Voluntary Carbon Standard Project Description

19 November 2007

April 23rd, 2010

Contents

1 Description of Project:

1.1 Project title

Buenos Aires Ceramic Fuel Switching Project

Version 08

PDD completed in: April 23rd, 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 tonnes of CO2 equivalent and less than 1,000,000 tonnes of CO_2 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)**
2010	40,971
2011	40,971
2012	40,971
2013	40,971
2014	40,971
2015	40,971
2016	40,971
2017	40,971
2018	40,971
2019	40,971
Total Emission Reductions (tCO_2e)	**409,710**
Number of years of the crediting period	10
Annual average of estimated emissions reductions for the 10 years of crediting period (tCO_2e)	40,971

1.4 A brief description of the project:

The project activity is the project of *Buenos Aires* Ceramic, which is a red ceramic industry localized in *Buenos Aires* municipality, in the state of *Pernambuco*, northeast of Brazil. The ceramic industry produces ceramic bricks and flagstones, destined mainly for the regional market in *Pernambuco*.

The fuel utilized in the baseline scenario to cook the ceramic pieces was native wood from deforestation from the *Caatinga* biome, which is the common 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.

The *Caatinga* is an exclusively Brazilian biome and occupies around 844,453 Km^2, equivalent to around 10% of the territory of the country[1]. Although being rich in natural resources, the *Caatinga* is one of the most threatened ecosystems on the planet. Its high calorific value causes a major cause of its decline. In a region where the shortage of rivers leads to less access to electric energy, native firewood and charcoal account for thirty percent of the total energy utilized in the industries of the region, which has intensified the local deforestation[2].

The *Caatinga* is a biome with a strong propensity to desertification and its deforestation consequently brings forward an increase in this possibility. With the loss of natural vegetation, the exposed soil becomes more susceptible to erosion and salinization. These processes are responsible for changing the system of rivers, which makes the water supply of local communities and family farming scarce.

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 glycerin and native wood with sustainable management plan to feed the ceramic's kilns, replacing the use of wood from areas with non sustainable forest management, which did not have any kind of contribution to the level of biodiversity enrichment.

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 *Caatinga* 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. Moreover, in opposition to the identified baseline, the project activity will generate thermal energy without stimulating deforestation by using abundant renewable biomasses in the region.

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[1] *Available at: <http://www.ibge.gov.br/home/presidencia/noticias/noticia_visualiza.php?id_noticia=169&id_pagina=1>. Visited on July 1st, 2009.*

[2] *Available at: <http://www.faunabrasil.com.br/sistema/modules/wfsection/article.php?articleid=47>. Last visit on: April 21st, 2009.*

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 *Buenos Aires* in the state of *Pernambuco* which is indicated in Figure 1. The project site has the following postal address:

Granja São Joaquim, s/n

Buenos Aires – Pernambuco - Brasil

Postal Code: 55.845-000

The ceramic is located at the following coordinates:

- 7°42’68” S, 35°18’18” W;
- 7°42’53” S, 35°18’13” W;
- 7°42’52” S, 35°18’23” W;
- 7°42”56” S, 35°18’29” W.

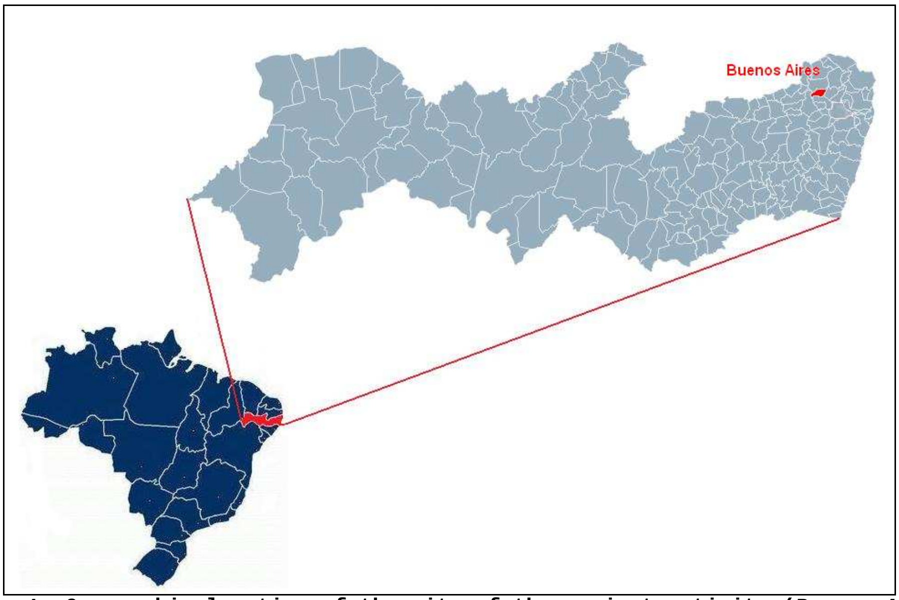

Figure 1. Geographic location of the city of the project activity (*Buenos Aires, Pernambuco)* that has the following coordinates: 07°58'00" S and 37°37'59" W

1.6 Duration of the project activity/crediting period:

- Project start date[3]: August 1st, 2008;
- Crediting period start date[4]: January 1st, 2010;
- Date of terminating the project activity[5]: December 31st, 2019;
- VCS project crediting period: 10 years renewable.

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

[4] *Date on which Buenos Aires Ceramic began acquiring all the biomasses in accordance with the environmental license of the state of Pernambuco; therefore the emission reductions of this ceramic will be accounted after January, 2010.*

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

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 energy needs [6]. 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[7].

According to Seye (2003)[8], in Brazil, the red ceramic pieces are produced through an inefficient and traditional process using wood without forest management to generate thermal energy. The use of wood is a prevalent practice among the ceramics in Brazil, representing 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 utilization of 41,410 m³ of non-renewable native wood per year to provide thermal energy to the ceramic's kilns. The project activity focuses on the glycerin and native wood with sustainable management 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:

Buenos Aires Ceramic produces ceramic bricks (Figure 2) and flagstones. The production process at *Buenos Aires* Ceramic encompasses three "Hoffman" kilns[9] (Figure 3) in order to burn the fuel and cook the ceramic pieces at 850ºC.

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[6] *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.*

[7] *Energy Research Company. National Energy Balance - energy consumption per sector. Available at <http://www.mme.gov.br/mme/galerias/arquivos/publicacoes/BEN/2_-_BEN_2008_-_Ano_Base_2007/1_-_BEN_2008_Portugues_-_Completo.pdf>. Last visit on: September 8th, 2009.*

[8] *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.*

[9] *Kind of kiln that is normally divided in 80-120 chambers (or "lines"), all linked by a central gas collector. This type of kiln has parallel columns where the heat from one line is used in the next, therefore recycling the generated heat in the previous lines. The kiln is fuel fed from its top.*

Figure 2. Ceramic pieces **(bricks) at *Buenos Aires* Ceramic**

Figure 3. "Hoffman" kiln at *Buenos Aires* Ceramic.

Before being cooked in the kilns, the pieces must be dried. At *Buenos Aires* Ceramic, the ceramic pieces are dried naturally. They are placed under a transparent roof, in order to accelerate the drying process (Figure 4).

Figure 4. Ceramic Pieces naturally drying at *Buenos Aires* Ceramic.

Two “Hoffman” kilns encompass 92 lines, while the other “Hoffman” kiln has 102 lines. Together, the three “Hoffman” kilns produce around 3,524,197 units monthly. Each line cooks around 2,000 ceramic pieces. The clay demands are supported by the own ceramic.

Buenos Aires ceramic had to acquire a wood shredder in order to cut the bigger pieces of wood and permit their entrance into the kilns. Furthermore, it was acquired six mechanic burners to automatically inject biomasses and air into the kilns.

Due to the fuel switch, a set of adaptations were necessary, such as adjustments in the kiln entrances to embed mechanic burners and to permit the entrances of the renewable biomasses (figure 5). Moreover, a shed was constructed in order to store and dry biomasses and consequently, improve their burning efficiency. It was also necessary to acquire equipment related to glycerin burning (such as pipes, pumping system, reservoir, etc).

Figure 5. Adaptations of the kiln entrances on the “Hoffman” kiln at *Buenos Aires* Ceramic

Currently, using glycerin and native wood with sustainable manage plan, *Buenos Aires* Ceramic utilizes approximately 378 tons of renewable biomass per month. Currently, the percentage of use of these biomasses are around 35% of glycerin and 65% of native wood with sustainable manage plan (proportion in mass unity), as can be observed in table 2.

It is important to state that the proportion of renewable biomass may change depending on the harvest, which may occur shortages depending on natural and economic factors. In case of shortages, *Buenos Aires* Ceramic may equalize by buying more native wood with sustainable management plan, glycerin, or any other renewable biomass, once its origin is verified. The expectation of the entrepreneur is to utilize gradually glycerin as the main renewable biomass. However, as stated before, the proportion may change. *Buenos Aires* Ceramic utilized coconut fiber as fuel during the testing period, which demonstrates this practice of changing proportions. Moreover, as the amount of biomass was obtained by summing all biomass registries from September to December 2009, the consumption of renewable biomass may change.

However, others biomasses can also be used, since its renewable origin can be verified, such as *Eucalyptus* wood, cashew tree pruning, *Algaroba* wood, coconut fiber, sugar cane briquette, elephant grass, and wood residues (such as sawdust, woodchips, municipal waste, pallets, construction residues, among other types of wood residues. Henceforward, this last group will be named “wood residues” in order of simplification). The project proponent has an area around the ceramic industry that is planted with *Eucalyptus*. Furthermore, 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[10].

Table 2. Scenario of *Buenos Aires* Ceramic

***Buenos Aires* Ceramic**	
Production	3,524,197
Native wood with sustainable manage plan consumption (tons/month)	244
Glycerin (tons/month)	134

The biomasses providers are listed in table 3, which does not exclude the possibility of buying biomass from others:

Table 3. Main biomasses providers.

Biomass	Provider	Location
Native wood with sustainable forest management plan	*Associação das Mulheres Agricultoras de B.N.*	*Serra Talhada – PE*
	Associação Rural dos Agricultores do PA Mandacaru	*Serra Talhada – PE*
	Associação dos Moradores e Assentados da Fazenda Laginha	*Serra Talhada - PE*
	Maria Verônica dos Santos Trindade	*Taquaritinga do Norte - PE*
	Associação Rural dos Moradores do Assentamento PA Paulista	*Serra Talhada – PE*
	Romero Mayer	*Sume – PB*
	José Eduardo do Anacape	*Ingazeira – PE*

[10] According to EMBRAPA (Brazilian Agricultural Research Corporation's). Source: http://www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292. Last visit on March 27th, 2009.

	Antônio de Souza Filho	*Iguaracy – PE*
	Roberto Severino Trindade	*Alcantil – PB*
	Fazenda Poço de Ferro III	*Floresta - PE*
	Fazenda Poço de Ferro V	*Inajá - PE*
	Fazenda Paulista	*Serra Talhada - PE*
	Fazenda Olho D´Água da Cunha	*Sume - PB*
	Associação Rural dos Assentados P. A. Catolé	*Serra Talhada - PE*
	Fazenda Mucuitu	*Serra Talhada - PE*
	Fazenda São Miguel Barra Nova	*Serra Talhada - PE*
	Fazenda Duas Barras	*Iguaraci - PE*
	Fazenda Batalha	*Serra Talhada - PE*
	Oriosvaldo Barros Mangueira	*Floresta – PE*
	Severino Filho do Nascimento	*Serra Talhada – PE*
	Fazenda Riacho Verde	*Sertania - PE*
	Ivanilda Barbosa Brito de Andrade	*Sertania – PE*
Glycerin	*Perfil Comércio de Produtos Químicos Ltda – ME*	*Paulista – PE*
	IBPC Ecológica do Brasil Ltda - ME	*Recife – PE*

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

This project is in accordance to the CONAMA[11] Resolution, no. 237/97 that establishes that clay extraction activities and ceramic production must be supported by specific licenses, such as clay extraction license, environmental licenses and the operational license, which is granted by the State Agency of Environment and Water Resources of *Pernambuco* (CPRH[12]), and must run under the valid time.

According to the IBAMA Normative Instruction Nº 112 from August 21st, 2006;[13] the entrepreneur who uses raw material from native forests is obliged to use the DOF (Document of Origin Forestry) to control the origin, transport, and storage of forest products and by-products. Therefore, to use firewood obtained from native forests in a sustainable manner, it is necessary to use the DOF, which is required by the Operational License of the state of *Pernambuco*. The DOFs asked from *Buenos Aires* Ceramic are available for consultation at *IBAMA* website.[14]

The decree 11097/05, which introduces biodiesel in the Brazilian energy matrix states that renewable diesel (biodiesel) must be added into the fossil. As from 2008, the portion of biodiesel into the fossil diesel must be 2%. According to the same decree, after 2013, the portion of biodiesel added to fossil diesel must raise to 5%.[15] Currently, there is no Brazilian legislation regarding the disposal of glycerin, nor for energy purpose.

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).[16]

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

- Availability and price of the renewable biomasses

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

[12] *CPRH is the State Agency of Environment and Water Resources of the State of Pernambuco responsible to issue the environmental licenses according to CONAMA resolution 237/97. More information at: <http://www.cprh.pe.gov.br/>.*

[13] *BRASIL. INSTRUÇÃO NORMATIVA IBAMA Nº 112, DE 21 DE AGOSTO DE 2006. Available at: <http://www.cetesb.sp.gov.br/licenciamentoo/legislacao/federal/inst_normativa/2006_Instr_Norm_IBAMA_112.pdf>. Visited on: July 6th, 2009.*

[14] *To check the DOF´s, it is necessary to enter the ceramic registry (CNPJ) and its password. Please visit <http://servicos.ibama.gov.br/ctf/sistema.php?modulo=aplicacao/modulo&moduloId=392> to check DOFs.*

[15] *BRASIL. Presidência da República – Lei nº 11.097, de 13 de Janeiro de 2005. Available at: http://www.biodiesel.gov.br/docs/lei11097_13jan2005.pdf. Last visit on September 24th, 2009.*

[16] *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 on: June 3rd, 2009.

The thermal energy generation through the combustion of biomasses is an innovation in the ceramic industries. The future demand of this alternative fuel (e.g. by other consumers) is not easy to foresee. There is currently a great amount of these types of biomasses available regionally, however, a demand and price increase has already been reported. If non-foreseeable reasons affect the availability of the biomasses, the ceramic owner will search for other type of renewable biomasses. Hence, it follows that the project approval will make the continue use of renewable biomasses feasible.

- Availability of the renewable biomasses

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

- Closing of the ceramic business

If the ceramic company closes, it may substantially affect the project's GHG emission reductions, once other ceramic would probably supply the products consuming native wood which is the common practice of the region. However, there are currently good perspectives in the ceramic market and the organized administration verified at *Buenos Aires* Ceramic avoid this possibility in short term.

- Difficulty related to the abrupt change

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

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

The historical of *Buenos Aires'* activities using native wood as fuel clearly confirms that the project was not implemented to create GHG emissions for the purpose of its subsequent removal or destruction.

Buenos Aires Ceramic used to feed the kilns with native wood from deforestation activities to generate thermal energy in order to cook ceramic pieces for several years. Moreover, the opportunity of carbon credits made the ceramic owner to consider the possibility of the fuel-switch. This evidence guarantees the integrity of this project activity.

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

This 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 assess the social, environmental and economic conditions of communities affected by the project, and demonstrates through continuous monitoring the project's contribution to sustainable development.

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

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

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

Project Proponent

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

Industrial Establishment: *Patrícia Matos de Cunha LTDA.*

Mr. Rodolpho Cunha Neto, director and owner: Information about the ceramics, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramics pieces market challenges.

Mrs. Roberta Joana dos Santos, monitoring responsible: General data and information on inputs and outputs of the ceramics, 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:

Granja São Joaquim, s/n
Buenos Aires – Pernambuco – Brasil
Postal Code: 55.845-000

Project Developer

Carbono Social Serviços Ambientais LTDA.: Project developer, Project participant and Project idealizer.

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 assessors directly involved are:

Gabriel Fernandes de Toledo Piza and *Marcelo Hector Sabbagh Haddad*, Technical Analysts: Project Design Document writers, elaboration of GHGs Emissions’ Inventory, direct contact between *Carbono Social Serviços Ambientais LTDA* and the ceramics, 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
Postal Code: 55.845-000
São Paulo – SP, Brazil

Phone number: +55 11 2649-0036
Web site: http://www.socialcarbon.com
Email: *gabriel@socialcarbon.com*
marcelo@socialcarbon.com
rafael@socialcarbon.com

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

The project is eligible according to:

- Legislative: the project attends all legal requirements;
- Technical: alterations/adaptations required are technically feasible;
- Economic: carbon credits will compensate the high investments that were necessary to achieve the fuel-switch;
- Sectoral: incentive of good practices to the sector;
- Social: social carbon methodology will be applied which will improve long term sustainability. The culture of burning wood without sustainable management 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 Application by the User** – Version 01 from February 1st of 2008 onwards.

The amount of non-renewable biomass (B_y) will be determined according to the option "a" of the applied methodology.

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

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

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

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

There are no similar registered small-scale CDM project activities in the region of *Buenos Aires* once Social Carbon Company made a research and did not find any registered small–scale CDM Project activity in the region. The sources of registered small-scale CDM project activity consulted were the United Nations Framework Convention on Climate Change (UNFCCC) [17] and Brazilian's Technology and Science Ministry [18]. Therefore, the proposed project activity is not saving the non-renewable biomass accounted by the other registered project activities.

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

Firewood used to be the most employed source of primary energy until de decade of 1970, when the petroleum started to supply the majority of Brazilian's energy needs[19]. Moreover the Brazilian's Energy and Mine Ministry has been monitoring every energetic sectors of Brazil since 1970, and firewood appears over the years monitored as a significant source of thermal

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[17] *CDM activities registered by CDM Executive board are Available at: <http://cdm.unfccc.int/Projects/registered.html>. Visited on March 27th, 2009.*

[18] *Brazilian´s Technology and Science Ministry is responsible for registry and approval of all CDM activities within Brazilian boundaries. CDM activities submitted to the Brazilian Inter-Ministerial Commission of CDM Activities are available at: <http://www.mct.gov.br/index.php/content/view/47952.html>.Visited on September 23th, 2009.*

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

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

According to historical data from *Buenos Aires* ceramic industry, the ceramic facilities used to utilize non-renewable native wood from areas without any kind of management since 1988.

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

The biomasses utilized in the project, glycerin and native wood with sustainable management plan are common in the region generated.

The native wood with sustainable forest management plan and the *Eucalyptus* wood are considered renewable according to option I, as soon as they fit all the assumptions below:

"The biomass is originating from land areas that are forests where:

(a) The land area remains a 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 and nature conservation regulations are complied with."

The native wood with sustainable forest management plan fits all the three options above since the area remains a forest due to sustainable management practices that are undertaken with.

The sustainable forest management plan can be organized into three stages: firstly, the division of the property in exploitable areas and areas of permanent preservation that are inaccessible to exploitation. The second stage is the planning of roads that connect the area with the primary roads. In the third stage, the allocated area is divided for exploration in blocks in order to sustain forest exploitation annually[22].

Afterwards, a technical responsible elaborates the next stages: forest inventory, estimation of growth, the best intervention techniques, fixes the arrangement of exploration and the silvicultural treatment. An annual technical report of the sustainable forest management area is elaborated and it is necessary a yearly authorization of the environmental agency of the state to keep the activities.

In addition, the sustainable forest management promotes the conservation of biodiversity, conservation of soil and water regime, which are essential practises to combat the desertification. Moreover, there is an increment at the opportunity of employment for the rural population due to the sustainable exploration of plants destined for fruits, apiculture, medicinal, oil, ornamental and fiber production purposes[23].

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[20] *National Energy Balance - Energy Consumption per Sector. Available at: <http://www.mme.gov.br/mme/galerias/arquivos/publicacoes/BEN/2_-_BEN_2008_-_Ano_Base_2007/1_-_BEN_2008_Portugues_-_Completo.pdf>. Visited on September 23th, 2009.*

[21] *Source: UHLIG, A.* ***Lenha e carvão vegetal no Brasil: balance oferta-demanda e métodos para estimação de consumo****, tese de doutorado, Universidade de São Paulo, São Paulo, 2008. 156 p. Available at: <http://www.teses.usp.br/teses/disponiveis/86/86131/tde-14052008-113901/>. Visited on March 27th, 2009.*

[22] *Plano de Manejo Florestal (Forest Management Plan). Available at: <http://www.manejoflorestal.org/guia/pdf/guia_cap1.pdf>. Last visit on: April 22nd, 2009.*

[23] *BRASIL. Manejo sustentável dos recursos florestais da Caatinga/MMA. Secretaria de Biodiversidade e Florestas. Departamento de Florestas. Programa Nacional de Florestas. Unidade de Apoio do PNF no Nordeste._Natal: MMA, 2008. 28p.*

Furthermore, the minimum requirements of the management plan are defined by Articles 19, 20 and 21 of Brazilian Forest Code, and are regulated by Decree 5975/06[24].

On the other hand, the *Eucalyptus* genus is cultivated over 3.5 millions of hectares in Brazil, and can generate 23 to 25 tons of biomass per hectare[25]. The grand major of these cultivations were established in the middle of 1970 to 1980.

The area destined for afforestation in *Brazil* corresponds to 5.5 millions of hectares, where the *Eucalyptus* genus corresponds to 3.5 millions of this area, and can generate 20 to 25 tons of biomass per hectare. Moreover, the afforestation supplies the society demands and avoids the pressure on the remnants of natural forests[26].

In addition, sustainable management practices of the afforestation in Brazil (as the techniques of preparation, fertilization, control of weeds, improved seeds, cloning and reform) were introduced and constantly improved in order to increase its productivity[27].

The afforestation in Brazil is complied with the ABRAF[28], which represents, promotes and defends the collective interests of the forestry companies that engage in sustainable development based on planted forests. The limits of the area of environmental preservation and legal reserve as defined by legislation will be respected.

The cashew tree pruning is considered renewable according to option II, as soon as it fits all the following assumptions:

“The biomass is 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.”

Glycerin, coconut fiber, wood residues, and sugar cane briquette are industry residues coming from agro industrial activities. Thus, these biomasses 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”.

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[24] *BRASIL. Lei nº. 4.771, de 15 de setembro de 1965. Código Florestal.* ***Diário Oficial [da] República Federativa do Brasil****, Brasília, DF, 16 de set. 1965. Available at: <http://www.planalto.gov.br/ccivil_03/LEIS/L4771.htm>. Last visit on: April 22nd, 2009.*

[25] *Available at: <http://www.agencia.fapesp.br/materia/9405/especiais/eucalipto-no-pareo.htm>. Last visit on: September 8th, 2009.*

[26] *FOLKEL. C.* ***Silvicultura e Meio Ambiente.*** *Source: <http://www.celso-foelkel.com.br/artigos/Palestras/Silvicultura%20&%20Meio%20Ambiente.%20Vers%E3o%20final.pdf>. Last visit on: May 18th, 2009.*

[27] *MCT/IPEF.* ***Silvicultura e Manejo.*** *Source: <http://www.ipef.br/mct/MCT_03.htm>. Last visit on: May 18th, 2009.*

[28] *Brazilian Association of producers of cultivated forests. Source: <http://www.abraflor.org.br/estrutura.asp>. Last visit on: May 5th, 2009.*

Glycerin is also a common residue in the region. The glycerin is a residue generated at the biodiesel process, which is named transesterification.[29]

Coconut residues are widely generated due to the utilization of the coconut fruit for several finalities, like feeding, water, fiber, among others.

Wood residues like sawdust, woodchips, municipal waste, pallets, and construction residues from constructions and industries are a residue coming from several segments. The wood residues from constructions and industries are resulted from construction and industries residues, which constitute a huge problem due to the deficiency of a correct destination for this wood. The sawdust is generated in the production of wood, which is utilized in several segments of industries and activities, such as furniture, and scaffold for civil constructions.

Sugar cane briquette is generated by industries to produce sugar and alcohol and can be compacted into briquettes in order to generate thermal energy.

The *Algaroba* wood is considered renewable according to option IV, as soon as it fits the following assumption:

“The biomass is a biomass residue and the use of that biomass residue in the project activity does not involve a decrease of carbon pools, in particular dead wood, litter or soil organic carbon, on the land areas where the biomass residues are originating from.”

The utilization of *Prosopis juliflora* is in according with option IV since it is considered a biomass residue due its competitive characteristics. A research made by EMBRAPA[30], which encompass the States of *Pernambuco* and *Bahia*, affirmed that *Algaroba* is characterized as an invasive exotic plant due to its fast expansion, which causes many environmental impacts[31]. This source stated that there were several centers of *Algaroba* operation highlighting the *San Francisco* Basin, which is comprised for many municipalities from the states of *Bahia* and *Pernambuco*, including this project region.

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

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

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

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

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

Currently, elephant grass has been acquiring national importance as biomass to generate thermal energy due to its high productiveness and easy adaptation in almost all climate and soil Brazilian conditions[32]. The

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[29] AUTH, et. al; ***Estudo e preparação do biodiesel.*** *UNIVATES – Centro Universitário; Programa de Pós-graduação em Ensino de Ciências Exatas. Available at: http://www.univates.br/ppgece/docs/PT_Eniz1.pdf. Last visit on: September 23rd, 2009.*

[30] EMBRAPA is the Brazilian Agricultural Research Corporation's which its mission is to provide feasible solutions for the sustainable development of Brazilian agribusiness through knowledge and technology generation and transfer.

[31] ARAUJO, J. L. P., CORREIA, R. C., ARAUJO, E. P., LIMA, P. C. F. ***Cadeia Produtiva da Algaroba no Pólo de Produção da Bacia do Submédio São Francisco.*** *EMBRAPA. Petrolina - PE – Brazil.*

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

elephant grass is 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. In case of utilizing elephant grass, the limits of the area of environmental preservation and legal reserve as defined by legislation will be respected.

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

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

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

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

Table 4. 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 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 5. Distribution of fuel utilized at the ceramic sector in Brazil in percentage

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

(Brazilian Energy Balance, Available at: <http://www.mme.gov.br/mme/galerias/arquivos/publicacoes/BEN/2_-_BEN_2008_-_Ano_Base_2007/1_-_BEN_2008_Portugues_-_Completo.pdf>)

The most probably scenario in the absence of native wood from deforestation areas would be the use of fuel oil, which is not viable considering its higher prices when compared with other non-renewable biomass. Even though, fuel oil presents a higher Net Calorific Value when compared with non-renewable firewood; the costs with fuel oil are higher because of its expensive prices. According to ABEGÁS[33], for the industrial sector in the northeast region, the fuel oil has a price of around 32 BRL/MMBTU, and the firewood has a price of around 14 BRL/MMBTU, regarding the period of the project start date (August, 2008).

Therefore, the cost with the utilization of fuel oil is higher than the utilization of firewood without sustainable forest management. Besides, the fuel oil requires more technology to be inserted. The conclusion is that the use of fuel oil is not attractive, at all.

Another plausible baseline scenario would be the use of Natural Gas. Although there is distribution/gas pipe in the region[34], the inconstant distribution of natural gas made the project proponents not to trust in this

[33] *ABEGÁS Report: Market and Distribution. Year III, n° 24, July of 2009. Available at: <http://www.abegas.org.br/arquivos/relatorio_julho09_mercado.pdf>. Last visit on: September 22nd, 2009.*

[34] *Source: <http://www.ctgas.com.br/template02.asp?parametro=2547>. Last visit on: June 3rd, 2009.*

fuel, as 40% of the natural gas consumed in *Brazil* proceeds from *Bolivia*[35], therefore excluding this possibility.

Therefore, the identified baseline for this project activity is the use of native wood without sustainable forest management, which was used by the ceramic for a long time and has a consolidated delivery system and long term supply assurance. The overall characteristics of the ceramic production are used to obtain the real amount of non-renewable biomass used in the baseline scenario.

Before the project activity, the Ceramic's monthly production was about 3,524,197 ceramic pieces per month, using about 2,785.5 tons of native firewood per month in the process of cooking and burning of the ceramic pieces in order to sustain that production.

The efficiency of the kilns are around 0.7904 tons of wood per thousand of blocks produced, which is less efficient than average for the "Hoffman" kiln[36]. This value is discrepant because of the lack of technology in the region, and the indiscriminate use of the native wood without sustainable forest management.

If afterwards, the production in the ceramics rises, it will be reported in the monitoring report.

Table 6. General description of the ceramic

	***Buenos Aires* Ceramic**
Production at baseline (pieces per year)	42,290,364
Non-renewable wood consumption at baseline (tons per year)	33,426

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

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

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

The production during the baseline scenario could increase, since there is no lack of non-renewable wood offer. The high devastation rate of *Caatinga* Biome makes available large amounts of wood.

According to ASPAN[37], the major industries, mainly the steel, plasterer and ceramic industries are primarily responsible for the use of native firewood as fuel in their productions. Of a total of 844,453 km², currently it is remaining 50% of the local biome, even with 365,000 hectare of annual loss of all the biome[38].

[35] *Source: <http://ecen.com/eee51/eee51p/gn_bolivia.htm>. Last visit on: June 3rd, 2009.*

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

[37] *Source: Association for the nature defense of Pernambuco. http://www.aspan.org.br/ Brazilian Institute of Environment and Renewable Natural Resources*

[38] *http://www.faunabrasil.com.br/sistema/modules/wfsection/article.php?articleid=47*

Therefore, assuming that the deforestation rate maintains constant, the native wood would be enough to ensure the increase in ceramics production for at least the next 30 years, which is over the project activity life-time.

Project additionality is explained according to section 5.8 of the Voluntary Carbon Standard - Specification for the project-level quantification, monitoring and reporting as well as validation and verification of greenhouse gas emission reductions or removals. To demonstrate that the project is additional, the PD used the test 1:

Test 1 – The project test

Step 1: Regulatory Surplus

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

Legal requirements, as stated by the Constitution of the Federal Republic of Brazil [39] as well as Federal and State Regulations, do not require entrepreneurs, which use raw forest materials as an energy source, to switch from non-renewable biomasses to renewable biomasses. Therefore, the project activity is not a legal obligation, and in accordance with Article 5 of the Constitution of the Federative Republic of Brazil; moreover, nobody can be forced to follow a course of action if it is not addressed by law.

There are legal requirements constraints regarding the use of non-renewable biomass as exposed in Decree N.5,975 of November 30th, 2006. However, it is not enforced namely due to the lack of control[40].

The consumption of non-renewable biomass by the ceramic industry was related by several authors (NERI, 2003[41]; ALBUQUERQUE *et al*, 2006[42]; VIANA, 2006[43]; CARDOSO, 2008[44]).

Probably, the fuel switch would not be to renewable biomass, once the common practice at the ceramic sector is the use of non-renewable fuel.

Step 2: Implementation Barriers

The project shall face at least one distinct barrier compared with barriers faced by alternative projects.

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[39] BRASIL. CONSTITUIÇÃO DA REPÚBLICA FEDERATIVA DO BRASIL DE 1988. Available at: http://www.planalto.gov.br/ccivil_03/constituicao/constitui%C3%A7ao.htm. Visited on July 6th, 2009.

[40] Corte e poda de árvores pelo Dnit na BR-158 é considerado crime ambiental, Jornal Grande CPA, Available at: http://www.grandecpa.com.br/?p=noticia&id_noticia=129. Visited on March 27th, 2009.

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

*[42] 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.*

*[43] VIANNA, F.M.A. **Participação Pública em Programas Ambientais: Um Estudo em Área Suscetível a Desertificação no Estado do Rio Grande do Norte.** 2006, 109f. Dissertação (Mestrado em Engenharia de Produção) – Universidade Federal do Rio Grande do Norte, Natal, 2006. Available at: <http://www.pep.ufrn.br/publicacoes.php?enviou=1>. Visited on March 27th, 2009.*

*[44] 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.*

- **Financial barrier**

With the project implementation, the ceramic company had to withstand higher costs than if it had continued utilizing native wood as fuel. The most important additional costs are related to biomass transportation.

Furthermore, there are spending with the equipment maintenance, so the mechanic burners can operate. Besides, due to the implementation of the project activity, the ceramic had to purchase six mechanic burners 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 using glycerin. The project proponent also acquired thermocouples, as well other equipment related to glycerin burning (such as pipes, pumping system, reservoir, etc).

When the new production techniques have been introduced in the ceramic plant, an adaptation period and a testing period were necessary. For the adaptation of the kilns, a still period of a burning cycle for each kiln had to be considered. Also, a testing period of approximately three months was required in order to identify the correct burning curve; thus, it led to a waste of a considerable amount of biomass (average 25%) in each burning cycle. All these adaptations resulted in losses at the financial profit and economical balance of the company.

Due to all the above mentioned, the ceramic industry had to deal with higher production costs. Those made the company think about stopping the fuel switching project.

Table 7. Main Costs before and after the project activity and investment costs

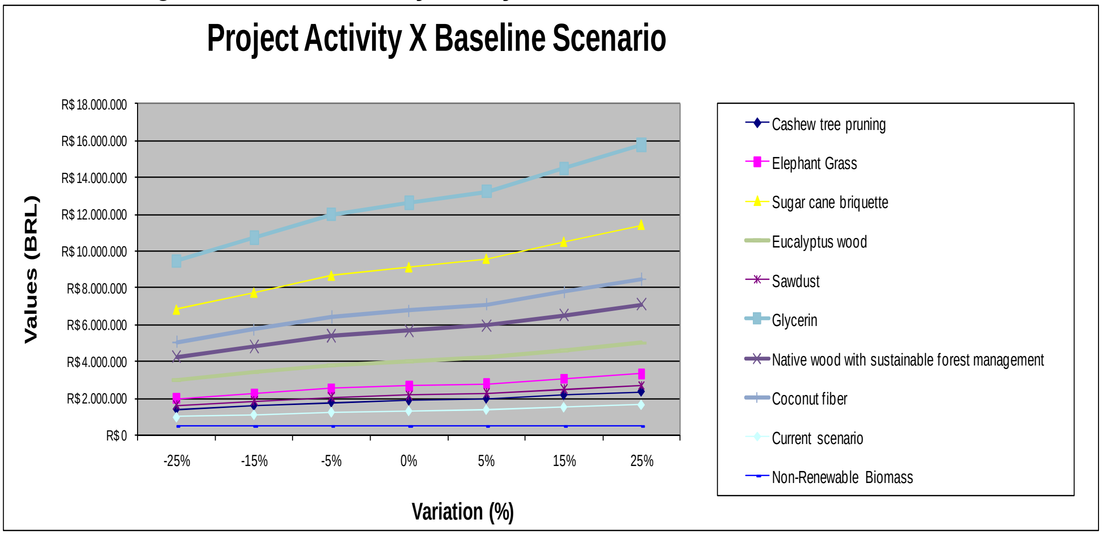
***Buenos Aires* Ceramic**					
Scenario	**Non-renewable wood**		**Renewable Biomass**		
Production	3,524,197	pieces/month	3,524,197		pieces/month
Monthly consumption of the fuel	3,451.08	m^3/month	Glycerin	Native wood with sustainable forest management plan	Biomass
			134	244	ton/month
Cost per m^3	12.01	BRL/m^3	520.00	170.00	BRL/ton
Total Fuel Costs	41,450.00	BRL/month	69,853.42	41,510.26	BRL/month
			111,363.68		
Cost per ceramic device	0.01176	BRL/ceramic device	0.03160		BRL/ceramic device

Investment Costs		
Costs with mechanic burner	7,800.00	**BRL**
Costs with termal sensor	15,000.00	**BRL**
Costs with glycerin equipment	32,561.15	**BRL**
Costs of construction of shed	45,000.00	**BRL**
Weighing machine equipment	926.00	**BRL**
Waste of products in the testing period (3 months)	105,725.91	**BRL**
Waste of biomass in the testing period (BRL)	83,522.76	**BRL**
Loss of revenues - period for adaptation of the kiln for biomass	114,400.00	**BRL**
Total Costs	**404,935.82**	**BRL**

Table 8. Sensitivity Analysis of *Buenos Aires* Ceramic

Biomasses	Biomass Costs(BRL/ tonnes)	Estimated Amount to be Employed (tonnes/year)	-25%	-15%	-5%	0%	5%	15%	25%
Cashew tree pruning	35.71	52,908.58	R$ 1,417,194	R$ 1,606,153	R$ 1,795,113	R$ 1,889,592	R$ 1,984,072	R$ 2,173,031	R$ 2,361,990
Elephant grass	67.45	39,665.25	R$ 2,006,566	R$ 2,274,108	R$ 2,541,650	R$ 2,675,421	R$ 2,809,192	R$ 3,076,734	R$ 3,344,276
Sugar cane briquette	230.00	39,681.36	R$ 6,845,035	R$ 7,757,706	R$ 8,670,377	R$ 9,126,713	R$ 9,583,048	R$ 10,495,720	R$ 11,408,391
Eucalyptus wood	117.65	34,071.43	R$ 3,006,303	R$ 3,407,143	R$ 3,807,983	R$ 4,008,404	R$ 4,208,824	R$ 4,609,664	R$ 5,010,505
Sawdust	60.00	36,278.36	R$ 1,632,526	R$ 1,850,197	R$ 2,067,867	R$ 2,176,702	R$ 2,285,537	R$ 2,503,207	R$ 2,720,877
Glycerin	520.00	24,270.06	R$ 9,465,324	R$ 10,727,367	R$ 11,989,410	R$ 12,620,431	R$ 13,251,453	R$ 14,513,496	R$ 15,775,539
Native wood with sustainable forest management	170.00	33,428.57	R$ 4,262,143	R$ 4,830,429	R$ 5,398,715	R$ 5,682,858	R$ 5,967,000	R$ 6,535,286	R$ 7,103,572
Coconut fiber	160.00	42,328.13	R$ 5,079,376	R$ 5,756,626	R$ 6,433,876	R$ 6,772,501	R$ 7,111,126	R$ 7,788,376	R$ 8,465,626
Algaroba wood	35.00	27,397.65	R$ 719,188	R$ 815,080	R$ 910,972	R$ 958,918	R$ 1,006,863	R$ 1,102,755	R$ 1,198,647
Native wood with sustainable forest management	170.00	2,930.14	R$ 373,592	R$ 423,405	R$ 473,217	R$ 498,123	R$ 523,029	R$ 572,842	R$ 622,654
Glycerin	520.00	1,612.00	R$ 628,681	R$ 712,505	R$ 796,329	R$ 838,241	R$ 880,153	R$ 963,977	R$ 1,047,801
Current scenario	**-**	**4,542.14**	**1,002,273.12**	**1,135,909.54**	**1,269,545.95**	**1,336,364.16**	**1,403,182.37**	**1,536,818.78**	**1,670,455.20**
Non-renewable wood	14.88	33,428.57	R$ 497,400	R$ 497,400	R$ 497,400	R$ 497,400	R$ 497,400	R$ 497,400	R$ 497,400

Figure 6. Sensitivity Analysis at *Buenos Aires* Ceramic



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

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 bricks and flagstones.

2. Identify possible types of baseline candidates.

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

BRAZILIAN ENERGY BALANCE 2008 - CERAMIC SECTOR EVALUATION			
FUEL	**2005**	**2006**	**2007**
Natural Gas	24%	26%	25%
Charcoal	2%	1%	1%
Wood	50%	50%	49%
Other recuperations	1%	1%	1%
Diesel Oil	0%	0%	0%

Fuel Oil	8%	8%	8%
Liquified Petroleum Gas	4%	4%	4%
Others from Petroleum	2%	2%	4%
Piped gas	0%	0%	0%
Electricity	8%	8%	7%
Others non specified	0%	0%	0%

(Brazilian Energy Balance, source: <http://www.mme.gov.br/mme/galerias/arquivos/publicacoes/BEN/2_-_BEN_2008_-_Ano_Base_2007/1_-_BEN_2008_Portugues_-_Completo.pdf>)

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[45] 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 *Pernambuco*. 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 *Buenos Aires* Ceramic did its fuel switch.

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

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

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

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

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

There are legal requirements constraints regarding the use of non-renewable biomass as exposed in Decree N.5,975 of November 30th,2006. However, it is not enforced namely due to the lack of control[46]. The consumption of non-renewable biomass by ceramic industry was related by several authors (NERI, 2003[47]; ALBUQUERQUE et al, 2006[48]; VIANA, 2006[49];

[45] *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.*

[46] *Corte e poda de árvores pelo Dnit na BR-158 é considerado crime ambiental, Jornal Grande CPA, Available at: <http://www.grandecpa.com.br/?p=noticia&id_noticia=129>. Visited on March 27th, 2009.*

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

CARDOSO, 2008[50]). This is also observed in other industries as in the production of steel (BRASIL, 2005[51]), which has a much better structure and internal organization when compared with ceramic industries that are generally small and familiar enterprises. BRASIL (2001) suggests that it is important to stimulate the miner sector, especially who are respecting the environment. The incomes from carbon credits can be this incentive which would contribute to avoid the consumption of non-renewable biomass illegally. Therefore laws and regulations will not be considered as criteria to excluded baseline candidates and to constraint the geographical area and temporal range of the final list of the baseline candidates.

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

5. Identify a final list of baseline candidates.

Table 9 provides the percentage of the level of penetration of each fuel employed in the ceramic sector during the average of the three last years available (2005, 2006 and 2007). Baseline candidates are the use of:

a) **Wood:** The fuel most employed, which would be the scenario of highest GHG emissions, once its emission factor is the highest according to IPCC 2006[52].

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[53] and the lack of availability. 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[54] was offering subsidy to the consumption of fuel oil in spite of natural gas in the State of *São Paulo*. Moreover, according to the same sources, PETROBRAS is

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[48] *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.*

[49] *VIANNA, F.M.A.* ***Participação Pública em Programas Ambientais: Um Estudo em Área Suscetível a Desertificação no Estado do Rio Grande do Norte.*** *2006, 109f. Dissertação (Mestrado em Engenharia de Produção) – Universidade Federal do Rio Grande do Norte, Natal, 2006. Available at: <http://www.pep.ufrn.br/publicacoes.php?enviou=1>. Visited on March 27th, 2009.*

[50] *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.*

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

[52] *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 2.19. Visited on September 8th, 2009.*

[53] *Source: <http://www.dep.fem.unicamp.br/boletim/BE31/artigo.htm>. Visited on March 27th, 2009.*

[54] *PETROBRÁS performs in oil and oil by product 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> and <http://www.fecombustiveis.org.br/revista/mercado/probleminha.html>. Last visit on: August 7th, 2009.*

pressing the distributors of Natural Gas to sign contracts that forecast only an amount of the deliver as constant, and the rest as flexible, being cut when the power plants need to come into operation. 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[55].

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.[56]

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

In Brazil, the red ceramic pieces are produced through an inefficient and traditional process using wood without forest management to generate thermal energy technologies[57]. 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[58]. Furthermore, using non-renewable wood is a simple procedure and well known by the kiln operators.

The native forest without any kind of sustainable management has always been a source of firewood in the ceramic sector [59], 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[60].

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

The acquiring of new equipment and the overall costs of the fuel switch represented a risk to the ceramic owner since the baseline practice was already established and well-known by the laborers. The operators did not have the knowledge of the ideal amount of renewable biomass that is necessary to use in order to achieve the temperature of about 850ºC to

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[55] *Source: <http://www.ctgas.com.br/template04.asp?parametro=155>. Visited on March 7th, 2009.*

[56] *The use of renewable biomass was not included in table 9 which shows the fuel most employed in the ceramic sector according to Brazilian Energy Balance.*

[57] *ABREU, Y. V.; GUERRA, S. M. G.* ***Indústria de Cerâmica no Brasil e o Meio Ambiente.*** *Chile: IV Congreso Nacional de Energía, 2000. Available at: <http://www.nuca.ie.ufrj.br/bgn/bv/abreu2.htm>. Visited on March 27th, 2009.*

[58] *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.*

[59] *UHLIG, A.* ***Lenha e carvão vegetal no Brasil: balance oferta-demanda e métodos para estimação de consumo****, tese de doutorado, Universidade de São Paulo, São paulo, 2008. 156 p. Available at: <http://www.teses.usp.br/teses/disponiveis/86/86131/tde-14052008-113901/>. Visited on March 27th, 2009*

[60] *PAULETTI, M. C.* ***Procedimento para Introdução de Nova Tecnologia em Agrupamentos de Micro e Pequenas Empresas: Estudo de Caso das indústrias de Cerâmica Vermelha no Vale do Rio Tijucas.*** *2001. Available at: <http://biblioteca.universia.net/html_bura/ficha/params/id/597230.html>. Visited on March 27th, 2009.*

cook its ceramic pieces, to acquire the final product with the same quality and to maintain the optimal process as they did when using the wood. As a result of the fuel switch, an extensive training course was required for the staff in order to clarify new measures linked to the machinery in order to sustain the quality of the final product.

Therefore, the project activity is not a common practice.

Impact of projects approval

Presently, the ceramic industrial segment of the state of *Pernambuco* is comprised mostly by small industrial units that still use varying technological models. The grand majority of ceramic industries in the region of this project activity use native wood without sustainable forest management as fuel, mainly from *Caatinga* biome. These industries have some technological restrictions such as the energy exploitation and the efficiency of the machinery.

Brazil is the third major contributor[61] 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[62] – Background Reports indicates that the major source of GHG emissions in Brazil is due to deforestation, mainly occurred in *Amazonian* (59% of the deforestation) and *Cerrado* biomes (26%).

The *Caatinga* is an exclusively Brazilian biome and occupies around 844,453 Km², equivalent to around 10% of the territory of the country[63]. Although being rich in natural resources, the *Caatinga* is one of the most threatened ecosystems on the planet. Its high calorific value causes a major cause of its decline. In a region where the shortage of rivers leads to less access to electric energy, native firewood and charcoal account for thirty percent of the total energy utilized in the industries of the region, which has intensified the local deforestation[64]. The forecast for 2010 is that it will remain less than 30% of the original area of *Caatinga*. Currently it is remaining 50% of its original structure[65].

According to ASPAN[66], the major industries, mainly the steel, plasterer and ceramic industries are primarily responsible for the use of native firewood as fuel in their productions[67].

The *Caatinga* is a biome with a strong propensity to desertification and its deforestation consequently brings forward an increase in this possibility. With the loss of natural vegetation, the exposed soil becomes more susceptible to erosion and salinization. These processes are responsible for changing the system of rivers, which makes the water supply of local communities and family farming scarce. The *Caatinga* biome is the fourth

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61 Source: GOLDEMBERG & MOREIRA. ***Política Energética no Brasil****. Estudos Avançados 19 (55), 2005. Available at: <http://www.scielo.br/pdf/ea/v19n55/14.pdf>. Last visit on: March 17th, 2009.*

62 Available at: <http://www.mct.gov.br/index.php/content/view/17341.html>. Last visit on: March 17th, 2009.

63 Available at: <http://www.ibge.gov.br/home/presidencia/noticias/noticia_visualiza.php?id_noticia=169&id_pagina=1>. Visited on July 1st, 2009.

64 Available at: <http://www.faunabrasil.com.br/sistema/modules/wfsection/article.php?articleid=47>. Last visit on: April 7th, 2009.

65 Available at: <http://www.reape.pe.gov.br/not-01-2007.shtml>. Last visit on: April 7th, 2009.

66 Association for the nature defense of Pernambuco. Available at: <http://www.aspan.org.br/>. Last visit on: April 7th, 2009.

67 Available at: <http://www.ambienteemfoco.com.br/?p=457>. Last visit on: August 10th, 2009.

largest Brazilian biome. It is located in the northeast portion of Brazil and can be observed in table 10. The flora and fauna of this biome is rich once it shares frontiers with the main Brazilian biomes to its west with *Amazonian*, to the southwest with *Cerrado*, and to the southeast with *Mata Atlântica*. In spite of the size and importance of this biome, the *Caatinga* is an endangered habitat.

Table 10. 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[68])

Another relevant issue is how fast deforestation occurs in the *Caatinga* biome, representing 365,000 ha/year[69].

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 between 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.

[68] *Available at: <http://www.ibge.gov.br/home/presidencia/noticias/noticia_visualiza.php?id_noticia=169&id_pagina=1>. Visited on March 27th, 2009.*

[69] *Available at: < http://www.reporterbrasil.org.br/exibe.php?id=553 >. Last visit on April 23th, 2009.*

3 Monitoring:

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

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

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

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

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

The monitoring will be done with the aim of determining the most approximate quantity of non-renewable wood that, in the absence of the project, would be used in the ceramic' kilns and consequently, the amount of GHG that would be emitted in tonnes of CO_2e. The following table shows the frequency of the monitoring of each parameter.

Table 11. Data reported in monitoring estimation

Parameters	Description	Units	Origin	Frequency
Qrenbiomass	Amount of renewable biomass	Tons	It is calculated through the receipts and invoices describing the weight of each renewable biomass	Monthly
Origin of Renewable Biomass	Renewable origin of the biomass	Not applicable	Controlled by the ceramic owner	Annually
PRy	Production of ceramic pieces	Units	It is achieved through a sheet that is daily fed by an operator inside of the ceramic company that counts the total of pieces produced in the machine that gives form to the ceramic blocks. In the case of absence of these documents, the production will be evidenced through the financial transactions of the ceramic company	Monthly
Renewable Biomass Surplus	Amount of renewable biomass available	Tons or m^3	Monitored by articles and database, which are described at leakage section,	Annually

			at section 4.1.	
Leakage of Non-Renewable Biomass	Leakage resulted from the non-renewable biomasses	tCO_2e	Monitored by articles and database, which are described at leakage section, at section 4.1.	Annually
EFprojected fossil fuel	CO_2 Emission factor of residual fuel oil	tCO_2/TJ	IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Source: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf>. Page 2.18. Table 2.3.	Not monitored
NCVbiomass	Net Calorific Value of non-renewable biomass	TJ/tonne of Wood	Bibliography, described in respective table at section 3.3.	Not monitored
ρbiomass	Specific gravity of non-renewable biomass	Tonne/m^3	Bibliography, described in respective table at section 3.3.	Not monitored
***f*NRB,y**	Fraction of biomass (wood) used in the absence of the project activity in year y can be established as non-renewable biomass using survey methods	Percentage	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>. Other bibliographies utilized are described in respective table at section 3.3.	Annually
BFy	Consumption of non-renewable biomass per thousand of ceramic pieces produced	tons/ thousand of ceramic pieces	Data from ceramic owner	Not monitored

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

$$\mathbf{By = PRy \times BFy}$$

Where:

PRy = Number of ceramic pieces produced per month;

BFy = Tons of wood per thousand of pieces produced.

The exactly production (PRy) will be monitored by an internal control of the ceramic. A production sheet is daily fed by an operator inside of the ceramic company, which counts the total of pieces produced in the machine that gives form to the ceramic blocks. In the case of absence of these documents, the production will be evidenced through the financial transactions of the ceramic company.

The value of BFy was determined through historical consumption of non-renewable biomass by the ceramic. It was calculated by dividing the monthly consumption at the baseline from the monthly production at the baseline, in thousands.

The responsible to monitor data provided in table 11 will be Mrs. *Roberta Joana dos Santos.* Internal audit will guarantee data quality. It will be realized by Mr. *Rodolpho Cunha Neto,* Director of *Buenos Aires* ceramic.

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

Monitored Parameters

<table>
<tr><td>Data / Parameter:</td><td>$Q_{renbiomass}$</td></tr>
<tr><td>Data unit:</td><td>tons per month</td></tr>
<tr><td>Description:</td><td>Amount of renewable biomass utilized</td></tr>
<tr><td>Source of data to be used:</td><td>Measured by the ceramic owner</td></tr>
<tr><td>Value of Data applied for the purpose of calculating expected emission reductions:</td><td>
<table>
<tr><th>Biomass</th><th>Glycerin</th><th>Native wood with sustainable management plan</th></tr>
<tr><td>$Q_{renbiomass}$</td><td>134</td><td>244</td></tr>
</table>
</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>
The amount of renewable biomass will be monitored in accordance to the weight described in the receipts or invoices from the providers.

It will be utilized the Specific Gravity in order to convert from m^3 to ton through the specific gravity of each biomass. The specific gravity values of the renewable biomasses utilized in this project are:
<table>
<tr><th>Biomass</th><th>Glycerin</th><th>Native wood with sustainable management plan</th></tr>
<tr><td>Specific gravity (tons/m^3)</td><td>1.1900</td><td>0.8072</td></tr>
</table>
Source:

<u>- Native wood with sustainable forest management plan</u>

NASCIMENTO, W. S. A. Avaliação dos Impactos Ambientais Gerados Por Uma Indústria Cerâmica Típica da Região do Seridó/RN; Dissertação (Mestrado em Engenharia Mecânica), Universidade Federal do Rio Grande do Norte, Natal, 2007. Available at: <http://bdtd.bczm.ufrn.br/tedesimplificado//tde_busca/arqui
</td></tr>
</table>

	vo.php?codArquivo=1239>. Last visit on: July 04th, 2009. LORENZI, H. **Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil**, vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002. LORENZI, H. **Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil**, vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002. Associação de Plantas do Nordeste. Projeto Madeira. Available at: <http://www.plantasdonordeste.org/madeiras.pdf>. - Glycerin PIRES, L.F. **Uso da energia nuclear para fins pacíficos: medidas de densidade, umidade e comprimento de materiais usando radiação gama.** Ponta Grossa, PR. Available at: http://revista.cefet-al.br/index.php/edutec/article/viewFile/8/2 Last visit on November 25th, 2009.
QA/QC procedures to be applied:	It will be rechecked according to the receipts of purchase.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	**PRy**
Data unit:	Unity of ceramic pieces per month
Description:	Production of ceramic pieces
Source of data to be used:	Controlled by the ceramic owner
Value of Data applied for the purpose of calculating expected emission reductions:	Approximately 3,524,197
Description of measurement methods and procedures to be applied:	The measurement will be done by an internal control sheet monitored by the ceramic owner, which will be fed daily. The production will preferentially be monitored through a sheet that is daily fed by an operator inside of the ceramic company that counts the total of pieces produced in the machine that gives form at the ceramic blocks. In the case of absence of these documents, the production will be evidenced through the financial transactions of the ceramic company.
QA/QC procedures to be applied:	The ceramic has an internal control of the quantity of pieces produced. It will be rechecked according to the biomasses utilized and the kiln consumption of renewable biomass.
Any comment:	The production stated above is an average of the pieces produced from August, 2007 to July, 2008. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	**Origin of Renewable Biomass**
Data unit:	Not applicable
Description:	Renewable origin of the biomass
Source of data to be used:	Controlled by the ceramic owner
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 (native wood with sustainable management plan, glycerin, coconut fiber, *Eucalyptus* wood, cashew tree pruning, wood residues, sugar cane briquette, *Algaroba* wood, and elephant grass) are considered renewable as fulfilling the options described in the methodology applied.
QA/QC procedures to be applied :	The biomasses will be considered as renewable if they are according to the definition given by the methodology applied. Furthermore, documents proving the origin of renewable biomasses from forested resources will be provided.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	**Leakage of non-renewable biomass**
Data unit:	tCO_2e
Description:	Leakage resulted from the non-renewable biomass
Source of data to be used:	Monitored
Value of Data 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.

<table>
<tr><td>Data / Parameter:</td><td>Renewable biomass surplus</td></tr>
<tr><td>Data unit:</td><td>ton or m³</td></tr>
<tr><td>Description:</td><td>Amount of renewable biomass available</td></tr>
<tr><td>Source of data to be used:</td><td>Monitored</td></tr>
<tr><td>Value of Data 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>Native wood with sustainable management plan (m³)</td><td>519,558</td><td>2007</td></tr>
<tr><td>Algaroba wood (m³)</td><td>2,500,000</td><td>2007</td></tr>
<tr><td>Coconut fiber (tons)</td><td>301,500</td><td>2007</td></tr>
<tr><td>Sugar cane briquette (tons)</td><td>2,500,396</td><td>2007</td></tr>
<tr><td>Cashew tree pruning (tons)</td><td>82,875</td><td>2007</td></tr>
<tr><td>Wood residues: sawdust (m³)</td><td>2,917,055</td><td>2007</td></tr>
<tr><td>Eucalyptus wood (m³)</td><td>13,259,341</td><td>2007</td></tr>
<tr><td>Glycerin (m³)</td><td>129,370</td><td>2008</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 methodology applied will be monitored. The measurement of the leakage will be based in national and international articles and databases every monitoring period. These sources will provide information about the biomass availability in the project activity’s region.</td></tr>
<tr><td>QA/QC procedures to be applied :</td><td>Data available regarding the ceramic industry fuel consumption will be utilized to monitor the leakage.</td></tr>
<tr><td>Any comment:</td><td>Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.</td></tr>
</table>

Data / Parameter:	***f*NRB,y**
Data unit:	Fraction of biomass or (percentage).
Description:	Fraction of biomass (wood) used in the absence of the project activity in year y established as non-renewable biomass using survey methods. It was also discounted the amount of wood saved by similar projects in the same biome.
Source of data used:	Survey methods
Value of Data applied for the purpose of calculating expected	0.996 or 99.6%

emission reductions:	
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)[70], the *Caatinga* Biome has only 0.11% of its total area with sustainable use. According to a research made by Brazilian Environmental Ministry, there are around $20m^3$ of wood per hectare in *Caatinga* biome[71]. Thus, the amount of non-renewable wood available at *Caatinga* biome is around $1,471,979m^3$. It was made two sheets in order to calculate the amount of wood consumed. The first one encompasses the amount of wood consumed by the ceramics located at the *Caatinga* biome. The other sheet calculates the amount of wood consumed regarding only *Buenos Aires* Ceramic. Dividing these values by the total of wood available, it was achieved the amount of renewable biomass that has been saved by all the project activities, or only by *Buenos Aires* project, respectively.[72] Afterwards, summing each value with the Sustainable use areas defined by Klink (2005), it was acquired two fraction of renewable biomass. Finally, each value was subtracted from 100% to achieve the $f_{NRB,y}$. Therefore, it was taken the smaller value in order to be more conservative. These sheets are available at the VCU Estimative spreadsheet.
QA/QC procedures to be applied :	The monitoring of this parameter will be based in national and international articles and database. The source provided information about the sustainable use of *Caatinga* biome. Wood saved from projects with same biome and applied methodology developed by *Carbono Social Serviços Ambientais LTDA* was considered in this fraction. CDM or VCS registered projects will also be included in this fraction if placed in the same region and methodology.
Any comment:	It will be utilized 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.

[70] *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 on: April 9th, 2009.*

[71] *Source: Brazilian Environment Ministry, Normative Instruction nº 6 of 2006. Available at: <http://www.carvaomineral.com.br/abcm/meioambiente/legislacoes/bd_carboniferas/geral/in_06-2006_mma_n.pdf>. Last visit on: August 12nd, 2009.*

[72] *According to data from project activities at Social Carbon Company.*

Fixed Parameters

Data / Parameter:	**EF_{CO2}**
Data unit:	tCO_2/TJ
Description:	CO_2 Emission factor of residual fuel oil
Source of data to be used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Available at: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf>. Page 2.18. Table 2.3. Last visit on : April 9th, 2009.
Value of Data applied for the purpose of calculating expected emission reductions:	77.4 tCO_2/TJ
Description of measurement methods and procedures to be 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.
QA/QC procedures to be applied :	The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel.
Any comment:	Applicable for stationary combustion in the manufacturing industries and construction.

Data / Parameter:	**$NCV_{biomass}$**
Data unit:	TJ/tonne of wood
Description:	Net Calorific Value
Source of data to be used:	Brazilian study carried out with *Caatinga* wood utilized at the ceramic sector: NASCIMENTO, W. S. A. Avaliação dos Impactos Ambientais Gerados Por Uma Indústria Cerâmica Típica da Região do Seridó/RN; Dissertação (Mestrado em Engenharia Mecânica), Universidade Federal do Rio Grande do Norte, Natal, 2007. Available at: <http://bdtd.bczm.ufrn.br/tedesimplificado//tde_busca/arquivo.php?codArquivo=1239>. Last visit on: July 04th, 2009.
Value of Data applied for the purpose of calculating expected emission reductions:	0.0159
Description of measurement methods and procedures to be applied:	This value will provide the energy generated by the amount of wood that would be used in the absence of the project. The species used to calculate the average value are typical trees of *Caatinga* Biome that are usually utilized 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).

QA/QC procedures to be applied :	It was included species that are usually employed as fuel from *Caatinga* Biome in the ceramic sector according to "NASCIMENTO, W. S. A." These species present such good characteristics in order to be applied as fuel in the ceramic kilns.
Any comment:	

Data / Parameter:	$\rho_{biomass}$
Data unit:	tonne/m³
Description:	Specific gravity of non-renewable wood
Source of data to be used:	Brazilian study carried out with *Caatinga* wood utilized at the ceramic sector: NASCIMENTO, W. S. A. **Avaliação dos Impactos Ambientais Gerados Por Uma Indústria Cerâmica Típica da Região do Seridó/RN**; Dissertação (Mestrado em Engenharia Mecânica), Universidade Federal do Rio Grande do Norte, Natal, 2007. Available at: <http://bdtd.bczm.ufrn.br/tedesimplificado//tde_busca/arquivo.php?codArquivo=1239>. Last visit on: July 04th, 2009. LORENZI, H. **Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil**, vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002. LORENZI, H. **Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil**, vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002. Associação de Plantas do Nordeste. Projeto Madeira. Available at: <http://www.plantasdonordeste.org/madeiras.pdf>.
Value of Data applied for the purpose of calculating expected emission reductions:	0.8072
Description of measurement methods and procedures to be applied:	The amount of wood used in the baseline was measured by volume units, so this data is used to the unity conversion. The species used to calculate the average value are typical trees of *Caatinga* Biome that are usually employed as fuel in the ceramic industries of the region.
QA/QC procedures to be applied :	It was included species that are usually employed as fuel from *Caatinga* Biome in the ceramic sector according to "NASCIMENTO, W. S. A." These species present such good characteristics in order to be applied as fuel in the ceramic kilns.
Any comment:	

Data / Parameter:	**BFy**
Data unit:	Tons of wood per thousand of pieces
Description:	Consumption of non renewable biomass per thousand of ceramic pieces produced in year y
Source of data to be used:	Historical data from ceramic owner
Value of Data applied for the purpose	0.7904

of calculating expected emission reductions:	
Description of measurement methods and procedures to be applied:	The value was acquired through the average consumption and production of ceramic pieces during the years when the ceramic used to consume non-sustainable wood. This value is in accordance with the data acquired in other ceramics that utilize the same type of kiln in the region. If nowadays *Buenos Aires* ceramic still used native firewood, its consumption would be around 2.785.5 tons of native firewood (or 3,451.08 m^3) per month to produce 3,524,197 ceramic pieces. The value is utilized to calculate the real amount of wood displaced to maintain the ceramic production in the baseline scenario.
QA/QC procedures to be applied :	These values lead to an efficiency of 0.7904 tons of native wood to produce a thousand of ceramic pieces at *Buenos Aires* ceramic. *Buenos Aires* ceramic's kilns are less efficient than average for a "Hoffman" kiln. This value is discrepant because of the lack of technology in the region, and the indiscriminate use of the native wood without sustainable forest management.
Any comment:	In order to determine the baseline production of *Buenos Aires* ceramic (from August, 2007 to July, 2008), the production was calculated according to the financial transactions of the ceramic.

3.4 Description of the monitoring plan

The party responsible for implementing the monitoring plan will be the owner of *Buenos Aires* Ceramic. The ceramic owner 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. *Roberta Joana dos Santos,* by *Buenos Aires* 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.

With the carbon credits income, in order to complement the monitoring of the production of ceramic pieces, equipments from *Alutal* will monitor each burning cycle of the 3 kilns through graphics of the temperature reached in the kiln versus time.

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

In addition, the Social Carbon Reports will be available at: Markit Registry (http://www.markitenvironmental.com/registryview.php?pg=prj) 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.

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 non-renewable biomass (wood) used in the absence of the project activity in year y

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

$EF_{projected\ fossil\ fuel}$: Emission factor for the projected fossil fuel consumption in the baseline in tCO_2e/TJ[73].

B_y is determined using the following option: calculated through the product of the number of appliances multiplied by the estimate of average annual consumption of biomass per appliance.

$$B_y = PR_y \times BF_y \quad \text{(Equation 02)}$$

Where:

PRy = Number of ceramic pieces produced per month;

BFy = Tons of wood per thousand of pieces produced.

The exactly production (PRy) will be monitored by the financial transactions of the ceramic.

The value of BFy was determined through historical consumption of non-renewable biomass by each ceramic. It was calculated by dividing the monthly consumption at the baseline from the monthly production at the baseline, in thousands.

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

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

Categories, which identifies different emission sources based on the type of biomass considered (described in the table 12).

Table 12. Sources of leakage according to the type of the biomass.

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

Observing the table above, the sources of leakage of the present project activity are the competing use of biomass for biomass residues or waste and the emissions from biomass generation/cultivation in case of biomass from cropland. The source of leakage of the present project is showed below according to each type of biomass:

Native wood with sustainable forest management plan

The sustainable forest management plan can be organized into three stages: firstly, the division of the property in exploitable areas and areas of permanent preservation that are inaccessible to exploitation. The second stage is the planning of roads that connect the area with the primary roads. In the third stage, the allocated area is divided for exploration in blocks in order to sustain forest exploitation annually[74].

Afterwards, a technical responsible elaborates the next stages: forest inventory, estimation of growth, the best intervention techniques, fixes the arrangement of exploration and the silvicultural treatment. An annual technical report of the sustainable forest management area is elaborated and it is necessary a yearly authorization of the environmental agency of the state to keep the activities. Furthermore, the minimum requirements of the

[74] *Plano de Manejo Florestal (Forest Management Plan). Available at: <http://www.manejoflorestal.org/guia/pdf/guia_cap1.pdf>. Last visit on: April 22nd, 2009.*

management plan are defined by Articles 19, 20 and 21 of Brazilian Forest Code, and are regulated by Decree 5975/06.[75]

The total area properly regularized with sustainable forest management plan in the *Caatinga* biome corresponds to 94,287 hectares. There are around 189 sustainable forest management plans operating in this biome[76].

Considering that around 5.7% of a sustainable forest management plan can be explored per year (exploration in blocks in order to sustain forest exploitation annually)[77], the area available for exploration is around 5,374 ha per year in *Caatinga* biome. In addition, it was considered the productivity of wood in *Caatinga* biome as 96.68 m^3/ha[78]. Therefore, the production of wood with sustainable forest management plan in *Caatinga* biome was around 519,558 m^3 in 2007.

As *Buenos Aires* ceramic consumption presented in this project activity is around 2,928 tons (or 3,627 m^3) per year, the consumption of this kind of fuel represents less that 1% of the total of wood with sustainable forest management plan produced in the region.

The sustainable forest management promotes the conservation of biodiversity, conservation of soil and water regime, which are essential practices to combat the desertification. Moreover, there is an increment at the opportunity of employment for the rural population due to the sustainable exploration of plants destined for fruits, apiculture, medicinal, oil, ornamental and fiber production purposes[79].

Sugar Cane Briquette

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. Each plant produces around 1.5 million tons of cane yearly[80]. One ton of sugar cane produces about 140 kilograms of cane bagasse and finally 90% of this amount can be used to energy production, either in natura or compacted into briquettes[81].

According to the table 13, the state of Pernambuco presents a great amount of sugar cane bagasse, i.e. the ceramics have enough availability of this kind of biomass, what avoid the possibility of leakage generation in case of the sugar cane utilization as fuel source.

[75] *BRASIL. Lei nº. 4.771, de 15 de setembro de 1965. Código Florestal.* ***Diário Oficial [da] República Federativa do Brasil****, Brasília, DF, 16 de set. 1965. Available at: <http://www.planalto.gov.br/ccivil_03/LEIS/L4771.htm>. Last visit on: April 22nd, 2009.*

[76] *CNIP, 2007. Source: < http://www.cnip.org.br/planos_manejo.html>. Last visit on: April 29th, 2009.*

[77] *BRASIL. Manejo sustentável dos recursos florestais da Caatinga/MMA. Secretaria de Biodiversidade e Florestas. Departamento de Florestas. Programa Nacional de Florestas. Unidade de Apoio do PNF no Nordeste._Natal: MMA, 2008. 28p.*

[78] *Adapted from: BRASIL. Estatística Florestal da Caatinga/MMA. Ano 1. Vol. 1 (ago. 2008). Natal, RN: APNE, 2008. 136p.*

[79] *BRASIL. Manejo sustentável dos recursos florestais da Caatinga/MMA. Secretaria de Biodiversidade e Florestas. Departamento de Florestas. Programa Nacional de Florestas. Unidade de Apoio do PNF no Nordeste._Natal: MMA, 2008. 28p.*

[80] *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 on: April 9th, 2009.*

[81] *Source: Centro de Gestão e Estudos Estratégicos (CGEE), 2001. Available at: <www.cgee.org.br/arquivos/estudo003_02.pdf>. Last visit on: April 9th, 2009.*

Table 13. Production of Sugar Cane in the State of Pernambuco

Harvest	04/05	05/06	06/07	07/08
Production of Sugar Cane (in tonnes)	16,684,867	13,858,319	15,293,700	19,844,415
Sugar Cane Bagasse (in tonnes)	2,335,881	1,940,165	2,141,118	2,778,218

Source: http://www.unica.com.br/downloads/estatisticas/processcanabrasil.xls

Sugar cane bagasse is also employed for cogeneration systems. However, figure 7 presents the excess of energy in Brazil from sugar cane bagasse. Please observe that the State of Pernambuco (PE) presents a large surplus of this biomass.

Pernambuco state is marked by the monoculture of sugar cane, using much of the labor-place. The ceramics may be supplied easily with sugar cane briquette, due to its availability at the local market.

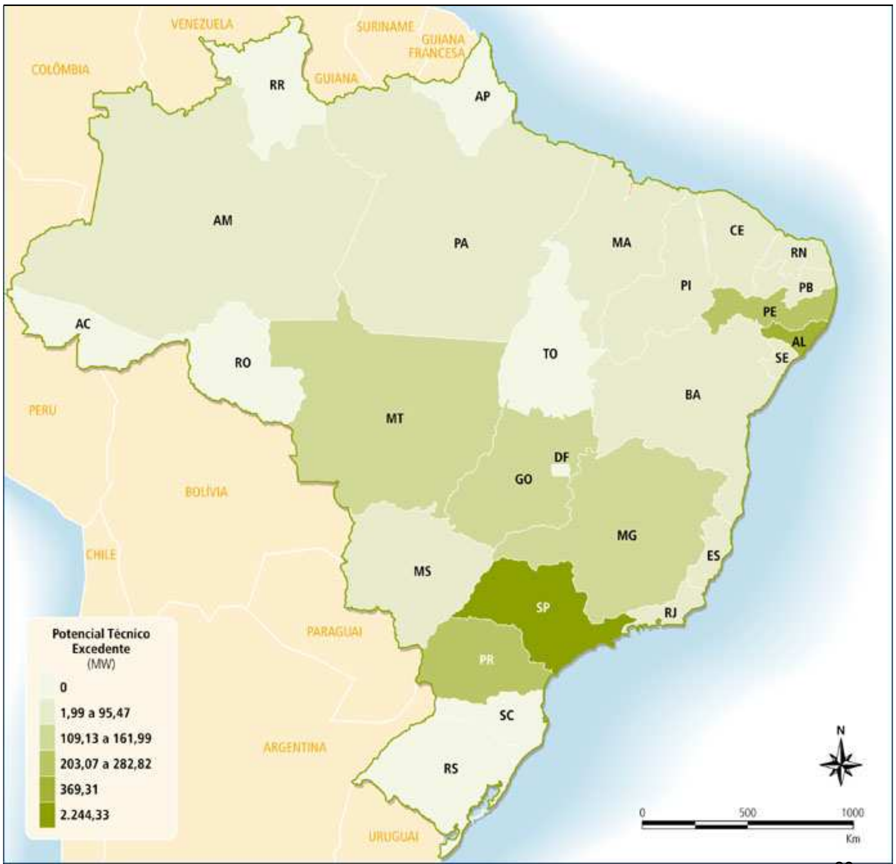

Figure 7. Sugar Cane Residue Potential for Energy Generation[82]

This project activity would be responsible for the consumption of around 7,055 tonnes per year, or around 0.3% of the total production of bagasse from sugar cane[83]. Thus, the amount of residues from sugar cane necessary to provide thermal energy in the ceramics' kilns would not be significant, which avoids the possibility of leakage.

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

[83] *Considering a generation of 2,500,396 tons of sugar cane bagasse on 07/08 that can be used to energy production.*

Algaroba wood

According to Silva (2007)[84], *Algaroba*[85] (Prosopis juliflora) is a tropical legume tree fairly common in the semi-arid region of Brazil, which thrives in dry environments where other plants would hardly survive.

At the beginning of 40's, this specie was introduced in the Northeast region of Brazil with the aim of providing food to animals and to be utilized for reforestation actions. However, currently, due to its competitive skills, *Algaroba* has spread through several regions of Brazilian semi-arid areas[86].

A research made by EMBRAPA[87], which encompass the States of Pernambuco and Bahia, affirmed that *Algaroba* is characterized as an invasive exotic plant due to its fast expansion, which causes many environmental impacts[88]. This source stated that there were several centers of *Algaroba* operation highlighting the San Francisco Basin, which is comprised for many municipalities from the states of Bahia and Pernambuco, including this project region. Besides, *Algaroba* presents a considerable capacity of regeneration and dispersal[89], which means that the plant does not die, it sprouts again stead.

The research's author reported that wood from *Algaroba* exploration on San Francisco Basin is mainly commercialized as fuel for industries of vegetable oil, leather, ceramic and bakeries. On the other hand, *Algaroba* wood is not sold for stake[90], pegs and poles uses.

The factors which contribute most to the expansion of *Algaroba* uses, as firewood in these industries sectors, were its wide availability in the region and its legal release extraction from IBAMA[91].

Furthermore, this research showed that *Algaroba* is not used as a unique source of fuel for thermal energy generation in these industries sectors, e.g. corresponding only for 30% of the fuel's source in bakeries of the region studied.

The same research estimated that in the Northeast semi-arid region there were about 500 thousands hectares spread through every type of its region land. Moreover, according to EMBRAPA (1992)[92], wood's production by *Algaroba*

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[84] *SILVA, C. G. M, MELO FILHO, A. B., PIRES, E. F., STAMFORD M. Physicochemical and microbiological characterization of mesquite flour (Prosopis juliflora (Sw.) DC).* ***Ciênc. Tecnol. Aliment.****, Campinas, 27(4): 733-736, out.-dez. 2007.*

[85] *Algaroba may also be known as mesquite.*

[86] *EMBRAPA, Projeto vai definir manejo para evitar invasão da Algaroba no ambiente semi-árido. Avaliable at: <http://www.embrapa.gov.br/imprensa/noticias/2002/agosto/bn.2004-11-25.4648301041/>. Last visit on: April 28th, 2009.*

[87] *EMBRAPA is the Brazilian Agricultural Research Corporation's which its mission is to provide feasible solutions for the sustainable development of Brazilian agribusiness through knowledge and technology generation and transfer.*

[88] *ARAUJO, J. L. P., CORREIA, R. C., ARAUJO, E. P., LIMA, P. C. F.* ***Cadeia Produtiva da Algaroba no Pólo de Produção da Bacia do Submédio São Francisco.*** *EMBRAPA. Petrolina - PE – Brazil.*

[89] *EMBRAPA, Projeto vai definir manejo para evitar invasão da Algaroba no ambiente semi-árido. Avaliable at: <http://www.embrapa.gov.br/imprensa/noticias/2002/agosto/bn.2004-11-25.4648301041/>. Last visit on: April 28th, 2009.*

[90] *Heavy pole to which cattle is tied.*

[91] *IBAMA (Brazilian Institute for Environment and the Renewable Natural Resource) is the environmental agency of Brazil affiliated with Ministry of Environment. The main missions of IBAMA are: Environmental Protection, Environmental Licensing, Environmental Quality and Sustainable Use of Forest Management and Animal Resources. More information about IBAMA is available at: <www.ibama.gov.br >.*

[92] *EMBRAPA, Comunicado Técnico Nº, Nov/92, p.1-2. Available at: <http://www.cpatsa.embrapa.br/public_eletronica/downloads/COT51.pdf>. Last visit on: April 28th, 2009.*

is at least 5 m^3/ha/year, i.e. the production in the project's region is about 2,500 thousands of m^3 per year, what represents less than 1% of the total of *Algaroba* wood utilized per year, as *Buenos Aires* Ceramic would consume approximately 3,120 m^3 of *Algaroba* wood per year.[93]

Therefore, this kind of fuel does not encompass any type of leakage since there is currently a great amount of these renewable biomasses available locally as described before.

Cashew tree pruning

The cashews cultivation is extremely important to Brazilian economy, where it is responsible for generate 150 million dollars per year. The cashew production is important especially in the northeast region, representing about 95% of Brazilian´s cashew production. Besides, cashew production is responsible for generating job opportunities for 35,000 fieldworkers, 15,000 in the manufacturing process and 200,000 indirect job opportunities[94]. The Brazilian production achieved 143,000 tons of cashew-nuts in 2005 spread in an area of 650,000 Hectares. Besides, Brazilian´s production presents the tendency of increasing so far, carried by the new technologies utilized and the higher national and international demand of cashew nuts[95]. This way, the Brazilian sources of residues from cashew trees will increase following the Brazilian production, due the fact that cashew cultivation request continuous cut of cashew trees. The cut of cashew trees is necessary in order to allow an appropriate formation of the tree and maintaining favorable conditions for the next harvest time. This way, in cashew cultivation must be cut undesirable branches of the cashew trees[96]. Moreover, dry branches on the ground compound a considerable amount of residues from cashew trees cultivation.

There is no estimated amount of residues from cashew trees, however its abundant availability is well-known all over the country. Besides, in order to destine the great amount of residues from cashew trees, the Brazilian´s government allowed the utilization of this residue as firewood.

According to "Plantio do Caju" cashew trees cultivation presents a density of 51 units of trees per hectare[97], and the production of firewood residues from each tree is 2.5 kg per year[98]. The cultivation of cashew is located in an area of 650,000 hectares. This way, the Brazilian production of residues from cashew trees is around 82,875 tonnes per year. According with other ceramic industry that utilizes this fuel,[99] this project activity would be

[93] *According to Barro Forte Ceramic (Tacaimbó – PE), which utilizes around 100 m^3 per month to maintain a 2.6 lesser production. It was considered the specific gravity of Algaroba wood 0.76 ton/m^3, according to: Pereira J. C. D., Lima P. C. F. Comparação da Qualidade da Madeira de Seis Espécies de Algarobeira para a Produção de Energia. Bol. Pesq. Fl., Colombo, n. 45, jul/dez. 2002 p. 99-109*

[94] *According with EMBRAPA (Brazilian Agricultural Research Corporation's). Available at: <http://sistemasdeproducao.cnptia.embrapa.br/FontesHTML/Caju/CultivodoCajueiro/index.htm>. Last visit on: April 28th, 2009.*

[95] *Available at: <http://www.nordesterural.com.br/nordesterural/matLerdest.asp?newsId=2219>. Last visit on: April 28th, 2009.*

[96] *According with EMBRAPA (Brazilian Agricultural Research Corporation's). Available at: <http://sistemasdeproducao.cnptia.embrapa.br/FontesHTML/Caju/CultivodoCajueiro/tratosculturais.htm>. Last visit on: April 28th, 2009.*

[97] *According with "Resposta Técnica" from CETEC (Technologic Center of Minas Gerais) considering a space of 10 meters from each tree. Available at: <http://sbrtv1.ibict.br/upload/sbrt4555.pdf?PHPSESSID=76a9111889defa6787039ca56b380c58>. Last visit on: April 28th, 2009.*

[98] *According with "Manual de Aplicação de sistemas descentralizados de Geração de Energia elétrica para projetos de Eletrificação rural" Available at: <http://www.cepel.br/~per/download/rer/rt-789-00.pdf>.*

[99] *According with J. L. Silva ceramic, which utilizes around 150 tons of cashew tree pruning per month in order to produce ¾ of Buenos Aires production.*

responsible for the consumption of around 2,400 tons per year, or around 3% of the total production of residues from cashew trees. Thus, the amount of residues from cashew trees necessary to provide thermal energy in the ceramics' kilns would not be significant, which avoids the possibility of leakage.

Eucalyptus wood

The area destined for afforestation in Brazil corresponds to 5.6 millions of hectares, where the *Eucalyptus* genus corresponds to 3.5 millions of this area, and can generate 23 to 25 tonnes of biomass per hectare[100]. The grand major of these cultivations were established in the middle of 1970 to 1980. The *Eucalyptus* and *Pinus* genuses correspond to 80% of the afforestation in Brazil.

In addition, sustainable management practices of the afforestation in Brazil (as the techniques of preparation, fertilization, control of weeds, improved seeds, cloning and reform) were introduced and constantly improved in order to increase its productivity[101]. As a consequence, Brazil withholds the best productivity taxes (in m^3/ha/year) over the world due to the adaptation of these species to the Brazilian territory and the success of the experiments of genetic improvement[102].

The production of wood from afforestation in the state of *Bahia*, which is a bordering state in the northeast region of Brazil, was of 13,259,341 m^3[103] in 2007. According with other ceramic industry that utilize this biomass,[104] the consumption of this kind of fuel by *Buenos Aires* Ceramic would be around 1,560 m^3 per year, what would represent around 0.01% of the total of *Eucalyptus* wood produced in the region.

Sawdust

The production of wood generates a large amount of residues, which can be reused to generate thermal energy, considering that around 22% of the wood produced will generate sawdust[105]. The production of wood in the state of Pernambuco was 13,259,341 m^3[106] in 2007. Thus, the production of sawdust was 2,917,055 m^3 per year.

According to other ceramic industry that utilize this fuel,[107] *Buenos Aires* ceramic would utilize 13,080 m^3 per year, i.e. the ceramic would utilize less than 1% of the biomass availability in the state of Bahia. This way, this renewable biomass does not have potential to generate leakage emissions due to its high availability.

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[100] *Available at: <http://www.agencia.fapesp.br/materia/9405/especiais/eucalipto-no-pareo.htm>. Last visit on: September 8th, 2009.*

[101] *MCT/IPEF. **Silvicultura e Manejo.** Source: <http://www.ipef.br/mct/MCT_03.htm>. Last visit on: April 9th, 2009.*

[102] *JUVENAL, T. L.; MATTOS, R. L. G. **O setor florestal no Brasil e a importância do reflorestamento.** BNDES Setorial, Rio de Janeiro, n. 16, p. 3-30, set. 2002. Available at: <http://www.bndes.gov.br/conhecimento/bnset/set1601.pdf>. Last visit on: January 22nd, 2009.*

[103] *According to IBGE (Geographic and Statistic* Brazilian *Institute). Available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=ba&tema=extracaovegetal2007>. Last visit on: April 9th, 2009.*

[104] *According with Bom Jesus Ceramic, which utilizes around 78 m^3 of Eucalyptus wood per month in order to produce 60% of Buenos Aires production.*

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

[106] *Available at: <http://www.ibge.gov.br/estadosat/temas.php?sigla=pe&tema=extracaovegetal2007>. Last visit on May 5th, 2009.*

[107] *According with Bandeira Ceramic, which utilizes around 545 m^3 of sawdust per month in order to produce 50% of Buenos Aires production.*

As can be observed in the figure below, the potential of energy generation in the state of *Bahia* is considered high, which means that there is an enormous availability of this kind of fuel to be employed in the project activity.

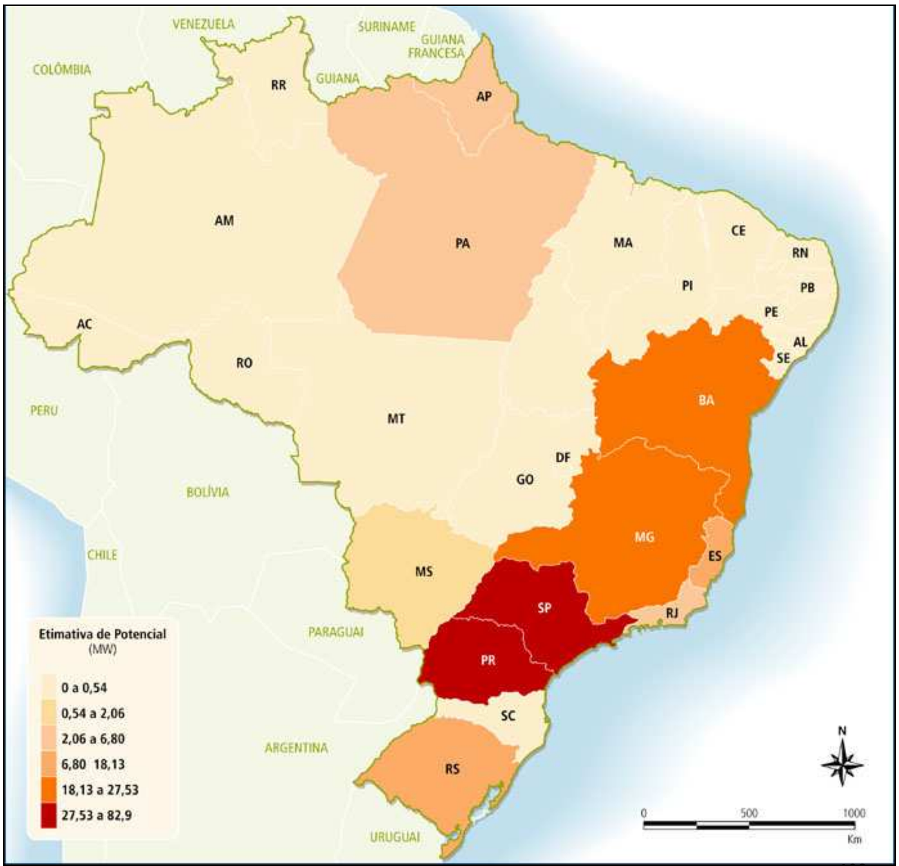

Figure 8. Woody Residues Potential for Energy Generation[108]

Coconut fiber

The coconut has several uses, which briefly is used for aliment, water, fiber among others. Coconut fiber is produced from coconut husk, which is a common residue at northeast region of Brazil, reaching 6.7 millions tonnes of coconut husk annually[109]. To produce coconut fiber, it is utilized some equipments in order to crush, press and segregate fiber and power.

Considering the residue generation stated above, and that only 4.5% of the coconut husk is converted into coconut fiber[110], thus, the northeast coconut fiber generation is around 301,500 tons yearly.

This project activity would be responsible for the consumption of around 1,713 tons of coconut fiber per year,[111] or around 0.6% of the coconut fiber availability. Therefore, this biomass is widely available in the region,

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

[109] *Source: <www.sbpcnet.org.br/livro/60ra/textos/SI-GoreteMacedo.pdf>. Last visit on: April 9th, 2009.*

[110] *ROSA, M. F.* ***Beneficiamento da casca de coco verde****. EMBRAPA. Available at: <http://www.cnpat.embrapa.br/home/portfolio/tecnologia.php?id=10>. Last visit on: June 4th, 2009.*

[111] *According to CGM Ceramic, located at Crato – CE, which utilizes around 60 tons of coconut husk per month to maintain a 2.38 times lesser production.*

once its use for generate thermal energy may be a solution for the solid waste disposal in these cities.

Glycerin

The glycerin is a residue generated at the biodiesel process, which is named transesterification.[112] As the production of biodiesel is growing in Brazil, the offering of glycerin is also growing.[113]

A study carried out by *Universidade Federal do Rio de Janeiro* states that for 90 m³ of biodiesel, it is generated 10 m³ of glycerin.[114] As the Brazilian production of biodiesel in 2008 was 1,164,332 m³,[115] the amount of glycerin generated was 129,370 m³.

This project activity is responsible for the consumption of around 1,351 m³ of glycerin. Thus, the project activity would utilize around 1% of biomass availability, which avoids the possibility of leakage.

Elephant grass

In case of using elephant grass[116] 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[117] 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)[118]. 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.

Moreover, studies of drying elephant grass in order to employ it as fuel are being done and there are possibilities of start using this as renewable biomass in the project. Elephant grass has an excellent net calorific value when it is dried, although its drying process is still a problem for the project proponents.

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

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[112] *AUTH, et. al;* ***Estudo e preparação do biodiesel.****UNIVATES – Centro Universitário; Programa de Pós-graduação em Ensino de Ciências Exatas. Available at: http://www.univates.br/ppgece/docs/PT_Eniz1.pdf. Last visit on: September 23rd, 2009.*

[113] *MELLLO et al.* ***Visões Ambientais para o Financiamento de Biocombustíveis no Brasil.*** *Departamento de Meio Ambiente do BNDES. Available at: http://www.conservacao.org/publicacoes/files/15_Finaciamento_Biocombust_BNDES.pdf. last visit on September 23rd, 2009.*

[114] *GONÇALVES, et. al. Universidade Federal do Rio de Janeiro – Instituto de Química. Biogasolina:* ***Produção de Éteres e Ésteres da Glicerina****. Rio de Janeiro,*

[115] *SÃO PAULO, Estado - Instituto de Economia Agrícola.* ***Desempenho da Produção Brasileira de Biodiesel em 2008.*** *Avaiable at: http://www.iea.sp.gov.br/out/verTexto.php?codTexto=10115. Last visit on: September 24th, 2009.*

[116] *An African grass mostly used to feed cattle which its fast growing can promote four harvests per year. It was verified, after many studies, that the Elephant Grass when dried is a great source of biomass that can be used to energy generation purposes.*

[117] *Source: <www.mwglobal.org/ipsbrasil.net/nota.php?idnews=3292>. Last visit on: April 9th, 2009.*

[118] *Source: <www.cnpgl.embrapa.br/nova/informacoes/pastprod/textos/17Instrucao.pdf>. Last visit on: April 9th, 2009.*

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

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

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

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

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

To ensure that the project activity at *Buenos Aires* Ceramic will not cause the type of leakage described in item B, *Carbono Social Serviços Ambientais LTDA* made a research about the ceramics industries in the state of *Pernambuco*, and the result was that there are around 150 ceramic facilities in the state, nevertheless around 90% use native wood without sustainable management[119]. Furthermore, there are many studies regarding the consumption of non-renewable native wood at the ceramic industries[120]. Therefore, it can be concluded that the wood which was avoided by the present project activity is not being used by other ceramists.

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

With the implementation of the project activity, the ceramics will avoid the consumption of about 41,410 m³ per year of non-renewable wood, helping the conservation of forests in *Caatinga* biome, besides the ecological and social benefits to the region.

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

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

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[119] Programa de Apoio à Competividade das Micro e Pequenas Indústrias (PROCOMPI) – Tecnologia Cerâmica. SENAI (PE), 2008.

[120] Some studies regarding the consumption of non-renewable native wood at the ceramic industries: <http://www.ufpe.br/revistageografia/index.php/exemplo/article/viewFile/66/26>, last visit on August 12nd, 2009; <http://www.ambienteemfoco.com.br/?p=457>, last visit on August 12nd, 2009; <http://ambienteacreano.blogspot.com/2008/04/produo-de-lenha-em-pernambuco-e-rio.html>, last visit on August 12nd, 2009; <http://noticias.ambientebrasil.com.br/noticia/?id=41624>, last visit on August 12nd, 2009; among others.

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

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

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

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

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

Buenos Aires Ceramic

ERy, total = 33,426 tonnes of wood x 0.996 x 0.0159 TJ/tonne x 77.4 tCO2/TJ

ERy, total = 40,971 tonnes of CO2e

Table 14. Emission reductions without considering the leakage

Year	**Emission Reductions (tCO2e)**
2010	40,971
2011	40,971
2012	40,971
2013	40,971
2014	40,971
2015	40,971
2016	40,971
2017	40,971
2018	40,971
2019	40,971
Total Emission Reductions (tCO2e)	**409,710**
Number of years of the crediting period	10
Annual average of estimated emissions reductions for the 10 years of crediting period (tCO2e)	40,971

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 15. Estimation of overall emission reductions

Year	Baseline Emissions (tonnes of CO2e)	Leakage (tonnes of CO2e)	Emission Reductions (tonnes of CO2e)
2010	40,971	-	40,971
2011	40,971	-	40,971
2012	40,971	-	40,971
2013	40,971	-	40,971
2014	40,971	-	40,971
2015	40,971	-	40,971
2016	40,971	-	40,971
2017	40,971	-	40,971
2018	40,971	-	40,971
2019	40,971	-	40,971
Total			40,971
Average			40,971

5 Environmental Impact:

As can be observed in table 16, the only negative impact identified is that the project activity will generate ashes due to the burning of the biomass, but this impact will be mitigated by incorporating the ashes into the clay mixture used as thermal insulator in the kilns entrance. In addition, ashes are also utilized as fertilizer in the *Eucalyptus* plantation next to the ceramic industry.

The burning of the new biomasses also emits particulate material and CO2, as well as when using wood. However, the emission reductions of GHG will improve since they are renewable biomasses.

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

Table 16. Summary of the environmental impacts

Environmental 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	No more use of a polluting residues as fuel for energy production	Positive
Fauna	Biodiversity preservation	Positive
Flora	Biodiversity preservation	Positive

Environmental Laws related to the plant activities

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

An EIA was not required due to the project activity.

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.

6 Stakeholders comments:

The main stakeholders considered in this project are the Union of Ceramic Industries for Construction in the State of *Pernambuco* (SINDICER)[121] and the ceramic company employees. A letter was sent to the stakeholders informing about the project. In the ceramic's facilities, the letter was posted on the employees' board which is a visible place with high circulation of employees. The letter was available during 7 days and the comments were expected for a period of 7 days after the letter has been posted.

SINDICER sent a letter stating their support to the present project activity[122].

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

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

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

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[121] The objectives of the SINDICER are: to work with authorities in the development of social solidarity; to promote events relating to the subject; to mediate a dialogue between the ceramic factories in order to make the market fair and accessible to all.

[122] The letter from SINDICER was evidenced to the DOE.

7 Schedule:

- Project start date: Date on which the project began reducing or removing GHG emissions, i.e. when the project proponents began employing renewable biomass: August 1st, 2008;
- Crediting period start date: January 1st, 2010;
- Validation Report predicted to: March, 2010;
- First Verification Report predicted to: August, 2010;
- VCS project crediting period: 10 years renewable;
- Monitoring and reporting frequency: preferentially from 6 to 12 months, since the beginning of the crediting period;
- Date of terminating the project: December 31st, 2019.

After the project start date, the ceramic owner made adaptations due to the use of new biomasses and its technology encompassing, for example, tests using the new biomasses, the ideal mix of renewable biomasses (different percentages of each biomass) and technological adaptations.

8 Ownership:

8.1 Proof of Title:

Ceramic's article of incorporation and the contract between *Carbono Social Serviços Ambientais* LTDA. - project developer – and the ceramic industry of this project activity will proof the title, demonstrating the rights to the GHG emissions reductions and the ownership of the project. These proofs of title will be checked by DOE and are in power of the Ceramic Company and available to consultation.

The responsible for the contract between *Buenos Aires* ceramic and *Carbono Social Serviços Ambientais* LTDA is the director of the ceramic: Mr. *Rodolpho Cunha Neto.*

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

Not applicable.