Voluntary Carbon Standard Project Description

19 November 2007

May 05th, 2010

Contents

1 Description of Project:

1.1 Project title

Ituiutaba Ceramic Fuel Switching Project

Version 03

PD completed in: May 05th, 2010

1.2 Type/Category of the project

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

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

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

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

The amount of emission reductions are greater than 5,000 tons of CO2 equivalent and less than 1,000,000 tons of CO2 equivalent, thus classifying as a project under the VCS 2007.1 size groups (micro project, project, mega project).

Table 1. Emission reductions estimate during the crediting period

Year	Emission Reductions (tCO_2e)
July to December - 2008	8,237
2009	16,475
2010	16,475
2011	16,475
2012	16,475
2013	16,475
2014	16,475
2015	16,475
2016	16,475
2017	16,475
January to June - 2018	8,237
Total Emission Reductions (tCO_2e)	**164,749**
Number of years of the crediting period	10
Annual average of estimated emissions reductions for the 10 years of crediting period (tCO_2e)	**16,475**

1.4 A brief description of the project:

The project activity is the project of CERÂMICA ITUIUTABA LTDA. (hereof "*Ituiutaba* Ceramic"), which is a red ceramic industry localized in

Ituiutaba municipality, in the state of *Minas Gerais*, region known as *Triangulo Mineiro,* southeastern of Brazil. The ceramic industry produces bricks and roof tiles, destined mainly for the regional market in *Minas Gerais*, but also for *Mato Grosso* and *Goiás*, which are boundary states.

The fuel utilized in the baseline scenario to fire the ceramic units was native wood from the *Cerrado* biome, which is a pioneer practice in the region. This type of wood is considered a non- renewable biomass, once it is not originated in areas with reforestation activities or sustainable management activities.

This fuel switching project activity will reduce the greenhouse gases (GHG) emissions through the substitution of native wood from deforestation activity for renewable biomasses to generate thermal energy.

As renewable biomasses, the project activity consists in utilizing sawdust and wood chips as renewable biomass for energy supply, replacing the use of wood from areas with non sustainable forest management.

This project pointed out the possibility to switch non-renewable biomass for renewable biomasses, which was unattractive due to high investments on the adaptation of machineries to work with the new biomasses and other barriers. The ceramic owner considered the income from the commercialization of the carbon credits to become the project activity viable.

The main goal of this project activity is to minimize the negative impacts of the deforestation of the *Cerrado* biome by discouraging the exploitation of the area through limiting the interested party in acquiring the proper legal documents for the commercialization of the native firewood. Furthermore, the project activity will grant a satisfactory destination to wood residues such as sawdust and wood chips. Moreover, in opposition to the identified baseline, the project activity will generate thermal energy without stimulating deforestation by using an abundant renewable biomass in the region.

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

The ceramic is located in the Municipality of *Ituiutaba* in the state of *Minas Gerais* which is indicated in Figure 1. The project site has the following postal address and geographical coordinates:

Avenida Geraldo Alves Tavares, 903, Ipiranga

Ituiutaba – Minas Gerais, Brasil

CEP: 38.302-134

Ceramic’s Boundaries Coordinates:

18º57'53'' S 49º27'14'' W

Figure 1. Geographic location of the city of the project activity that has the following coordinates in *Minas Gerais* State: *Ituiutaba*: *18º57'53''S, 49° 27′ 14″ W.*

1.6 Duration of the project activity/crediting period:

- Project start date:[1] May 30th, 2008;
- Project Crediting Period Start Date:[2] July 1st, 2008;
- Date of terminating the project activity:[3] June 30th , 2018;
- VCS project crediting period: 10 years 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 facility and this non renewable biomass is offered with low prices.

Although firewood from deforested areas has been used for many decades as fuel in Brazil, it is impossible to define a start date on which this kind of non-renewable biomass began to be applied. Firewood 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

---

[1] *Date on which the project began reducing or removing GHG emissions, i.e. when the project proponent began employing renewable biomass. At this date, the ceramic industry fired the first ceramic units with biomass.*

[2] *Date on which the project proponent completed the fuel switch of Ituiutaba ceramic, thus, when the ceramic stopped employing native wood.*

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

energy needs.[4] Moreover the Brazilian´s Energy and Mine Ministry has been monitoring all energetic sectors of Brazil since 1970, and firewood appears over the years monitored as a significant source of thermal energy for ceramic sector[5].

According to Seye (2003),[6] in Brazil, the red ceramic units 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.

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 20,483.13 m^3 of non-renewable native wood per year to provide thermal energy to the ceramic's kilns. The project activity focuses on the use of wood residues such as sawdust and wood chips, 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 company. Therefore, the emissions launched during the combustion of native wood from deforestation activities were not offset by the replanting, which is a carbon absorbance method. An opposite scenario occurs with the renewable biomasses utilized in this project activity, which have carbon neutral cycle.

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

Ituiutaba Ceramic utilized seven "Round kilns"[7] to produce around 15,181 tons of ceramic products per year, which are mainly used in the construction sector. This kiln is commonly utilized in Brazil to fire bricks and roof tiles. The following table shows the value of the dry mass per product, specified by *Ituiutaba* ceramic.

Table 2. Values of Dry mass per product

Telha Americana	*Telha Portuguesa*	*Telha Romana*	Bricks	Unity
3.50	2.50	2.55	4.0	kg

The ceramic industry has an internal control of the quantity of the ceramic units produced per product. The quantities of the product were multiplied by the final product weight, reaching the results of the production in tons.

---

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

[5] *Energy Research Company. National Energy Balance - energy consumption per sector. Available at <http://www.mme.gov.br/download.do?attachmentId=16555&download>. Last visit on: April 15th, 2009.*

[6] *SEYE, O.* ***Análise de ciclo de vida aplicada ao processo produtivo de cerâmica estrutural tendo como insumo energético capim elefante (Pennisetum Purpureum Schaum).*** *Campinas, SP: [s.n.], 2003.*

[7] *The "Round Kilns" are intermittent kilns with round shape and lateral furnaces. Its internal diameter is about 9 meters. It is usually employed to burn roofs and bricks*

The products have different weights, and the productions are not regular since it follows the tendencies of the market and its demands, thus, the tons of products vary according to it.

The following table shows the technical parameters of *"Round"* kilns.

Table 3. Technical parameters of "Round" kilns at Ituiutaba ceramic

Technical Parameter	*Round* Kilns
Consumption of firewood[8] (ton of wood per tons of product)	0,769
Features	Intermittent with closed circular kiln, with 4 fuel entrances distributed along its perimeter
Maximum Temperature (ºC)	900º
Time of kiln loading (hours)	6
Warming (hours)	8
Burning Cycle (hours)	20
Cooling (hours)	24
Time of unloading (hours)	6
Average Production per burning cycle (thousand of ceramic units)[9]	14
Average burning cycles per month	35

The fuel was gradually switched in May 30th, 2008 and was finalized on July 1st, 2008. Before the fuel switching, *Ituiutaba* consumes around 973 tons per month of wood from *Cerrado* biome.

In the current scenario, the ceramic industry has an average consumption of 339 ton of sawdust/wood chips per month to maintain the same production.

The ceramic industry will preferentially employ wood chips/sawdust[10] as its renewable biomass, however, other biomasses (sugar cane bagasse, corn straw, and rice husk) can be employed due to seasonal harvest reasons, and once its renewable origin is proved. In case of lack of these kinds of biomasses, the project proponents can use elephant grass.

If any biomass were to be utilized in the future, it will be reported at the Monitoring Report.

The afforestation residues (sawdust and wood chips) are resulted from wood manufacturing, considering that around 22% of the wood produced

---

[8] The value adopted is an average of the last year that the Ituiutaba ceramic used the native wood with the last year that ceramic had control of it production.

[9] It varies according to the type of ceramic blocks and the size of the kilns.

[10] The renewable origin of the biomass will be proved through documents that demonstrate the reforestation activities in the areas that supply wood to the sawdust mills providers.

will generate sawdust/wood chips[11]. The biomass providers listed at the table below are only a few of those that work for the ceramic industry; nevertheless, it does not exclude the possibility of buying biomass from others.

The ceramics owners also showed interest in elephant grass. Currently, elephant grass has been acquiring national importance as biomass to generate thermal energy due to its high productiveness and easy adaptation in almost all climate and soil Brazilian conditions.

Table 4 Main biomasses providers

Biomass	Provider	Location
Sawdust / Wood chips	Caxuana s/a Reflorestamento	*Minas Gerais*
	Pinus Brasil Uberlandia	*Minas Gerais*
	Serraria Cunha e Silva Ltda	*Minas Gerais*
	APC Indústria e comercio de madeira ltda	*Goias*

Figure 2. *Ituiutaba* Ceramic's entrance.

The biomass arrives in the ceramic industry and it is stored under a shed, which needed to be constructed once such procedure is essential to protect the biomass by keeping it away from the rain to maintain it dry, keeping an acceptable efficiency. When the biomass is dry, its efficiency increases considerably. The wood chips and sawdust are carried in a handcart to the mechanic burners by an employee, after the burning cycle completes, the ashes generated are incorporated into the clay and used in the kilns' door.

Due to the project activity, a set of adaptations were necessary, such as alterations to the furnaces and other machineries, as well as the acquisition of new equipments so the ceramics industry can operate with the new biomasses. With the use of mechanic burners, the employees avoid dangerous contact to the kiln entrances and do not have to carry with their arms the huge pieces of wood, thus contributing to preserve their health and safety.

The following figures show some of the new technology employed.

[11] *FEITOSA, B.C. Aproveitamento Econômico Dos Resíduos De Madeira Como Alternativa Para Minimização De Problemas Sócio-ambientais No Estado Do Pará. 2007. Webartigos.com | Textos e artigos gratuitos, conteúdo livre para reprodução. Avaiable at: <http://www.webartigos.com/articles/1175/1/aproveitamento-economico-dos-residuos-de-madeira-como-alternativa-para-minimizacao-de-problemas-socio-ambientais-no-estado-do-para/pagina1.html>. Last Visit: October 10th, 2009*

Figure 3. Mechanic Burners acquired in order to employ the renewable biomass.

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

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

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

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

- Price of the renewable biomasses

The thermal energy generation through the combustion of biomasses is an innovation in the ceramic industry. The future demand of this alternative fuel (e.g. by other consumers) is not easy to foresee.

[12] CONAMA (National Environmental Council), created in 1981 by Law 6.938/81, is the Brazilians' department responsible for deliberation and consultation of the whole national environmental policy and it is chaired by the Minister of Environment. Therefore, it is responsible for the establishment of standards and criteria relating to licensing of potentially polluting companies. More information is available at:< http://www.mma.gov.br/port/conama/estr.cfm.>. Last Visit: October 10th, 2009

[13] IEF – Forest State Institute executes and proposes forest politics of fishing and sustainable aquaculture. It is linked to the State Environment and Sustainable Development Secretary. More information is available at: <www.ief.mg.gov.br>. Last visit: October 10th, 2009

[14] The objectives of the National Department of Mineral Production are: to foster the planning and promotion of exploration and mining of mineral resources, to 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.>.Last visit: October 10th, 2009

There is currently a great amount of these types of biomasses available locally, however, it is possible that the demand and the prices will increase. If this scenario occurs, the project approval will make the continued use of renewable biomasses feasible.

- Availability of the renewable biomasses

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

- Difficulty related to the abrupt change

As affirmed before, the ceramic industry used native wood in its kilns since their beginning, the sudden change claimed a lot of effort from each one in the ceramic; the main challenges are the reconfiguration of the internal logistic, the employees’ resistance to the new situation and the lack of knowledge.

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

The historical of *Ituiutaba’s* activities using wood as fuel clearly confirms that the project was not implemented to create GHG emissions for the purpose of its subsequent removal or destruction.
Ituiutaba ceramic uses native wood to generate thermal energy in order to fire ceramic units in its kilns since the beginning of its operation.

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

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

Social Carbon Methodology is being applied only as a Sustainability tool in association with VCS 2007.1 standard.

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

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

Ituiutaba’s 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:

<u>Project Proponent I</u>

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

Cerâmica Ituiutaba LTDA

Mr. *Mário Eugênio Rezende Jacob Iunes,* Director and owner: Information about the ceramics, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramics devices market challenges.

Mrs. *Cibele Aparecida Silva*, monitoring data responsible: General data and information on inputs and outputs of the ceramic industry, detailed information on the acquisition of renewable biomasses and how this data *is kept by the controller's office.*

Other information on the project's proponent:

Address:

Avenida Geraldo Alves Tavares, 903 - Ipiranga

Ituiutaba- Minas Gerais, Brasil.

CEP: 38.302-134

Phone number: +55 (34) 3269-9084

Project Proponent II and Project Developer

Carbono Social Serviços Ambientais Ltda: Project participant, project proponent and responsible for developing VCS PD and SOCIALCARBON reports.

As the project authorized contact, *Carbono Social Serviços Ambientais LTDA* was given the responsibility of preparing the present project report and to accompany the proponent until the end of the crediting period. The assessor directly involved is:

Rafael Kupper Bonizio Oliva, Technical Analysts: Project Design Document writers, elaboration of GHGs Emissions' Inventory, direct contact between *Carbono Social Serviços Ambientais LTDA* and the ceramic industry, and responsible for collecting the necessary information.

Coordinated by:

Rafael Ribeiro Borgheresi, Technical Coordinator.

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

Address:

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

CEP: 04.038-032

São Paulo – SP, Brazil

Phone number: +55 11 2649-0036

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

Email: kupper@socialcarbon.com

rafael@socialcarbon.com

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

The project is eligible according to:

- Legislative: the project attends all legal requirements;
- Technical: alterations/adaptations required are technically feasible;
- Economic: fuel switching project requires high investments;

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

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

1.17 List of commercially sensitive information (if applicable):

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

2 VCS Methodology:

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

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

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

The project's emissions from the combustion of native wood from deforestation areas are accounted in the same way as fossil fuel combustion, as it is not renewable and emits CO2.

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 *Ituiutaba* 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)[15] and Brazilian´s Technology and Science Ministry[16]. Therefore, the proposed project activity is not saving the non-renewable biomass accounted by the other registered project activities.

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

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

According to historical data from *Ituiutaba*, the ceramic facilities used to employ non-renewable native wood from areas without any kind of management since 1975.

This way, it can be concluded that non-renewable biomass has been used since before 31st December, 1989. Thus, the project activity is in agreement under the methodology applicability requirements.

---

[15] *CDM activities registered by CDM Executive board are Available at: <http://cdm.unfccc.int/Projects/registered.html>. Last visit: May 28rd, 2009.*

[16] *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.htm>l. Last visit: May 15th, 2009.*

Sawdust and wood chips are forest residues while rice husk, corn straw, and sugar cane bagasse 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 and rice husk are common residues in the region generated.

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

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

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

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

(c) Any national or regional forestry, agriculture and nature conservation regulations are complied with." Moreover, the project activity will annually generate less than 45 MWThermal.

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

According to the applied methodology, the project boundaries for the project are the physical and geographical areas of the renewable energy generation, thus, the ceramics limits.

In the baseline scenario, 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 (commonly known as a carbon sink).

Table 5. Gases included in the project boundary and brief explanation

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

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

Observing table below, the common fuels employed and therefore, the baseline candidates are: natural gas, charcoal, wood, other recuperations, diesel oil, fuel oil, liquefied petroleum gas, others from petroleum, piped gas, electricity and others non-specified.

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

BRAZILIAN ENERGY BALANCE 2008[17] - CERAMIC SECTOR EVALUATION Unit: 10^3 Ton of oil equivalent			
FUEL	**2005**	**2006**	**2007**
Natural Gas	831	901	960
Charcoal	70	42	33
Wood	1,710	1,762	1,885
Other recuperations	36	32	35
Diesel Oil	9	8	7
Fuel Oil	268	285	313
Liquefied Petroleum Gas	148	151	153
Others from Petroleum	71	76	170
Piped gas	0	0	0
Electricity	270	276	284
Others non specified	0	0	0

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

Ituiutaba was the one of the first ceramics industry of the region to take the risk and switch its source of energy to a renewable one. The Ceramic ceased to use native wood and now uses wood chips from legal sawmills which are considered renewable biomass once these sawmills make use of wood with approved forest management.

The identified baseline for this project activity nowadays would employ 973 tons of native wood per month from the *Cerrado* biome, to provide thermal energy to the ceramics' kilns and obtain an approximate temperature of 900°C, in order to produce an average of 15,181 tons of ceramic products per month.

---

[17] Brazilian Energy Balance, Available at: <http://www.mme.gov.br/mme/galerias/arquivos/publicacoes/ben/arquivos/ben_2008/BEN_Portugues_2008.pdf> .Page 82, "Tabela 3.7.10.a I Setor Industrial – Cerâmica". Last visit: October 10th, 2009

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

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

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

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

Test 1 – The project test

Step 1: Regulatory Surplus

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

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 machine experience or logistic modification in order to attend the project's needs, e.g. the new biomass must be stored in cover sites and needs to be dried in order to achieve a better burn efficiency, which required more low-skilled labor.

The operators did not have knowledge of the ideal amount of renewable biomass that was necessary to achieve the ideal temperature for its ceramic units firing, to acquire the final product with same quality and to maintain the optimal process as they did when using native wood. As a consequence of this barrier, there were variations in the color of the final ceramic devices, affecting the quality of the products; cracks on the ceramic devices; the explosion of some of them and cracks along the kilns; adding a significant amount of insecurity in production process. A pyrometric system (thermocouples) was installed in order to control the burning due to the lack of experience with the new fuel.

Diverging from the baseline scenario, in the project activity, the sawdust and wood chips are fed to the kilns by automatic machineries, the mechanic burners, which are fed manually by an operator, had to be installed. Also, the machineries needed some adjustments in order to use the new biomasses, fuels that are uncommonly employed for the initial propose of the machines.

The employees must be careful not to fill the devices with large amounts of biomass, which can clog the mechanic burner and consequently, cause disorder in the burning process and that was one of the causes of the production losses throughout the adaptation period. So, the mechanic burner’s feeding has to be done gradually, demanding even more time and labor from the employees.

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

Furthermore, there was a lack of infrastructure to utilize the new technology. The region of *Ituiutaba* is commonly known for not being updated with new technologies in the Ceramic sector and very resistant to changes or improvements to its work process and general practices. This way, a set of adaptations were necessary, such as adjustments in the kiln entrances to embed mechanic burners and the construction of sheds to store and to dry biomasses and consequently improve their burning efficiency.

Moreover, the use of new biomasses represented a high risk to the ceramic owner 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 renewable biomasses is an innovation in ceramic industry and their future demand (e.g. by other consumers) is not easy to foresee.

This means that *Ituiutaba* Ceramic had to find the best procedure to handle with the new technology, i.e. the new biomass, logistic and machines. An adaptation period was necessary to learn how to utilize the new fuel and employ it in the process.

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

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

- **Financial barrier**

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

  When the new production techniques were introduced at the ceramic plant, there was an adaptation period and a testing period. For the adaptation of the kilns a still period of a burning cycle for each kiln had to be considered. Also the testing period of approximately three months, required in order to identify the correct burning curve, lead to waste of considerable production (average 5%) per month. All this resulted in prejudice for the company financial profit and loss balance.

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

Table 7. Investment costs for the project activity at Ituiutaba Ceramic

Investment Costs		
Costs with shed construction	25.288	BRL
Costs with equipment acquisition (including freight)	90.280	BRL
Costs with Kiln adaptation	22.920	BRL
Electronic Burn Monitoring system	42.789	BRL
Loss of revenues - period for adaptation of the kiln for biomass	18.200	BRL
Waste of products in the testing period (3 months)	15.000	BRL
Total Invested	214.477	**BRL**

- ***Institutional barrier***

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

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

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

- ***Risk of the project***

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

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

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

  The thermal energy generation through the combustion of renewable biomasses such as sawdust is an innovation in the ceramic industry. The future demand of these alternative fuels e.g. by other consumers is not easy to foresee. Although there is currently a great amount of this type of biomass available locally, there is a possibility that the prices would increase as well, especially between harvests periods, when the problem with biomass disposal is mitigated. If the price of the biomass increases, the ceramics cannot re-pass it, once the ceramics would not have competitive prices in relation to others which did not made the fuel switch.

Step 3: Common Practice

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

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

The product of the project activity is ceramic roof tiles and bricks.

2. Identify possible types of baseline candidates.

Observing the table below, the common fuels employed in the ceramic sector and therefore, the baseline candidates are: natural gas, wood, fuel oil, electricity and others non-specified. Other possible baseline candidate would be the use of renewable biomass without the carbon credits support.

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

BRAZILIAN ENERGY BALANCE 2007[18] - CERAMIC SECTOR EVALUATION			
FUEL	**2004**	**2005**	**2006**
Wood	50.1	49.9	49.1
Natural Gas	24.3	25.5	25.0
Fuel Oil	7.8	8.1	8.1
Electricity	7.9	7.8	7.4
Other non specified	9.8	8.7	10.4
TOTAL	100.0	100.0	100.0

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

Brazil was identified as the geographic area of the baseline candidates because Energy Research Company[19] from Mines and Energy Ministry of Brazil is the most representative and reliable source of information about the ceramic sector and its fuel employed. Furthermore, there was no local data regarding to the ceramic sector and its energy source in the State of *Minas Gerais*. Therefore, data from table above were provided by a reliable source and it was considered 3 years of its historical data, including the most recent available data and the period when *Ituiutaba* Ceramic started its fuel switch.

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

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

The common practice criteria were 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.

---

[18] *Brazilian Energy Balance 2008, source: < http://www.mme.gov.br/mme/menu/todas_publicacoes.html >. Last visit: October 10th, 2009.*

[19] *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.*

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.5975 of November 30th,[20] 2006.

However, it is not enforced namely due to the lack of control[21]. The consumption of non-renewable biomass by ceramic industry was related by several authors (NERI, 2003[22]; ALBUQUERQUE et al, 2006[23]; BRASIL, 2001[24]; VIANA, 2006[25]; CARDOSO, 2008[26]). BRASIL (2001) suggests that it is important to stimulate the miner sector, especially who are respecting the environment. The incomes from carbon credits can be this incentive which would contribute to avoid the consumption of non-renewable biomass illegally. Therefore laws and regulations will not be considered as criteria to excluded baseline candidates and to constraint the geographical area and temporal range of the final list of the baseline candidates.

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

5. Identify a final list of baseline candidates.

Table 8 provides the percentage of the level of penetration of each fuel employed in the ceramic sector during the average of the three last years available (2004, 2005 and 2006). Baseline candidates are the use of:

---

[20] Source: http://www.planalto.gov.br/ccivil_03/_Ato2004-2006/2006/Decreto/D5975.htm

[21] Corte e poda de árvores pelo Dnit na BR-158 é considerado crime ambiental, Jornal Grande CPA, Available at: <http://www.grandecpa.com.br/?p=noticia&id_noticia=129>. Last visit: October 10th, 2009.

[22] NERI, J.T. Energia Limpa, Sustentável ou de Subsistência? Cerâmica Industrial, Rio Grande do Norte;V,8, n.1,35 -6,2003. Avaiable at: <http://www.ctgas.com.br/template02.asp?parametro=106>. Last visit: October 10th, 2009

[23] 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. Avaiable at: <http://www.ararajuba.org.br/sbo/ararajuba/artigos/Volume144/ara144not3.pdf>. Last visit: October 10th, 2009

[24] 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>. Last visit: April, 24th 2009.

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

[26] 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.Avaiable at: <http://www.inee.org.br/down_loads/biomassa/apresenta%20semin%20energia%20RJ%2003_09_2008.pdf>. Last visit: October 10th, 2009

a) Wood: The fuel most employed, which would be the scenario of highest GHG emissions, once its emission factor is the highest according to IPCC 2006.[27]

b) Natural gas: The Brazilian Energy Balance results showed significant percentage of natural gas consumption especially due to the production of ceramic tiles (used to finish floor or wall). Furthermore, in the case of structural ceramic, the use of natural gas is restricted by the absence of pipes, its high costs[28] and the lack of availability[29]. The risk of lack of offering and higher costs when compared with other fuels discourages the scenario of investing in this type of fuel even in local with piped gas. The distribution of gas is preferentially performed to thermal power plants, increasing the risk of blackout of natural gas.

c) Fuel Oil: This fuel is more expensive than wood, however it can be a more probable of substitute of wood than natural gas. The risks involving natural gas distribution are so considerable that PETROBRÁS[30] was offering subsidy to the consumption of fuel oil in spite of natural gas in the State of São Paulo. However, in the baseline scenario, the use of fuel oil is not feasible due to the high costs associated to atomization system required to its burn, which demands frequent maintenance[31].

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.[32]

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

In Brazil, the red ceramic units are produced through an inefficient and traditional process using wood without forest management to generate thermal energy technologies.[33] 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.[34] Furthermore, using non-renewable wood is a simple procedure and well known by the kiln operators.

---

[27] 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. Last visit: April 24th, 2009.

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

[29] Source: <http://www.gismaps.com.br/gasnatural/gasnatural.htm>. Last visit: April 24th, 2009.

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

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

[32] The use of renewable biomass was not included in Table 8 which shows the fuel most employed in the ceramic sector according to Brazilian Energy Balance.

[33] 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>. Last visit: April 24th, 2009

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

The native forest without any kind of sustainable management has always been a source of firewood in the ceramic sector [35], which seemed inexhaustible, due to the amount generated in the expansion of the agriculture frontier bringing forward environmental impacts, with regard to the degradation of soil, change in the regime of rainfall and consequent desertification.

The ceramic industry sector has practically not evolved compared to the past, mainly due to the simplified techniques of manufacture. Moreover, the major equipments (chiefly kilns) of the production process were not improved significantly. Most of these companies still use non-renewable wood in their kilns and the drying process occurs naturally, without the utilization of energy. On the other hand, the influence of the market by improvements in this sector is very insignificant.[36]

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

Therefore, the project activity is not a common practice.

Impact of project approval

Nowadays, the ceramic industrial segment of the state of *Minas Gerais* is constituted by small industrial units that still use the most diverse technological models.

The grand majority of ceramic industries in *Ituiutaba* use native firewood from *Cerrado* Biome as fuel. These industries have some technological restrictions such as the energy exploitation and the efficiency of the machinery, so the project approval can improve the development of this sector.

Brazil is the third major contributor[37] 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 First Brazilian Inventory of Anthropogenic Greenhouse Gas Emissions[38] – Background Reports indicates that the major source of GHG emissions in Brazil is due to deforestation, mainly occurred in *Amazônia* (59% of the deforestation) and *Cerrado* biomes (26%).

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

Another relevant issue is how fast deforestation occurs in the *Cerrado* biome, representing 1,5% or 3 million ha/ year. It is equivalent to 2, 6 soccer fields /minute[39].

A study performed by the non-governmental institution, Conservation International of Brazil, indicates that by 2030 the *Cerrado* biome will

---

[35] *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/>. Last visit: April 24th, 2009.*

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

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

[38] *Available at: <http://www.mct.gov.br/index.php/content/view/17341.html>. Last visited: April 24th, 2009.*

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

disappear maybe even sooner since the areas that are earmarked for official protection are also being destroyed. From a total of 204 million acres of the original biome, 57% has been completely destroyed, as shown in figure 5 and figure 6. The main areas that are being most affected by the alarming *Cerrado* deforestation are the states of *Mato Grosso do Sul, Goiás, Tocantins, Mato Grosso, Triângulo Mineiro* and the western portion of *Bahia*. These concerning deforestation rates are due to the expansion of the agricultural frontier, unregulated burnings and due to the disorderly growth of the urban zones[40].

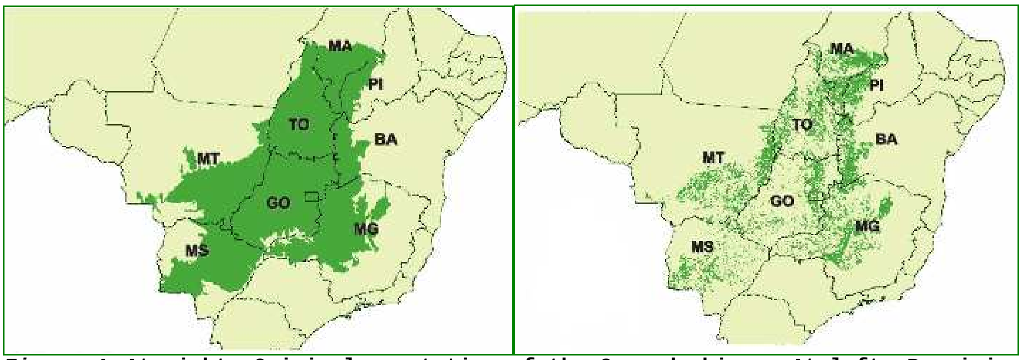

***Figure 4.* At right: Original vegetation of the Cerrado biome. At left: Remaining vegetation of the Cerrado biome in the year 2002** (Source: *Conservação Internacional Brasil*[41]).

The *Cerrado* biome is the second largest Brazilian biome. It is located in the central portion of Brazil and can be observed in table 9. The flora and fauna of this biome is rich once it shares frontiers with the Brazilian biomes: to its west with Amazonian; to the north with *Caatinga*; and to the east and south with *Mata Atlântica*. In spite of the size and importance of this biome, the *Caatinga* is an endangered habitat.[42]

Table 9. Brazilian biomes in decreasing order of importance.

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

(Source: IBGE – Brazilian Institute of Geography and Statistic[43])

[40] *AmbienteBrasil. Study performed by a partnership between Conservation International of Brazil and the Oréades NGO situated in Mineiros (GO). Available at: <http://www.cenargen.embrapa.br/cenargenda/noticias2006/atrativos130606.pdf>. Last visit: October 10th, 2009*

[41] *Available at: <http://www.conservation.org.br/arquivos/Mapa%20desmat%20Cerrado.jpg>*

[42] *Source: http://www.ibge.gov.br/home/presidencia/noticias/noticia_visualiza.php?id_noticia=169&id_pagina=1*

43 Available at: <http://www.ibge.gov.br/home/presidencia/noticias/noticia_visualiza.php?id_noticia=169&id_pagina=1>. Visited on April 04th, 2010.

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.

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.

Brazil occupies a top position among the emitters of carbon dioxide, therefore any kind of efforts to change this scenario and take Brazil out of this uncomfortable top position, is willingly received. In addition, the project activity will contribute to the sustainable development of the host country.

3 Monitoring:

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

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

This category comprises small thermal appliances that displace the use of non-renewable biomass by introducing new renewable energy end-user technologies. The project's emissions from the combustion of native wood are accounted in the same way as fossil fuel combustion, once it is not renewable and emits CO_2.

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

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

The monitoring will be done with the aim of determining the most approximate quantity of non-renewable wood that, in the absence of the project, would be used in the ceramics' kilns and consequently, the amount of GHG that would be emitted in tons of CO2e. The following table shows the frequency of the monitoring of each parameter.

Table 10. Data reported in monitoring estimation

Parameters	Description	Units	Origin	Frequency
PRy	Production of ceramic pieces	tons	Controlled by the project proponent.	Monthly
Qrenbiomass	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
Renewable Biomass Surplus	Amount of renewable biomass available	tons or m³	Monitored by articles and database.	Annually
Leakage of Non-Renewable Biomass	Leakage resulted from the non-renewable biomasses	tCO2e	Monitored by articles and database.	Annually
ƒNRB,y	Fraction of biomass (wood) used in the absence of the project activity in year y can be established as non-renewable biomass using survey methods	Percentage	Bibliography and Project Developer	Annually
EFprojected fossil fuel	CO2 Emission factor of residual fuel oil	tCO2/TJ	IPCC[44]	Not monitored
NCVbiomass	Net Calorific Value of non-renewable biomass	TJ/tonne of Wood	Bibliography	Not monitored

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

ρwood	Specific gravity of non-renewable biomass	ton/m3	Bibliography	Not monitored
BFy	Consumption of non-renewable biomass per thousand of ceramic devices produced per year	tons/ thousand of ceramic devices	Data from project proponent	Function of PRy

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

$$B_y = HG_{p,y} / (NCV_{biomass} \times \eta_{old})$$

The responsible to monitor data provided in Table 10 will be Mrs. *Cibele Aparecida Silva*. Internal audit will guarantee the quality of data monitored. It will be realized by Mr. *Mário Eugênio Rezende Jacob Iunes*, Director of *Ituiutaba* ceramic.

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:	**PRy**
Data unit:	Tons of ceramic units per month
Description:	Production of ceramic units
Source of data to be used:	Controlled by the project proponent.
Value of data applied for the purpose of calculating expected emission reductions	1,265.166
Description of measurement methods and procedures to be applied:	The amount was acquired by counting the total production of the last year before the project start date (March 2007 to February 2008). The measurement will be done by an internal control sheet monitored by the project proponent, which will be fed daily. The production is a representative sample to ensure that all appliances are still in operation
QA/QC procedures to be applied:	The ceramic has an internal control of the quantity of ceramic units produced. It will be rechecked according to the ceramic units produced multiplied by the final product weight.
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:	**Qrenbiomass**
Data unit:	Tons per month
Description:	Amount of renewable biomass
Source of data to be used:	Measured by the project proponent
Value of data applied for the purpose of calculating	339

<table>
<tr><td>expected emission reductions</td><td></td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>The calculations were performed according to the first month of record that the company made regarding to the use of renewable biomass. Then, an average of the amount of biomass per Kiln was made, and multiplied by the number of burning cycles per month.

The amount of renewable biomass will be monitored in accordance to the weight described in the receipts or invoices from the providers.

It will be utilized the Specific Gravity in order to convert from m³ to tons. Data to be applied are:
<table><tr><td>Biomass</td><td>Sawdust / wood chips</td></tr><tr><td>Specific gravity (tons/m3)</td><td>0.35</td></tr></table>
Source:

SIMIONE F. J. Análise Diagnóstica E Prospectiva Da Cadeia Produtiva De Energia De Biomassa De Origem Florestal No Planalto Sul De Santa Catarina – Available at:

<http://hdl.handle.net/1884/10294>. Visited on June 22th, 2009.</td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>The ceramic has spreadsheets of the quantity of biomass acquired. It will be rechecked according to the receipts of purchase.</td></tr>
<tr><td>Any comment:</td><td>Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later</td></tr>
</table>

Data / Parameter:	**Origin of Renewable Biomass**
Data unit:	Not applicable
Description:	Renewable origin of the biomass
Source of data to be used:	Controlled by the project developer
Value of data applied for the purpose of calculating expected emission reductions	Renewable biomass
Description of measurement methods and procedures to be applied:	This information will be given by the biomasses providers. The guarantee of acquiring renewable biomass will be achieved by invoices from the providers. As stated in the section 2.2, the biomasses (wood residues) 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 methodology AMS-I.E.-Switch from Non-Renewable Biomass for Thermal Applications by the User – version 01 from February 01 of 2008 onwards
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	**Renewable Biomass Surplus**
Data unit:	Tons or m³
Description:	Amount of renewable biomass available

<table>
<tr><td>Source of data to be used:</td><td>Monitored</td></tr>
<tr><td>Value of data applied for the purpose of calculating expected emission reductions</td><td>
<table>
<tr><th>Biomass surplus</th><th>Surplus</th><th>Year</th></tr>
<tr><td>Wood from afforestation in m^3</td><td>7,776,095</td><td>2007</td></tr>
<tr><td>Wood Residues (sawdust/wood chips) in m^3</td><td>5,737,174.08</td><td>2007</td></tr>
<tr><td>Industrial wood residues in tons</td><td>749,839</td><td>2006</td></tr>
<tr><td>Sugar Cane Bagasse (in thousand of tons)</td><td>36,941</td><td>2006/07</td></tr>
<tr><td>Corn Straw – Residues from corn production</td><td>19,975,556</td><td>2007</td></tr>
<tr><td>Rice Husk in m^3</td><td>124,000</td><td>2007/08</td></tr>
<tr><td>Elephant Grass</td><td>Not measured</td><td>-</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 “General guidance on leakage in biomass project activities” of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, will be monitored. The measurement of the leakage will be based in national and international 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 industries 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:	**Leakage of Non-Renewable Biomass**
Data unit:	tCO2e
Description:	Leakage resulted from the non-renewable biomass
Source of data to be used:	Monitored
Value of data applied for the purpose of calculating expected emission reductions	0
Description of measurement methods and procedures to be applied:	The three sources of leakages predicted in methodology applied will be monitored. Scientific articles, official statistical data, regional and national surveys will be provided in order to ensure that there is no leakage from non-renewable biomass (or to estimate the leakage).
QA/QC procedures to be applied:	Data available regarding the ceramic industry fuel consumption will be employed to monitor the leakage.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	***f*NRB,y**
Data unit:	Fraction of biomass or (percentage)

Description:	Fraction of biomass (wood) used in the absence of the project activity in year y.
Source of data to be used:	Survey methods
Value of data applied for the purpose of calculating expected emission reductions	0.9803 or 98.03%
Description of measurement methods and procedures to be applied:	Before the project activity, wood from areas without forest management was offered with low prices and high viability to the ceramics owner. *Thus, the totality of fuel employed in the baseline scenario is from non-renewable origin. However, according to Klink (2005)*[45]*,* Cerrado *Biome has only 1.9% of its total area with sustainable use. Furthermore, considering that 0.062% of this biome has been saved by other project activities, thus, 98.03% is considered as a fraction of non-renewable biomass.*
QA/QC procedures to be applied:	The monitoring of this parameter will be based in national and international articles and database every monitoring period. The sources will provide information about the sustainable use of *Cerrado* biome. Wood saved from projects with same biome and applied methodology developed by Carbono Social was considered in this fraction. CDM or VCS registered projects will also be included in this fraction if placed in the same region and methodology.
Any comment:	It will be employed in order to estimate the amount of non-renewable biomass. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Fixed parameters

Data / Parameter:	**EFprojected fossil fuel**
Data unit:	tCO_2/TJ
Description:	CO_2 Emission factor of residual fuel oil
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Source: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf. Page 2.18. Table 2.3. Visited on May 11th, 2009.
Value applied:	77.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	In the baseline scenario, the probable fossil fuel that would be consumed in the absence of native wood without sustainable forest management would be the heavy oil. This fuel is more expensive than wood, however it can be a more plausible of substitute of wood than natural gas due to risks involving natural gas distribution.
Any comment:	Applicable for stationary combustion in the manufacturing industries and construction. The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel. Data will be kept for two years after the end of the

[45] *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>. Last visit: May 11th, 2009.*

	crediting period or the last issuance of carbon credits for this project activity, whichever occurs later

Data / Parameter:	**NCVbiomass**
Data unit:	TJ/ton
Description:	Net Calorific Value
Source of data used:	Brazilian study carried out with Cerrado wood: Vale, A.T; Brasil, M.A.M; Leão, A.L. Quantificação e caracterização energética da madeira e casca de espécies de Cerrado. Ciência Florestal, Santa Maria; v.12, n.1, p. 71-80; 2002. Available at: http://www.ufsm.br/cienciaflorestal/artigos/v12n1/A8V12N1.pdf. Visited on May 11th, 2009.
Value applied:	0.0186
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value will provide the energy generated by the amount of wood that would be used in the absence of the project.
Any comment:	The species used to calculate the average value are typical trees of *Cerrado* Biome that are usually employed as fuel in the ceramic industries of the region. IPCC default values shall be used only when country or project specific data are not available or difficult to obtain, according to "Guidance on IPCC default values" (Extract of the report of the twenty-fifth meeting of the Executive Board, paragraph 59). Data 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:	**ρwood**
Data unit:	ton/ m^3
Description:	Specific gravity
Source of data used:	Brazilian study carried out with Cerrado wood: Vale, A.T; Brasil, M.A.M; Leão, A.L. Quantificação e caracterização energética da madeira e casca de espécies de Cerrado. Ciência Florestal, Santa Maria; v.12, n.1, p. 71-80; 2002. Available at: http://www.ufsm.br/cienciaflorestal/artigos/v12n1/A8V12N1.pdf. Visited on May 11th, 2009.
Value applied:	0.5702
Justification of the choice of data or description of measurement methods and procedures actually applied :	The amount of wood used in the baseline was measured by volume units, so this data is used to the unity conversion.
Any comment:	The species used to calculate the average value are typical trees of *Cerrado* Biome and usually employed as fuel in the ceramic industries of the region. 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:	**BFy**
Data unit:	Tons of wood per tons of product

Description:	Consumption of non renewable biomass per tons of product produced in the last 1 year before the start of fuel switching.
Source of data used:	Historical data from project proponent
Value applied:	0,769
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 tons of ceramic product during the last year when the ceramic company 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 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

3.4 Description of the monitoring plan

The party responsible for implementing the monitoring plan will be the owner of *Ituiutaba* Ceramic. The project proponent will also be responsible for developing the forms and registration formats for data collection and further classification. Data monitored will be kept during the crediting period and 2 years after. For this purpose, the authority for the registration, monitoring, measurement and reporting will be Mrs. *Cibele Aparecida Silva* by *Ituiutaba* Ceramic. All the monitored parameter will be checked annually as requested in the methodology AMS-I.E. - Switch from Non-Renewable Biomass for Thermal Applications by the User – Version 01 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. The ceramic roof tiles are certified by Certification Body, accreditaded by Inmetro, Brazilian Product Certification Accreditation Body. Due this, the Certification Body, performs 2 audits per year in order to check the conformance of the product to Brazilian ceramic roof tiles standards.

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

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

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

This category comprises small thermal appliances that displace the use of non-renewable biomass by introducing new renewable energy end-user technologies. The project's emissions from the combustion of native wood are accounted in the same way as fossil fuel combustion, once it is not renewable and emits CO_2.

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

Baseline

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

Where:

ER_y: Emission reductions during the year y in tCO_2e

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

$f_{NRB,y}$: Fraction of 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[46].

B_y is determined using the following option:

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

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

Where:

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

η_{old} : Efficiency of the system being replaced

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

Where:

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

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

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

---

[46] *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

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

Where:

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

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

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

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

Leakage (LE)

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

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

The leakage from biomass projects, like the project activity, shall also be estimated according to the "General guidance on leakage in biomass project activities" (attachment C of appendix B) of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, which identifies different emission sources based on the type of biomass considered (described in the Table 10).

Table 11. 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 the table above, the source of leakage of the present project is the competing use of wood chips/sawdust and wood from areas without forest management. In relation to wood chips/sawdust according to an article of the Ministry of Science and Technology, the production of sawdust in Brazil consumes about 33.5 million m³ of wood, where approximately 50% of this volume indicates generated residue, of which 620,000 tons is sawdust. The project activity will employ approximately 5,400 tons of woodchips/sawdust per year.

Forest Residues (Sawdust/wood chips)

Forest Residues are also a probable fuel to be used for the ceramic units burning. The production of wood generates a large amount of residues, which can be reused to generate thermal energy. As can be observed in the figure 5, the potential of energy generation in the state of *São Paulo* is extremely high, and *Minas Gerais* has a great potential too, which means that there is an enormous availability of this kind of fuel to be employed in the project activity. This way, this biomass does not have potential to generate leakage emissions due to its high availability.

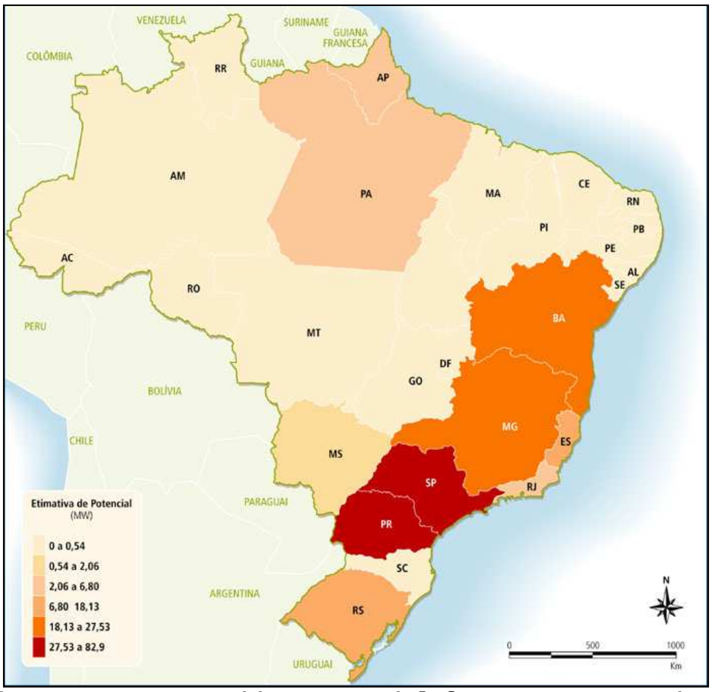

Figure 5. Forest Residues Potential for Energy Generation47

According to IBGE 2007, the production of log of wood and firewood in the State of *São Paulo,* [48] *Mato* Grosso do Sul, [49] and *Minas Gerais* [50] totalizes 38.5 millions of wood which will generate more than 8.4 millions of residues, considering that around 22% of this total will generate sawdust[51].

---

[47] Source: CENTRO NACIONAL DE REFERÊNCIA EM BIOMASSA - CENBIO. Panorama do potencial de biomassa no Brasil. Brasília; Dupligráfica, 2003. 80 p. Avaiable at: <www.aneel.gov.br/aplicacoes/atlas/pdf/05-Biomassa(2).pdf>. Last Visit: June 30th 2009

[48] IBGE. Extração vegetal e silvicultura 2007. Available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=sp&tema=extracaovegetal2007>. Last visit: May 11th, 2009.

[49] IBGE. Extração vegetal e silvicultura 2007. Available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=mg&tema=extracaovegetal2007>. Last visit: May 11th, 2009.

[50] IBGE. Extração vegetal e silvicultura 2007. Available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=ms&tema=extracaovegetal2007>. Last visit: May 11th, 2009.

[51] [51] FEITOSA, B.C. Aproveitamento Econômico Dos Resíduos De Madeira Como Alternativa Para Minimização De Problemas Sócio-ambientais No Estado Do Pará. 2007. Webartigos.com

Table 12. Production of log of wood and firewood (m^3)

Production / State	*São Paulo*	*Mato Grosso do Sul*	*Minas Gerais*	**Residues Generated**
Log of wood	25,966,464	1,042,639	374,389	6,024,368
Firewood	7,407,385	468,143	3,326,732	2,464,497
Total	38,585,752			8,488,865

The project activity will employ approximately 4,068 tons or 11,623 m^3 of woodchips/sawdust per year which represent 0.14% of the total of residues generated, considering only this two States.

Sugar Cane Bagasse

Sugar Cane Bagasse is another probable biomass to be utilized in the project activity. A study made by *Universidade Estadual de Campinas* and *Universidade de São Paulo* (two of the most respected universities in Brazil) showed that in Brazil there are around three hundred sugar cane plants. Only in the state of São Paulo, there are located more than 40% of this total. Each plant produces around 1.5 million tons of cane yearly[52]. One ton of sugar cane produces about 140 kilograms of sugar cane bagasse and finally 90% of this amount can be used to energy production.[53]

Table 13. Production of Sugar Cane in the State of São Paulo. Text adapted from : http://www.unica.com.br/downloads/estatisticas/processcanabrasil.xls. Visited on May 11th, 2009.

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

Sugar cane bagasse is also employed for cogeneration systems. However Figure 6 presents the excess of energy in Brazil from sugar cane bagasse. The region of the project activity and its boundaries states has a great surplus of this biomass.

| *Textos e artigos gratuitos, conteúdo livre para reprodução. Avaiable at: <http://www.webartigos.com/articles/1175/1/aproveitamento-economico-dos-residuos-de-madeira-como-alternativa-para-minimizacao-de-problemas-socio-ambientais-no-estado-do-para/pagina1.html>. Last Visit: October 10th, 2009*

[52] *Triangulo Mineiro.com - Universidades unem pesquisas sobre biomassa da cana. Avaliable at: <http://www.triangulomineiro.com/noticia.aspx?catNot=59&id=3097&nomeCatNot=Ci%C3%AAncia> . Last visit: May 11th,2009.*

[53] *CGEE. Geração de energia elétrica a partir de biomassa no Brasil: situação atual, oportunidades e desenvolvimento. Available at: www.cgee.org.br/arquivos/estudo003_02.pdf. Last visit: May 11th, 2009.*

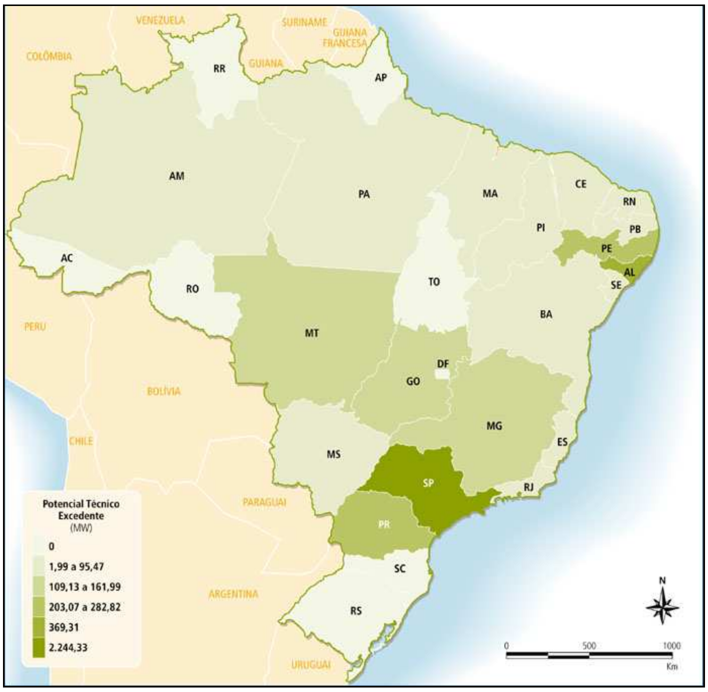

Figure 6. Sugar Cane Residue Potential for Energy Generation[54]

Corn Straw

Corn Straw is another probable biomass to be utilized in the project activity. A study made by *Universidade Federal do Rio Grande do Sul* (one the most respected universities in Brazil) showed that the residues of corn plantation are 2 times the quantity of corn extracted from it respective plantation.[55]

Only in the state of *Minas Gerais*, the production of corn in tons was 6,066,077 in 2007, according to IBGE (*Geographic and Statistic Brazilian Institute)* and *São Paulo*, which is a bordering state, had a production of 3,921,701 tons in 2007.

Table 14. Production of corn

Harvest – 2007	*Minas Gerais*[56]	*São Paulo*[57]	Total
Production of Corn (tons)	6,066,077	3,921,701	9,987,778
Residues from corn (tons)	12,132,154	7,843,402	19,975,556

[54] *Source: CENTRO NACIONAL DE REFERÊNCIA EM BIOMASSA - CENBIO. Panorama do potencial de biomassa no Brasil. Brasília; Dupligráfica, 2003. 80 p. Avaiable at: <http://www.aneel.gov.br/aplicacoes/atlas/pdf/05-Biomassa(2).pdf>. Last visit: October 10th, 2009*

[55] *Sabalsagaray, B. S.* ***Levantamento de produção de resíduos agro-industriais e seu potencial de utilização na indústria da construção.*** *Dissertação (Mestrado em Engenharia Civil)* – Universidade Federal do Rio Grande do Sul, *1998. Available at: <http://www.lume.ufrgs.br/bitstream/handle/10183/3121/000332554.pdf?sequence=1>. Visited on August 21th, 2009.*

[56] *According to IBGE(Geographic and Statistic Brazilian Institute) available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=mg&tema=pamclo2007>. Visited on: August 21th, 2009*

[57] *According to IBGE(Geographic and Statistic Brazilian Institute) available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=sp&tema=pamclo2007>. Visited on: August 21th, 2009*

Rice Husk

The project activity has the possibility to use rice husk as a renewable biomass, an abundant biomass in the region. The state of Minas Gerais and its border states near to Ituiutaba Municipality (Goias, Mato Grosso do Sul, Sao Paulo) has a production of 565,7 [58] thousand tons registered in the last year, and consequently a great supplier of rice husk.

The table below shows production of rice and rice husk in this region in the years of 2007/2008. Each ton of produced rice leads to the supply of 0.22 ton of rice husk[59].

Table 15. Rice and rice husk production.

Harvest	Area(ha)	Rice(ton)	Rice husk (ton)
2007/08	223,7 thousand	565,7 thousand	124 thousand

As stated before, the region has a harvest of 2007/08 produced 565.7 thousand tons, generating around 124 thousand tons of rice husk.

Elephant grass

In case of using elephant grass it will be cultivated in pasture or degraded areas, in which there is no vegetation to be deforested. Therefore, this practice will not generate competing use of biomass and it will not deforest a vegetated area, therefore the leakage that would be applicable is the emissions from biomass generation/cultivation. Currently, elephant grass has been acquiring national importance as biomass[60] 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)[61]. In case of using this kind of biomass, the ceramic company will cultivate, by itself, elephant grass in abandoned areas, in which there is no vegetation to be deforested. Therefore, this practice will not generate competing use of biomass and it will not deforest a vegetated area, i.e. only the leakage from biomass cultivation will be monitored in case of its use.

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

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

- Use/diversion of non-renewable biomass saved under the project activity by non-project households/users who previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non- renewable biomass used by the non-project households/users attributable to the project activity then baseline is adjusted to account for the quantified leakage.

[58] *Brazilian Rice Annuary of 2008. Available at <http://www.anuarios.com.br/port/versao_pdf.php?idEdicao=39&idAnuario=3>. Accessed on September 10th, 2008.*

[59] *Source: EMBRAPA. Available at <http://sistemasdeproducao.cnptia.embrapa.br/>. Visited on September 06th, 2008*

[60] *Osava M. Energia: Capim elefante, novo campeão em biomassa no Brasil. Available at: <www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292>. Last visit: May 11th, 2009.*

[61] *EMBRAPA. Formação e Utilização de Pastagem de Capim-Elefante. Available at: <www.cnpgl.embrapa.br/nova/informacoes/pastprod/textos/17Instrucao.pdf>. Last visit: May 11th, 2009.*

- 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 be saved for other project activity, since other ceramics was already consuming wood from non sustainable forest management (common practice).

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

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

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

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

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

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

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

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

By,total = 15,181 tons of ceramic units per year x 0.769 tons of wood/ton of ceramic units = **11,674 tons of wood per year**

ERy, total = 11,674 tons of wood x 0.9803 x 0.0186 TJ/Ton x 77.4 tCO2/TJ = **16,475 tCO_2e**

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

Year	Baseline Emissions (tCO_2e)
July to December 2008	8,237
2009	16,475

2010	16,475
2011	16,475
2012	16,475
2013	16,475
2014	16,475
2015	16,475
2016	16,475
2017	16,475
From January to June - 2018	8,237
Total	**164,749**
Annual Average	**16,475**

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

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

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

Table 17. Estimation of emission reductions.

Year	Emissions Reductions(tCO2e)
July to December 2008	8,237
2009	16,475
2010	16,475
2011	16,475
2012	16,475
2013	16,475
2014	16,475
2015	16,475
2016	16,475
2017	16,475
From January to June - 2018	8,237
Total	**164,749**
Annual Average	**16,475**

5 Environmental Impact:

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

An EIA was not required due to the project activity.

The project activity contributes to the reduction level of greenhouse gas (GHG) emissions by avoiding the incentive non-renewable biomass. In addition, the project activity will contribute to the sustainable development of the host country, such as:

- The use of clean and efficient technologies through the use of biomass waste as fuel. By these means, the project is in accordance to *Agenda 21* and with Brazilian Sustainable Development Criteria;

- A pioneer initiative that encourages throughout the country the development of new technologies that substitutes the use of usual fuels for renewable biomass which presents an efficient thermal energy generation potential as shown in the project demonstration.

As can be observed in the table below, 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 non-renewable biomass. 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 on the use of non-renewable biomass, as native firewood.

Table 18. Summary of the environmental impacts

Environmental Factor	Environmental Impact	Classification
Soil	Improvement of soil conditions because of the native 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	Encourage the use and study of	Positive

	cleaner energy	
Fauna	Biodiversity preservation	Positive
Flora	Biodiversity preservation	Positive

6 Stakeholders comments:

The main stakeholders considered in this project are the ceramic partners, the employees and the suppliers. In the ceramic’s facilities, the letter was posted on the employees’ board which is a visible place with high circulation of employees. The letter is available during 20 days and the comments are expected for a period of 7 days after the letter has been posted.

A letter was sent to the stakeholders informing about the project, including some partners and suppliers, such as CCB [62], Pinus Brasil Comércio de Madeira LTTDA, LEMC (laboratório de Ensaios Monte Carmelo), Mecânica Bonfante LTDA, among others.

No outcomes were received by the day when the PDD was sent for validation.

[62] *Available at: http://www.ccb.org.br/*

7 Schedule:

- Project start date[63]: 30/05/2008
- Project Crediting Period Start Date[64]: 01/07/2008
- Validation Report predicted to: 15/05/2010
- First Verification Report predicted to: 15/06/2010
- VCS project crediting period: 10 years renewable, two-times renewable
- Monitoring and reporting frequency: preferentially from 6 to 12 months, since the beginning of the crediting period.
- Date of terminating the project: 30/06/2018.

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

[64] *Date on which the project proponent completed the fuel switch and the first monitoring period commences.*

8 Ownership:

8.1 Proof of Title:

CERÂMICA ITUIUTABA LTDA. (Project Proponent I) owns the ceramic plant and is the company responsible for managing the human resources and the industrial structure at the project site. Hence, in attention to the provisions in the VCS Program Update dated January 21, 2010, the Project Proponent I is entitled to the right of use of the GHG emission reductions from the Project due to its ‘property right in the plant, equipment or process’ that generates them. A copy of the company articles of incorporation of the company, containing the Project Proponent I duly registered before the competent Board of Commerce, shall be presented to the validator as documentary evidence establishing conclusively the project proponent’s right of use in respect of such reductions.

CARBONO SOCIAL SERVIÇOS AMBIENTAIS LTDA. (Project Proponent II) holds the right of use to 50% of any GHG emission reductions generated by the Project due to an enforceable and irrevocable agreement entered by the Ituiutaba Ceramic. A copy of the agreement shall also be presented to the validator as documentary evidence establishing conclusively the project proponent’s right of use in respect of such reductions.

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

Not Applicable.