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292*

In the baseline, there is use of non-renewable biomass to burn ceramic devices in the ceramics' kilns. This practice is responsible to discharge in the atmosphere the carbon that was stored inside of the wood (well-known by a carbon sink).

Table 6. Gases included in the project boundary and brief explanation

	Gas	Source	Included?	Justification/ Explanation
Baseline	CO2	Emission from the combustion of non-renewable fuel	Yes	The major source of emissions in the baseline
	CH4	-	No	Deforestation rates will probably decay Excluded for simplification. This is conservative.
	N20	-	No	Possibly emissions from wood burning will be excluded for simplification. This is conservative.
Project Activity	CO2	-	No	Excluded for simplification. This emission source is assumed to be very small.
	CH4	-	No	Excluded for simplification. This emission source is assumed to be very small.
	N20	-	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 7, the common fuels employed and therefore, the baseline candidates are: natural gas, charcoal, wood, other recuperations, diesel oil, fuel oil, liquefied petroleum gas, others from petroleum, piped gas, electricity and others none specified.

Table 7. 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>)

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 0,895BRL/kg and the firewood used to present an average price of 16.29 BRL/tonne in the baseline scenario. These values lead us to conclude that the price of oil fuel around 0.000090587BRL/Kcal[24] as long as the price of this kind of wood is around 0.0000037BRL/Kcal[25] 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.

Another plausible baseline scenario would be the use of Natural Gas. However there is no distribution / gas pipe in the region[26], excluding this possibility. The most probably scenario would be the use of fuel oil, which is not viable considering its higher prices when compared with non renewable biomass.

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

The calculations regarding the quantity of non-renewable wood required in the burning process were done according to the consumption of non-renewable biomass of the kilns on the production, according to historical experience, which would require around 1.5 m³ or 1 ton to produce 1,000 ceramic devices, the same value for both ceramics. Both types of kiln, "Paulistinha" and

---

[24] *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*

[25] *According to the values of native wood paid in the Cenol and Telha Forte Ceramics before the project activity (11 BRL per m3 or 16.28 BRL per ton). The values of NCV and density utilized are the same utilized in monitoring parameters (NCV=0.0182 TJ/tonnes /Tonne and Density=0,6752 Tones/m3).*

[26] *Source: http://www.ctgas.com.br/template02.asp?parametro=2547*

"Round, have efficiency between 1.5 to 2 m³ per thousand of pieces [27], therefore concluding that the kilns operated within the expected efficiency. Furthermore, according to the ceramic owner, these kilns have the same producing capacity; both reach the same temperature and operating time.

Therefore, in the absence of this project activity, the identified baseline scenario would be the consumption of around 44,400 tons of non-renewable native wood per year to feed their kilns to sustain an annual production of 44,400,000 ceramic devices

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 Application by the User - Version 01 from February 01 of 2008 onwards, which is applicable for project activities that avoid greenhouse gas emissions by using renewable biomass in order to generate thermal energy.

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

The baseline identified for this project activity would be the employment of a total of 3,700 tonnes of native wood per month to feed their kilns to obtain an approximate temperature of 900°C with a burning of 60 hours, in order to generate thermal energy.

Project additionality is explained according to 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. To demonstrate that the project is additional, it will be used the test 1:

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

The project faces at least one distinct barrier 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 ceramics was necessary. The main technological barriers were the non-availability of human knowledge to operate and maintain the new technology, the internal logistic modification and the employees' resistance to the new technology.

Before the project activity, the process was noticeably different: native wood was delivered in the plant; it was inserted in the kilns by the employees and it was not necessary any logistic modification in order to attend the project's needs, e.g. the new biomass has to be stored in cover sites and needs to be dried in order to achieve a better burn efficiency.

The operators did not have knowledge of the ideal amount of renewable biomass that was necessary to achieve the temperature of about 900°C 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 new entrance of the kiln, designed especially for the project activity, 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 kiln's feeding has to be done gradually, demanding even more time and labor from the employees.

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

As a result of the fuel switch, some training courses were required for the staffs in order to clarify new measures linked to the use of renewable biomass, sustaining the quality of the final product.

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

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 *Cenol and Telha Forte* Ceramics had to find the best procedure to handle with the new technology, i.e. the new biomass, logistic and kiln's adaptations.

All these changes were made counting on this project approval in order to the ceramic become able to receive the biomass to be used. *Cenol and Telha Forte* Ceramics, with this project activity, intend to develop their burning process and their kilns 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.

- **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. Although the ceramic companies used to receive renewable biomass as donation, 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 truck maintenance.

Furthermore, initially there were high costs with electrical energy and with the mechanic burner's maintenance. However, due to those high costs, the mechanic burners had to be removed and other entrances were constructed to inject the renewable biomass without spend electricity and with less maintenance costs. Therefore, due to the implementation of the project activity, the ceramics had to purchase mechanic burners to automatically inject the biomass with air inside the kilns and after they had to remove that as described above. The project proponent also had to constructed sheds to store and dries the renewable biomasses.

Table 8.Comparison between costs due to the fuel switch in the baseline scenario and the project activity scenario of *Cenol Ceramic*

Scenario	**Non-Renewable biomass**		**Renewable biomass**	
			Açaí Pits	**Sawdust**
Variable costs				
Monthly consumption of the fuel (tons/month)	1,200	Tonnes of wood per month	167	791
Price of biomass (BRL per m3)	16.28	BRL per m3	0	0
Total acquisition biomass cost (BRL per month)	19,536.00	BRL per month	0,00	
Costs of truck pieces (BRL per month)	-	-	11,220.59	
Costs of truck maintenance service (BRL per month)	-	-	2,775.00	
Costs of fuel for transportation (BRL per month)	-	-	44,100.00	
Truck Drivers (BRL per month)	-	-	1,452.82	
New Labors (BRL per month)	-	-	952.84	
Total variable cost per month (BRL per month)	**19,536.00**	**BRL per month**	**60,501.25**	
Investment				
Costs with equipment acquisition (including freight) (BRL)			78,000.00	
Costs with Kiln adaptation (BRL)			31,500.00	
Eletronic Burn Monitoring system (BRL)			2,123.60	
Loss of revenues - period for adaptation of the kiln for biomass (BRL)			70,000.00	
Waste of products in the testing period (3 months) (BRL)			36,000.00	
New biomass storage shed (BRL)			22,763.50	
Total Invested			**240,387.10**	

Table 9.Comparison between costs due to the fuel switch in the baseline scenario and the project activity scenario of *Telha Forte Ceramc*

Scenario	Non renewable biomass	Renewable biomass	
		Açaí Pits	Sawdust
Variable costs			
Monthly consumption of the fuel (tons/month)	2,500	208	1,000
Price of biomass (BRL per ton)	16.28	0	0
Total biomass cost (BRL per month)	40,700.00	0.00	0.00
Costs of truck pieces (BRL per month)	-	11,220.59	
Costs of truck maintenance service (BRL per month)	-	2,775.00	
Costs of fuel for transportation (BRL per month)	-	44,100.00	
Truck Drivers (BRL per month)	-	2,407.66	
New Labors (BRL per month)	-	2,596.01	
Total variable cost per month (BRL per month)	**40,700.00**	**63,099.26**	
Investment			
Costs with equipment acquisition (including freight) (BRL)		84,500.00	
Costs with Kiln adaptation (BRL)		31,500.00	
Eletronic Burn Monitoring system (BRL)		4,391.60	
Loss of revenues - period for adaptation of the kiln for biomass (BRL)		91,000.00	
Waste of products in the testing period (3 months) (BRL)		75,000.00	
New biomass storage shed (BRL)		92,000.00	
Total Invested		**378,391.60**	

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

- **Institutional barriers**
  - **Risks of the project**

Since the use of native wood without sustainable management is an established and well-known process, the project activity implementation represents a risk to the project proponent because the use of a new biomass and its new logistic adds a significant amount of insecurity to the production process. This change an extensive period of fiscal vulnerability for the ceramic, since during the reconstruction of the kilns, the ceramic production was low. In addition, there is the transition period, where the ceramic lost production due to the adaptation to the use of biomasses and to the new logistic.

Furthermore, the ceramics can go through a period in which there is lack of biomasses, representing another period of risk.

Since it must be emphasized that there is no direct subsidy or support from the government for this project, without the income from the commercialization of the carbon credits, the fuel switch at *Cenol and Telha Forte* ceramics would not be feasible or attractive to the project proponent.

  - **Barrier due to the price of the biomass**

The combustion of sawdust and açaí pits to generate thermal energy is an innovation in the ceramic industry. The future demand of this alternative fuel (e.g. by other consumers) is not predictable. Although there is currently a great amount of these biomasses available, there is a possibility that the prices will increase when the biomasses disposal problem is attenuated. If the price of the biomass increases, in the other hand, the products can not increase, once it would not have competitive prices in relation to other ceramics which did not made the fuel switch.

These circumstances make the commercialization of the carbon credits essential to the maintenance of 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 roof tiles.

2. Identify possible types of baseline candidates.

Observing table 10, the common fuels employed and therefore, the baseline candidates are: natural gas, charcoal, wood, other recuperations, diesel oil, fuel oil, liquefied petroleum gas, others from petroleum, piped gas, electricity and others none specified. Other possible baseline candidate would be the use of renewable biomass without the carbon credits support.

Table 10. 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>)

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.

Therefore, data from table 10 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 *Cenol* and *Telha Forte* Ceramics did their 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

[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.*

not enforced namely due to the lack of police. The consumption of non renewable biomass by the ceramic industry was related by several authors (NERI, 2003[29]; ALBUQUERQUE et al, 2006[30]; BRASIL, 2001[31]; VIANA, 2006[32]; CARDOSO, 2008[33]). This have also been observed in other industries as in the production of steel (BRASIL, 2005[34]), which has a much better structure and internal organization when compared with the ceramic industry, that is usually a small and familiar enterprise. 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 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 10 provides the percentage of the level of penetration of each fuel utilized 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 used, which would be the scenario of highest GHG emissions, once its emission factor is the highest according to IPCC 2006[35].

b) Natural gas: it is restricted by the absence of pipes, its high costs[36] and lack of availability[37]. The risk of lack of offering and higher costs when compared with other fuels discourages the scenario of investing in this type of fuel even in local with piped gas. The distribution of gas is preferentially performed to thermal power plants, increasing the risk of blackout of natural gas.

c) Fuel oil: This fuel is more expensive than wood, however it can be a more plausible of substitute of wood than natural gas. The risks involving natural gas distribution are so considerable that PETROBRÁS[38] was offering

---

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

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

[31] *BRASIL. Ministério de Ciências e Tecnologias. Levantamento da Situação e das Carências Tecnológicas dos Minerais Industriais Brasileiros: com enfoque na mineração de: Argila para cerâmica, Barita, Bentonita, Caulim para carga, Talco / Agalmatolito e Vermiculita. Brasília, 2001. Available at: < http://www.cgee.org.br/prospeccao/doc_arq/prod/registro/pdf/regdoc710.pdf>. Access at: September 10th, 2008.*

[32] *VIANNA, F.M.A. Participação Pública em Programas Ambientais: Um Estudo em Área Suscetível a Desertificação no Estado do Rio Grande do Norte. 2006, 109f. Dissertação (Mestrado em Engenharia de Produção) - Universidade Federal do Rio Grande do Norte, Natal, 2006. Available at: <http://www.pep.ufrn.br/publicacoes.php?enviou=1>. Access at: September 10th, 2008.*

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

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

[35] *Source: IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Source: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf>. Page 2.18. Table 2.3.*

[36] *Source: <http://www.dep.fem.unicamp.br/boletim/BE31/artigo.htm>.*

[37] *Source: <http://www.gasnet.com.br/novo_entrevistas.asp?cod=145>.*

[38] *PETROBRÁS performs in oil and oil byproduct exploration, production, refining, marketing, and transportation, both in Brazil and abroad. More information available in: <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.

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[39].

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

In Brazil, the red ceramic devices are generally produced through an inefficient and traditional process using wood without forest management to generate thermal energy technologies[40]. 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[41].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, 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[42].

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[43].

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 did not have the knowledge of the ideal amount of renewable biomass that is necessary to use in order to achieve the temperature of about 900°C to cook its ceramic pieces, to acquire the final product with the same quality and to maintain the optimal process as they did when using the native wood without sustainable management. As a result of the fuel switch, an extensive training course was required for the staff in order to clarify new measures

---

[39] 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.

[40] *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 in: November, 20th 2008*

[41] *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.*

[42] *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*

[43] *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 in: November, 20th 2008.*

linked to the new technology in order to sustain the quality of the final product.

Thus, the project activity is not a common practice.

Impact of projects approval

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

Brazil is the third major contributor[44] to the carbon dioxide emissions in the year of 2003, though contemporary studies generally place Brazil fourth in the ranking of the countries that emit the most GHGs.

The Amazonian Biome deforestation, which can be observed in table 11 and graph 1, aggravates because of the grazing practice, agriculture and site preparation which involves extraction and burning of wood and firewood commercialization[45].

The First Brazilian Inventory of Anthropogenic Greenhouse Gas Emissions[46] – Background Reports indicates that the major source of GHG emissions in *Brazil* is due to deforestation, mainly occurred in Amazonian (59% of the deforestation) and Cerrado biomes (26%). Another relevant issue is the rise in deforestation rates in the Amazonian biome, which achieves more than 14,206,000ha of the Brazilian Legal Amazonian[47]. Currently, every part of the society sector should be involved in this, and all efforts are necessary to minimize the Amazonian biome scenario of degradation and prevent its extinction. The Amazonian Rainforest is the major tropical forest of the world. Furthermore, this biome is a supply of biodiversity, holding the bigger variety of species in the world; there are still many unknown vegetal and animal species in this magnificent biome[48].

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

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

---

[44] *Source: Goldemberg & Moreira. Política Energética no Brasil. Estudos Avançados 19 (55), 2005. Available in: <http://www.scielo.br/pdf/ea/v19n55/14.pdf> (last visit in July 2008).*

[45] *FERREIRA, Leandro Valle; VENTICINQUE, Eduardo and ALMEIDA, Samuel. O desmatamento na Amazônia e a importância das áreas protegidas. Estud. av. [online]. 2005, v. 19, n. 53 [cited 2009-01-14], pp. 157-166. Available from: <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-40142005000100010&lng=en&nrm=iso>. ISSN 0103-4014. doi: 10.1590/S0103-40142005000100010.*

[46] *Available at: <http://www.mct.gov.br/index.php/content/view/17341.html>*

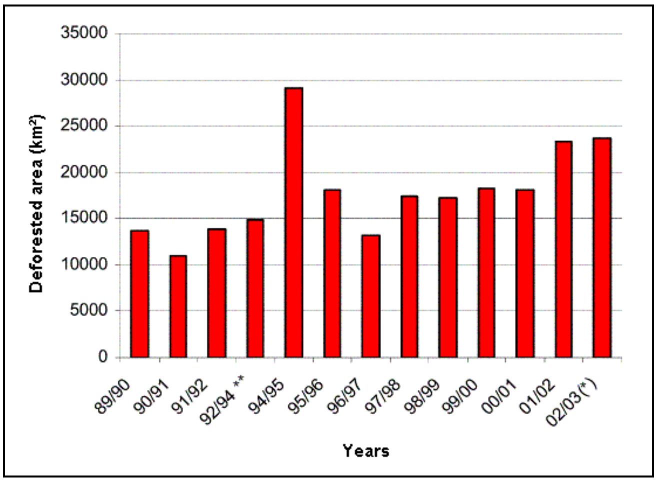
[47] *PRODES – Program for Deforestation Assessment in the Brazilian Legal Amazonian. Available from: http://www.obt.inpe.br/prodes/.*

[48] *Source: PERES, C. A. Porque precisamos de megareservas na Amazônia. Megadiversidade, Vol. 1, Número 1, julho 2005. Available at: <http://www.unifap.br/ppgbio/doc/23_Peres.pdf>. Checked at: September 10th, 2008.*

Table 11. Area and total deforestation proportion observed in the states of Amazonian

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

(Available from: <http://www.scielo.br/scielo.php?pid=S0103-40142005000100010&script=sci_arttext&tlng=en>)



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

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:

The methodology applied is Category AMS-I.E: Switch from Non - Renewable Biomass for Thermal Application 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.

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

Source data used in this report is based on real outputs from *Cenol and Telha Forte Ceramics*. 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 determine the most approximate quantity of wood without sustainable management that, in the absence of the project, would be used in the ceramics' kilns and consequently the amount of GHG that would be emitted in tons of CO_2e.

Table 12. Data reported in monitoring estimation

Parameters	Description	Units	Origin	Frequency
$Q_{renbiomass}$	Amount of renewable biomass	tons	Measured by the project proponent	Monthly
Origin of renewable biomass	Renewable origin of the biomass	Not Applicable	Controlled by the project proponent	Annually
PR_y	Production of ceramic pieces	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
$EF_{projected\ fossil\ fuel}$	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
$NCV_{biomass}$	Net Calorific Value of non-renewable biomass	TJ/ton of Wood	Bibliography	Not monitored
$\rho_{biomass}$	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 established as non- renewable biomass using survey methods	Percentage	Data from project proponent	Annually
BF_y	Consumption of non-renewable biomass per thousand of ceramic devices produced	tons/ thousand of ceramic devices	Data from project proponent	Not monitored

In the monitoring plan, the amount of non-renewable biomass (**B_y**) will be determined using the option 'b' of the applied methodology:

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

As stated before, the *Cenol* ceramic employed around 1,200 tones of native wood without sustainable management per month producing 1,200,000 ceramic devices and the *Telha Forte* ceramic employed around 2,500 tones of native wood per month producing 2,500,000 ceramic devices. This information leads to the number of 1 ton of native wood to produce a thousand of ceramic devices, the same value for both ceramics.

The quantity of native wood that would be used in the ceramics will be calculated through the multiplication of the ceramics' monthly production by the consumption of the kiln, as the following example for *Cenol* Ceramic:

By = (Monthly production/1000) x Kiln Consumption (BF_y)

By = 1,200 x 1 tons of wood/thousand pieces

By = 1,200 tons of native wood/month = 14,400 tons of native wood/year

The responsible to monitor data provided in table 12 will be Mr. *Francisco Valdir* for both ceramics. 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

Data / Parameter:	**PR_y**
Data unit:	Unity of ceramic pieces
Description:	Production of ceramic devices
Source of data to be used:	Controlled by the project proponent.
Value of data applied for the purpose of calculating expected emission reductions	<table><tr><th>Production (approximated)</th><th>Cenol</th><th>Telha Forte</th></tr><tr><td>Ceramic Devices</td><td>1,200,000</td><td>2,500,000</td></tr></table>
Description of measurement methods and procedures to be applied:	The amount was acquired by counting the total production of one year. The measurement will be done by an internal control sheet monitored by the project proponent, which will be filled daily. The production is a representative sample to ensure that all appliances are still in operation
QA/QC procedures to be applied:	The ceramics have an internal control of the quantity of pieces produced. It will be rechecked according to the biomass employed and the kiln consumption of renewable biomass.
Any comment:	

<table>
<tr><th>Data / Parameter:</th><th>$Q_{renbiomass}$</th></tr>
<tr><td>Data unit:</td><td>Tons per year</td></tr>
<tr><td>Description:</td><td>Amount of renewable biomasses</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>
<table>
<tr><th>$Q_{renbiomass}$</th><th>Cenol</th><th>Telha Forte</th></tr>
<tr><td>Sawdust</td><td>9,500</td><td>12,000</td></tr>
<tr><td>Açaí Pits</td><td>2,000</td><td>2,500</td></tr>
</table>
</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>The amount of biomasses will be monitored in accordance to the weight described in the receipts from the providers. Some values in the receipts are described in m^3, therefore it is necessary the conversion to tons through the specific gravity of each biomass. The specific gravity values of the renewable biomasses utilized in this project are:
<table>
<tr><th>Biomass</th><th>Sawdust</th><th>Açaí Pits</th></tr>
<tr><td>Specific gravity (tons/m_3)</td><td>0.245</td><td>0.723</td></tr>
</table>
The sources of these data are:
Sawdust:

Masses and Dead Loads of Concrete and Other Materials- http://www.cca.org.nz/pdf/Masses.pdf

Açaí Pits:
PADILHA, J. L.; CANTO, S. A. E.; RENDEIRO, G. Avaliação do potencial dos caroços de açaí para geração de Energia. Biomassa & Energia, v. 2, n. 3, p. 231-239, 2005. Available from: < http://www.renabio.org.br/arquivos/p_avaliacao_energia_8340.pdf></td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>The ceramics have spreadsheets of the quantity of biomass acquired. It will be rechecked according to the receipts of purchase. Even if the ceramic company receive donations their invoices will be required.</td></tr>
<tr><td>Any comment:</td><td></td></tr>
</table>

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 the applied methodology 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 industries fuel consumption will be utilized 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 m³</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>07/08</th></tr><tr><td>Forest Residues (sawdust) in m³</td><td>9,090,150</td></tr><tr><td>Rice Husk (tons)</td><td>84,734.3</td></tr><tr><td>Açaí Pits (tons)</td><td>79,715.5</td></tr><tr><td>Elephant Grass</td><td>Not measured</td></tr></table>
Detailed information in section 4.1 – Leakage.</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 internal articles and database every monitoring period. The 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:	**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 or checked at <http://www.sectam.pa.gov.br/seiamlic> in case of sawdust. As stated in the section 2.2, the biomasses (sawdust, rice husk and açaí pits) are considered renewable as fulfilling the options described in the methodology applied.
QA/QC procedures to be applied:	The biomass will be considered as renewable if it is according to the definition given by the applied methodology. Furthermore, documents proving the origin of renewable biomass from forested resources will be provided.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	$f_{NRB,y}$
Data unit:	Percentage
Description:	Fraction of biomass (wood) used in the absence of the project activity is established as non-renewable biomass using survey methods
Source of data used:	Survey methods.
Value of applied:	92.3%
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)[49], Amazonian Biome has only 7.7% of its total area with sustainable use, thus, 92.3% of its forest resources can be considered non-renewable.
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 Amazonian biome.
Any comment:	It will be employed in order to estimate the amount of non renewable biomass.

Fixed Parameters

Data / Parameter:	$NCV_{biomass}$
Data unit:	TJ/ton of wood
Description:	Net Calorific Value
Source of data used:	Sources: - Poder Calorífico da Madeira e de Resíduos Lignocelulósicos. Available in: http://www.renabio.org.br/arquivos/p_poder_lignocelulosicos_11107.pdf - LORENZI, H. Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil, vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002.
Value applied:	0.0182
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value will provide the energy generated by the amount of wood that would be used in the absence of the project. The species used to calculate the average value are typical trees of Amazonian Biome that are usually utilized as fuel in the ceramic industries of the region.
Any comment:	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).

[49] *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*

Data / Parameter:	**$\rho_{biomass}$**
Data unit:	ton/ m3
Description:	Specific gravity
Source of data used:	Source: – Poder Calorífico da Madeira e de Resíduos Lignocelulósicos. Available in: http://www.renabio.org.br/arquivos/p_poder_lignocelulosicos_11107.pdf – LORENZI, H. Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil, vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002.
Value applied:	0.6753
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 in volume units. This datum will be used for the unit conversion.
Any comment:	The species used to calculate de average value are typical trees of Amazonian Biome and usually utilized as fuel in the ceramic industries of the region.

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 will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

Data / Parameter:	**BFy**
Data unit:	ton of wood per thousand of devices
Description:	Consumption of non-renewable biomass per thousand of ceramic devices
Source of data used:	Historical data from project proponent
Value of data	1.00
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, 2000 [50], which estimates an approximate value for the kilns (“Paulistinha” and “Round”) of 1 – 1.35 tons/ thousand of pieces.

3.4 Description of the monitoring plan

The party responsible for implementing the monitoring plan shall be the owner of the companies. The project proponent will also be responsible for developing the forms and registration formats for data collection and further classification. Data monitored will be kept during the crediting period and 2 years after. For this purpose, the authority for the registration, monitoring, measurements and reporting is Mr. Francisco Valdir. All the monitored parameters will be checked annually as requested in the methodology Category AMS-I.E: Switch from Non - Renewable Biomass for Thermal Application by the User - Version 01 from February 01 of 2008 onwards.

The management structure will rely on the local technicians with a periodical operation schedule during the project. The technical team will manage the monitoring, the quality control and quality assessment procedures and the different auditory will be responsible to carry the project premises.

With the carbon credits income, in order to complement the monitoring of the production of ceramic devices, equipments from Alutal will monitor each burning cycle of the kilns through graphics of the temperature reached in the kiln versus time.

Social Carbon Company will also implement a report following the Social Carbon methodology, which was developed by *Instituto Ecológica* and focus on sustainable development and better social conditions for the communities where it is implemented. This Social Carbon Reports will be available at TZ1 registry (*http://www.tz1market.com/socialpublic.php*) once the project is registered.

[50] Source: TAPIA, R. E. C. et al. **Manual para a indústria de cerâmica vermelha**. Rio de Janeiro: SEBRAE/RJ, 2000. (Série Uso Eficiente de Energia).

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

Methodology AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User – Version 01 from February 01 of 2008 onwards, which comprises project activities that avoid greenhouse gas emissions by using renewable biomass in order to generate thermal energy. The project's emissions from the combustion of native wood are accounted in the same way as fossil fuel combustion, once it is not renewable and emits CO_2.

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

Baseline

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

Where:

ER_y: Emission reductions during the year y in tCO_2e

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

$f_{NRB,y}$: Fraction of non-renewable biomass (wood) used in the absence of the project activity in year y

$NCV_{biomass}$: Net calorific value of non-renewable biomass in TJ/ton

$EF_{projected\ fossil\ fuel}$: Emission factor for the projected fossil fuel consumption in the baseline in tCO_2e/TJ[51].

B_y is determined using the following option:

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

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

Where:

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

η_{old} : Efficiency of the system being replaced

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

Where:

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

PR_y: Amount of product produced in year y in thousand of ceramic devices

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

---

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

Where:

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

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

Where:

BF_y: Amount of native firewood needed to produce a certain amount of product in tonnes/thousand of ceramic devices

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

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

As shown in the calculations above, the ηold is not required to calculate the Emission Reductions, thus it was excluded from the By calculation.

Leakage (LE)

The Category AMS – I.E: Switch from Non – Renewable Biomass for Thermal Application 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 this project activity, was estimated according to the "General guidance on leakage in biomass project activities" (attachment C of appendix B) of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, which identifies different emission sources based on the type of biomass considered (described in the table 13).

Table 13. 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 13, 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. The source of leakage of the present project is showed below according to each type of biomass:

Elephant grass

This biomass is from grassland in abandoned areas, therefore the leakage that would be applicable is the shift of pre project activity and emissions from biomass generation/cultivation. Currently, elephant grass has been acquiring national importance as biomass[52] 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)[53]. In case of employing this kind of biomass, the project proponent will cultivate, by himself, elephant grass in pasture or degraded areas, in which there is no vegetation to be deforested. Therefore, this practice will not generate competing use of biomass and it will not deforest a vegetated area, i.e. this leakage will not exist.

Forest Residues

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 4, the potential of energy generation in the state of *Pará* is high, which means

[52] *Source: <www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292>*
[53] *Source: <www.cnpgl.embrapa.br/nova/informacoes/pastprod/textos/17Instrucao.pdf>*

that there is an enormous availability of this kind of fuel to be employed in the project activity. This way, this biomass does not have potential to generate leakage emissions due to its high availability.

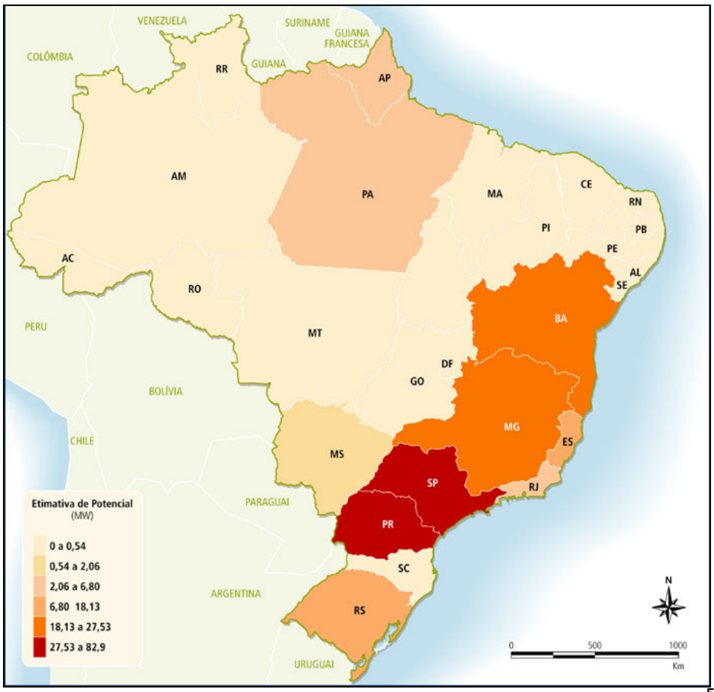


Figure 4.Forest Residues Potential for Energy Generation[54]

Considering that around 22% of the wood produced will generate sawdust[55]. The production of wood in the state of *Pará* was of 9,090,150 m^3[56] in 2007, thus, 1,999,833 m^3 will generate sawdust.

The project activity will employ approximately 21,500 tons, thus 87,755 m^3 of woodchips/sawdust per year which represents 4.39% of the total of these residues generated in the State of *Pará*.

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

Rice Husk

In the case of rice husk, the state of *Pará* produced 368,410 tons of rice in husk in the year of 2007[57]. The husk corresponds to 23% of the weight of rice in husk[58]. Therefore, the production of rice husk in the state of Para was 84,734.3 tons.

---

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

[55] *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.*

[56] *According to IBGE(Geographic and Statistic Brazilian Institute) available from: <http://www.ibge.gov.br/estadosat/temas.php?sigla=pa&tema=extracaovegetal2007>*

[57] *According to IBGE(Geographic and Statistic Brazilian Institute) available from: <http://www.ibge.gov.br/estadosat/temas.php?sigla=pa&tema=pamclo2007>*

[58] *GAIDZINSKI, R. Utilização da casca de arroz como sorvente alternativo para o tratamento de efluentes da Região Carbonífera Sul Catarinense. 2007. Available at: <http://www.cetem.gov.br/publicacao/serie_anais_I_jpci_2007/Roberta_Gaidzinski.pdf>. Last visit in: January 15th, 2008.*

According to other ceramic[59] that employ rice husk, which has similar type of kiln and production capacity, *Cenol* and *Telha Forte* ceramic would consume together around 14,400 tons of rice husk, considering that the ceramics production would only depend on this type of renewable biomass. Thus, the rice husk consumption would represent around 17% of the total of the amount produced. Therefore, the project activity would not disturb in any aspects this renewable fuel market once there is plenty of this kind of biomass available.

Açaí Pits

In terms of açaí pits, the state of *Pará* is the biggest producer of açaí (*Euterpe oleraceae*) in *Brazil*. The pits are easily found, especially in *Belém*, which is the major consumer of açaí in the Sate of *Pará*. The açaí is the basis of the daily alimentation of the population in this state, where is widely cultivated. Nevertheless, its residues are still without adequate economic destination[60].

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

The project activity will employ approximately 4,500 tons of açaí pits per year, representing around 5% of the total of the amount produced. Therefore, the project activity will not disturb in any aspects this renewable fuel market once there is plenty of this kind of biomass available.

There are no data regarding the demand for the biomasses in the State of *Pará*. However, according to *Barbosa* (2009)[63], it is a common practice in sawmills the generation of methane due to the decay of sawdust in their on site places. However, currently, there is a very low demand for sawdust in the State of Pará. Furthermore, according to *Townsend* (2001)[64], on the locals where the açaí is processed, there is a lot of açaí pits left to decay once they have very low utility. Therefore, the demand for the renewable biomasses used by the ceramic companies is very low.

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

The following potential sources of this type of leakage could be 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.

---

[59] *According to Milenium ceramic – Paraíso do Tocantins – Tocantins*

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

[61] *According to IBGE (Geographic and Statistic Brazilian Institute) available from: <http://www.ibge.gov.br/estadosat/temas.php?sigla=pa&tema=extracaovegetal2007>*

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

[63] *Barbosa D. – Do Globo Amazônia, em São Paulo. Available at: <http://portalamazonia.globo.com/noticias.php?idN=77689&idLingua=1%20-%2044k>*

[64] *Townsend C. R., Costa N. L., Pereira R. G. A., Senger C. C. D. Características químico-bromatológica do caroço de açaí. Nº 193, ago./01, p.1-5 Available at: <http://www.cpafro.embrapa.br/Pesquisa/public/2001/outros/Cot_193.PDF>*

– Use of non-renewable biomass saved under the project activity to justify the baseline of other project activities can also be potential source of leakage. If this leakage assessment quantifies a portion of non-renewable biomass saved under the project activity that is used as the baseline of other project activity then baseline is adjusted to account for the quantified leakage.

– Increase in the use of non-renewable biomass outside the project boundary to create non-renewable biomass baselines can also be potential source of leakage. If this leakage assessment quantifies an increase in use of non-renewable biomass outside the project boundary then baseline is adjusted to account for the quantified leakage

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

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

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

With the implementation of the project activity, *Telha Forte* and *Cenol* ceramics will avoid the consumption of about 44,400 tons per year of Amazonian native vegetation [65] , contributing to reduce the increasing deforestation rate of Amazonian biome.

This leakage will be monitored in order to guarantee the project conservativeness.

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 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.

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

The applied methodology does not predict project emissions; therefore, the baseline emissions are equivalent to emission reductions, which is demonstrated below for *Telha Forte* Ceramic.

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

By,total = 30,000 thousand of ceramic devices per year x 1 ton of wood/thousand of ceramic devices= **30,000 tonnes of wood per year**

[65] *Considering that 1 hectare contains 40 m³ of wood.*

ERy, total = 30,000 tonnes of wood x 0.923 x 0.01820 TJ/Tonne x 77.4 tCO_2/TJ = **39,006 tCO_2e**

Table 14. Emission reductions without considering the leakage

Year	Cenol total emission reductions (tCO_2e)	Telha Forte total emission reductions (tCO_2e)	Total (tCO_2e)
November to December-2007	3,121	6,501	9,622
2008	18,723	39,006	57,729
2009	18,723	39,006	57,729
2010	18,723	39,006	57,729
2011	18,723	39,006	57,729
2012	18,723	39,006	57,729
2013	18,723	39,006	57,729
2014	18,723	39,006	57,729
2015	18,723	39,006	57,729
2016	18,723	39,006	57,729
January to October-2017	15,603	32,505	48,108
Total Emission Reductions (tCO_2e)	187,230	390,060	577,290
Number of years of the crediting period	10	10	10
Annual average of estimated emission reductions for the 10 years of crediting period (tCO_2e)	18,723	39,006	57,729

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 enhancement for the GHG project:

Table 15. Estimation of overall emission reductions

Year	Cenol total emission reductions (tCO_2e)	Telha Forte total emission reductions (tCO_2e)	Total (tCO_2e)
November to December-2007	3,121	6,501	9,622
2008	18,723	39,006	57,729
2009	18,723	39,006	57,729
2010	18,723	39,006	57,729
2011	18,723	39,006	57,729
2012	18,723	39,006	57,729
2013	18,723	39,006	57,729
2014	18,723	39,006	57,729
2015	18,723	39,006	57,729
2016	18,723	39,006	57,729
January to October-2017	15,603	32,505	48,108
Total Emission Reductions (tCO_2e)	187,230	390,060	577,290
Number of years of the crediting period	10	10	10
Annual average of estimated emission reductions for the 10 years of crediting period (tCO_2e)	18,723	39,006	57,729

5 Environmental Impact:

As can be observed in table 16, 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.

Table 16. Summary of the environmental impacts.

Environmental	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
Economic-social	Increment of job opportunities in the region	Positive

Environmental Laws related to the plant activities

The National Environmental Policy (PNMA), instituted by the Brazilian Law 6.938/81, has the purpose of preservation, improvement and recovery of the environmental quality, with the intention to assure conditions for the social-economic development and the protection of human dignity in the country. The PNMA 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 sindicate 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 employee´s board, which is a visible place with high circulation of employees. The letter was available during 7 days and the comments were expected for a period of 7 days after the letter has been posted.

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

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

Till validation time, positive answers were received and outcomes are available and arrived within the validation of the project.

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

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

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

Figure 5. Stakeholders Consultation

Figure 6. Stakeholders Consultation

7 Schedule:

- Project start date: 1st march 2007
- Date of initiating project activities: 1st November 2007
- Validation Report predicted to: 19th November 2008
- First Verification Report predicted to 19th December 2008
- VCS project crediting period: 10 years renewable
- Date of terminating the project: 31st October 2017
- Monitoring and reporting frequency: preferentially from 6 to 12 months, since the beginning of the crediting period.

After the project start date, the ceramic owner made adaptation due to the use of new biomass and its technology encompassing, for example, tests using the new biomasses, the ideal mix of renewable biomasses (different percentages of each biomass) and technological adaptations such as the installation of mechanic burner and its sub sequential removal due to its high maintenance costs.

8 Ownership:

8.1 Proof of Title:

Ceramics' article of incorporation and the contract between Social Carbon – project proponent – and *Cenol* and *Telha Forte* Ceramics 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 DOE and are in power of *Cenol and Telha Forte* Ceramic and available to consultation.

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

The project activity required Voluntary Emission Reduction following Q27 Standard until August 31st 2008, which was developed by BRTUV. Please find attached the letter of methodology switch issued by BRTUV.