THE GOLD STANDARD MICRO-SCALE SCHEME PROJECT DESIGN DOCUMENT FORM - Version 2.2

CONTENTS

Annexes

SECTION A. General description of micro-scale project activity

A.1 Title of the micro-scale project activity:

Balsas Renewable Energy Project
PDD Completed in: 10/08/2012
Version 01

A.2. Project participants:

Project Developer

Sustainable Carbon – Projetos Ambientais Ltda.: Project developer, Project participant and Project idealizer.

As the project authorized contact, Sustainable Carbon was given the responsibility of preparing the present project report and to accompany the proponents until the end of the crediting period.

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

Address:
R. Doutor Bacelar, 368 – Conj. 54 – Vila Clementino
Postal Code: 04.026-001
São Paulo – SP, Brazil
Phone number: +55 11 2649 0036
Web site: http://www.sustainablecarbon.com

Emails: marcelo@sustainablecarbon.com; camila@sustainablecarbon.com; marianas@sustainablecarbon.com; mariana@sustainablecarbon.com; larissa@sustainablecarbon.com; thiago.othero@sustainablecarbon.com.

Project Proponent
The project proponent is:
Ceramica Balsas Ltda (*Balsas* Ceramic)

The following focal points are appointed to this project activity:

Mr. José Thyrson Ladeira da Paz, Director: Information and visit of the ceramic, detailed information on process and production lines, environmental challenges, technological challenges, research and development history and ceramic devices market challenges.

Mrs. Soraia da Silva Silveira, Secretary and Monitoring data responsibilities: General data, information on inputs and outputs of the ceramic, detailed information and numbers on sales, how output data is handled and how data is stored and kept by the *Balsas*'s office.

Other information on the project's proponent:

Address: Rod. BR 230, Km 09 – Rod. *Balsas*/Riachão, SN, Zona Rural, *Balsas*/MA.
Postal code: 65800-000
Phone number: +55 (99) 3541-9668
E-mail: ceramicabalsas@gmail.com

A.3 Description of the micro-scale project activity:

A.3.1. Location of the micro-scale project activity:

The project is located in northeast region of Brazil, in the State of *Maranhão*. Sections below provide more information on the exact location of *Balsas* Ceramic.

A.3.1.1. Host Country:

Brazil.

A.3.1.2. Region/State/Province etc.:

Maranhão.

A.3.1.3. City/Town/Community etc:

Balsas.

A.3.1.4. Details of physical location, including information allowing the unique identification of this micro-scale project activity:

The project activity is located in the northeast of Brazil, in the municipality of *Balsas* state of *Maranhão,* which is indicated in Figure 1 below. The geographic location of the project activity is: 7° 29' 10'' S and 46° 9' 24'' W.

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

BR 230, km 09 Rodovia Balsa/Riachão - Zona rural
Balsas - Maranhão, Brazil
Zip code: 65800 – 000

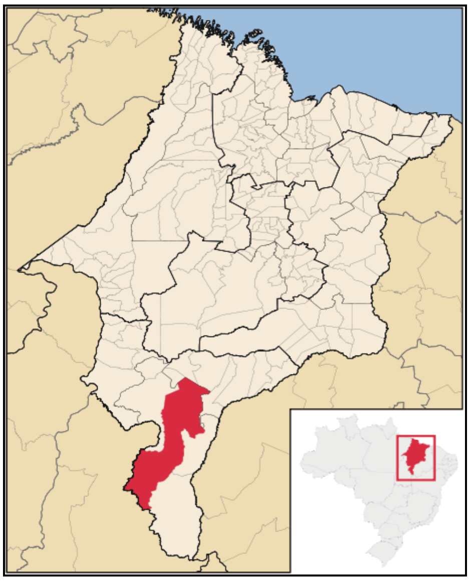


Figure 1. Geographic location of *Balsas*

A.3.2. Description including technology and/or measure of the micro-scale project activity:

The project activity is the project of *Balsas* Ceramic, which is a red ceramic company located in *Balsas* municipality, state of *Maranhão*, northeast of Brazil. *Balsas* Ceramic produces structural ceramic bricks destined mainly for the regional market in the municipalities of *Balsas*, *Mangabeira*, *Fortaleza dos Nogueira* and *Alto Parnaiba*.

The ceramic used exclusively non-renewable woody biomass (wood without sustainable forest management, also referred as native firewood) as fuel. The use of this type of non-renewable biomass is a common practice in the ceramic industry. Although firewood has been used for many decades as a 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 1970's, when the petroleum started to supply the majority of Brazilian´s energy needs[1]. Moreover, the Brazilian Energy and Mine Ministry has been monitoring every energy sector of Brazil since 1970, and firewood appears over the years monitored as a significant source of thermal energy for ceramic sector[2]. On the other hand, the project activity focuses on the use of renewable biomass for thermal energy supply.

[1] BRITO, J.O. "The use of wood as energy". Available at: <http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&tlng=ES>. Last visited on 18/05/2012.

[2] Energy Research Company. National Energy Balance - energy consumption per sector. Available at: <https://ben.epe.gov.br/BEN2007_Capitulo3.aspx>. Last visit on: 18/05/2012.

Balsas Ceramic operated one Tunnel[3] kiln by August, 2008 but since September, 2008 started to operate more two Round[4] kilns using in the baseline exclusively native firewood (wood without sustainable forest management) from the *Cerrado* Biome as fuel. As the project activity, the proponent has switched its fuel to renewable biomasses such as rice husks[5]. The ceramic has also acquired new equipments, including automatic feeders, to allow an efficient use of renewable biomass as fuel.

Before being cooked in the kilns, the pieces must be dried. At the ceramic the pieces are dried naturally, so no fuel is used for the drying process. During 2008, *Balsas* Ceramic has produced approximately 11,516 thousands of ceramic pieces. The identified baseline for this ceramic is the utilization of a total of around 4,965.97 tonnes of non-renewable woody biomass per year to provide thermal energy to the ceramics' kilns.

This project activity will reduce the greenhouse gases (GHG) emissions through the substitution of non-renewable biomass for renewable biomasses to generate thermal energy. As renewable biomasses, the project activity will utilize mostly biomass residues (such as rice husks and wood residues), biomass from forests, biomass from cropland and/or grasslands and glycerin) to feed the ceramic's kilns. The project will also involve energy efficiency measures, such as improved fuel handling and kilns improvement to reduce the necessary energy per production output[6].

This project pointed out the possibility for switching from non-renewable biomass to renewable biomasses, which was unattractive due some barriers, including higher fuel costs, uncertainties associated to the fuel switch and the lack of knowledge to operate with renewable biomass. The barriers that prevented the implementation of this project are further described in Section B.5. The ceramic owners have considered the income from the commercialization of the carbon credits to make the project activity viable.

The main goal of this project activity is to minimize the negative impacts of deforestation to obtain firewood, whose consumption also leads to GHG emissions that contribute to climate change. Moreover, in opposition to the identified baseline, the project activity will generate thermal energy exclusively from renewable sources, by using abundant renewable biomasses in the region. All these measures contribute to sustainable development by promoting renewable energy, mitigating atmospheric pollution and improving the quality of employment for the ceramic workers.

[3] Tunnel kiln has three sections: heating, burning and cooling, with the reutilization of heat among the sections. This kind of kiln is more efficient and modern, where the ceramic pieces are transported through a conveyor belt or special karts inside the kiln.

[4] Round kilns are extremely economical and work well with any type of fuel. It is an easy kiln to operate and it considered the best kiln to cook and burn roof tiles.

[5] During the crediting period other types of renewable biomasses can also be used, such as: wood residues, biomass from forests, biomass from cropland and/or grasslands and glycerin.

[6] No emission reductions are claimed for energy efficiency measures, since these are applied after the complete fuel switch to renewable biomass.

Table below provides a brief history of the implementation of this project:

Table 1. Brief history on the project implementation.

Date	Event
September, 1st 2008	Start date of the Round kilns construction.
December, 1st 2008	Conclusion date of the Round kilns construction.
August, 1st 2008	*Balsas* Ceramic begins testing renewable biomass in the Tunnel and Round kilns assisted by the Field Agent of Sustainable Carbon, *Antônio Cubano Rissone*.
April, 1st 2009 (Starting date of the project activity)	*Balsas* Ceramic starts to use exclusively renewable biomass in the Tunnel and Round kilns.
September, 1st 2009	*Balsas* Ceramic and Sustainable Carbon sign a contract for the development of an GHG emission reduction project.
January,1st 2011	Starting date of the crediting period.

A.3.3 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions (tCO2e)
2011	5,136
2012	5,136
2013	5,136
2014	5,136
2015	5,136
2016	5,136
2017	5,136
2018	5,136
2019	5,136
2020	5,136
Total estimated Emission Reductions (tCO2e)	**51,360**
Number of years of the crediting period	10
Annual average of estimated emissions reductions over the crediting period (tCO2e)	**5,136**

A.3.4. Public funding of the micro-scale project activity:

There is no public funding involved in this project activity. The project does not receive Official Development Assistance.

SECTION B. Application of an existing baseline and monitoring methodology or of a new methodology submitted as part of this project activity

B.1. Title and reference of the existing or new baseline and monitoring methodology applied to the micro-scale project activity:

The project utilizes the following methodology approved under the Clean Development Mechanism for small scale projects: "**AMS-I.E: Switch from Non-Renewable Biomass for Thermal Applications by the User**", version 05[7], valid from 03/08/2012 onwards.

This category comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies. The technology in case of this project activity is determined as the ceramic facilities, which utilize thermal energy generated by the new renewable energy technology.

The project also utilizes the following tool: Tool for the demonstration and assessment of additionality, version 06[8].

B.2 Justification of the choice of the methodology and applicability:

The applied methodology is applicable for the generation of thermal energy by introducing renewable energy technologies that displace the use of non-renewable biomass. As the project involves the substitution of non-renewable biomass (wood from areas without forest management plan) with renewable biomass, the project complies with conditions described on this methodology.

As further detailed in Section B.1, the project qualifies as a micro-scale project activity and will remain under the limits of micro-scale project activity types during every year of the crediting period[9]. As demonstrated on Section A.3.3, emission reductions are expected to remain below ten thousand tonnes of CO_2e per year.

The project is also within the CDM limits for small scale projects of type I. In 2008, the kilns of the *Balsas* Ceramic have generated 74.79 TJ. Converting this number to MWh, it was generated 20,691.55 MWhthermal per year, which corresponds to a capacity of 2.36

[7] Methodology available at: <http://cdm.unfccc.int/methodologies/DB/WHTQUFLWCVNB9CIUZC198A712WGQR4/view.html >. Last visited on: 03/08/2012.

[8] Tool available on UNFCCC's *website:* <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf>. Last visited on*:* 18/05/2012*.*

[9] According to the Annex T of the Gold Standard version 2.2 (Standalone micro---scale scheme rules), project activities are eligible under the micro-scale scheme if the annual emission reductions achieved are limited to a maximum of 10,000 tonnes of CO_2e in each and every year of the crediting period. Available at: <http://www.cdmgoldstandard.org/wp-content/uploads/2012/05/v2.2_ANNEX-T.pdf>. Last visit on: 12/04/2012.

MWthermal on average. The project will generate 100% of the needed energy from renewable biomasses and will involve energy efficiency measures, thus reducing the amount of energy per production output. As a conservative estimate, the project capacity for renewable energy generation is considered the same as the baseline scenario[10], which is less than the limits of 45 MWthermal for Type I Small scale project activities.

The table below provides an assessment of relevant applicability conditions and how the project complies with such conditions:

Table 2. Assessment of the project compliance to the chosen methodology and to Gold Standard eligibility requirements.

Applicability conditions		Assessment of project compliance to the applicability condition
Section	**Description**	
AMS-I.E: Switch from Non-Renewable Biomass for Thermal Applications by the User, version 05		
1.	This category comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies. Examples of these technologies include but are not limited to biogas stoves, solar cookers, passive solar homes, renewable energy based drinking water treatment technologies (e.g. sand filters followed by solar water disinfection; water boiling using renewable biomass).	The main focus of this Project is to allow the substitution of non-renewable biomass with renewable biomass for thermal energy generation. Such biomass will be used to provide thermal energy in kilns of *Balsas* Ceramic.
2.	Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	Firewood used to be the most employed source of primary energy until 1970's, when the petroleum started to supply the majority of Brazilian´s energy needs[11]. Moreover, the Brazilian Energy and Mine Ministry has been monitoring every energy sector of Brazil since 1970, and firewood appears over the years monitored as a significant source of thermal energy for ceramic sector[12].

[10] Energy production might vary during the crediting period depending on production. The production of the ceramics is expected to increase during the project activity. However, an increase beyond the limits of small scale project activities is not expected.

[11] BRITO, J.O. "The use of wood as energy". Available at: <http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&tlng=ES>. Last visited on 18/05/2012.

[12] Energy Research Company. National Energy Balance - *energy consumption per sector. Available at: <https://ben.epe.gov.br/BEN2007_Capitulo3.aspx>. Last visited on* 18/05/2012.

Applicability conditions		Assessment of project compliance to the applicability condition
Section	**Description**	
Gold Standard Toolkit Annex C		
First item	Activities making use of non-renewable biomass resources shall NOT be eligible for Gold Standard registration. Project Participants shall therefore provide convincing evidence that the project activities make use of renewable biomass resources. This criteria shall be monitored along the crediting period and therefore be included in the Sustainability Monitoring Plan.	The project will use exclusively demonstrably renewable biomasses whose source can be verified. Biomasses shall be considered renewable only if they are in accordance to the CDM EB definitions set out in Annex 18 of EB meeting 23[13].
Second item	Activities expected to make use of biomass resources already in use shall NOT be eligible for Gold Standard registration unless convincing evidence is provided showing that the current users are in agreement with the envisioned shift of use (potential leakage associated to such a shift must be taken into account). In the absence of such an agreement, Project Participants shall demonstrate that their project makes use of surplus biomass for each type of biomass resources used. They must do so once, ex-ante on time for validation for small-scale activities, and in time for validation and for each one of the verifications (inclusion in the Sustainability Monitoring Plan) for large-scale activities.	In case the project utilizes existing biomass, it shall be demonstrated that only surplus biomass is used. Publications shall be used to determine biomass availability in the project region.
Third item	Project Participants shall demonstrate that their activitywill only make use of degraded land and shall include this criterion in the Sustainability Monitoring Plan. Two exceptions may be considered: convincing evidence is provided showing that the envisioned energy crop is part of a traditional rotational cropping, OR an increase of the productivity is obtained, locally and to the benefit of the current users, through measures implemented in the context of the activity so as to at a minimum compensate	The project is not expected to use lands to grow dedicated energy crops. If that occurs during the crediting period, compliance with that applicability condition will be assured.

[13] Document is available at: <http://cdm.unfccc.int/EB/Meetings/023/eb23_repan18.pdf>. Last visited on 18/05/2012.

Applicability conditions		Assessment of project compliance to the applicability condition
Section	**Description**	
	for the part of the land newly allocated to growing the energy crop. Compliance with these criteria above must be monitored over the crediting period and thus be part of the Sustainability Monitoring Plan.	
Fourth item	Activities making use of GMOs shall declare so in a transparent way. Local stakeholders opinion on GMOs shall prevail and appropriate mitigation measures shall be put in place to address their concerns, if any, in a satisfactory way.	The project is not expected to use Genetically Modified Organisms.

B.3. Description of the project boundary:

According to the applied methodology, the project boundary for the project is the physical, geographical site of the use of biomass or the renewable energy. This means that the *Balsas* Ceramic is the project boundary.

For the determination of the baseline emissions, it is assumed that in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs. This means that baseline emissions are those resulting from the use of non-renewable fuels to burn ceramic pieces. This practice is responsible to discharge in the atmosphere the carbon that was stored in the fuel. Project activity emissions are not included according to the applied methodology. An increase in emissions due to transportation of renewable biomass is not likely to be significant, since similar means of transportation were used in the baseline scenario for the transportation of non-renewable biomass. Table below provides more information on the emission sources included in the project boundary.

Table 3. Gases included in the project boundary and brief explanation.

	Gas	Source	Included?	Justification/ Explanation
Baseline	CO_2	Emission from the combustion of fossil fuels	Yes	The major source of emissions in the baseline
	CH_4		No	Excluded for simplification. This is conservative.
	N_20		No	Excluded for simplification. This is conservative.

Project Activity	The methodology does not include any source of project emissions.

B.4. Description of the baseline and its development as per the chosen methodology:

The baseline scenario is identified according to general guidance to the small-scale CDM methodologies[14]. The baseline scenario is identified by assessing possible alternatives to the project that could provide similar levels of activity.

The possible alternatives to the project consist in the production of ceramic pieces by using different types of fuels to obtain thermal energy. Common fuels employed and therefore candidates for baseline fuels are (as shown in the Table 3): natural gas, charcoal, wood, other recuperations, diesel oil, fuel oil, liquefied petroleum gas, others from petroleum, piped gas, electricity and others none specified.

The most probable scenario, in the absence of the non-renewable biomass (i.e. firewood), would be the use of fossil fuels taking in considerations historic fuel usage by the ceramic sector in Brazil and barriers to the project as detailed in Section B.5.

Table 4. Distribution of fuel utilized on the ceramic sector in Brazil.

BRAZILIAN ENERGY BALANCE 2009[15] - CERAMIC SECTOR EVALUATION Unit: 10^3 Tonnes of oil equivalent				
FUEL	**2006**	**2007**	**2008**	**2009**
Natural Gas	901	960	1,007	1,000
Charcoal	42	33	9	1
Wood	1,762	1,885	2,122	2,081
Other recuperations	32	35	53	52
Diesel Oil	8	7	8	8
Fuel Oil	285	313	322	322
Liquefied Petroleum Gas	151	153	166	162
Others from Petroleum	76	170	173	179
Piped gas	0	0	0	0

[14] Available at: < https://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf>. Last visited on 18/05/2012.

[15] Brazilian Energy Balance, Chapter 3 Available at: https://ben.epe.gov.br/BENSeriesCompletas.aspx. Last visited on 18/05/2012.

Electricity	276	284	298	300
Others non specified	0	0	0	0
TOTAL	**3,533**	**3,841**	**4,157**	**4,107**

The baseline is identified as the amount of non-renewable biomass displaced with the fuel switching project. The overall characteristics of the ceramic production are used to obtain the real amount of non-renewable biomass used in the baseline scenario. Conservativeness in the determination of the baseline is assured by applying approved methodologies and methodological tools. The most recent versions at the time of first submission are applied. Conservativeness is also achieved by utilizing historical data from the project site for the ex-ante calculation of baseline and project emissions. More information on the set of data used for calculating baseline emissions is available in Section B.6.3.

According to the identified baseline scenario for this project activity, *Balsas* Ceramic would utilize around 413.83 tonnes of non-renewable biomass per month to provide thermal energy to the ceramic's kilns and obtain an approximate temperature of 950ºC, in order to produce an average of around 959.66 thousands of ceramic units per month. Therefore, the wood consumption of the ceramic in the baseline scenario is 0.4312 tonnes of woody biomass per thousands of ceramic pieces produced.

Table 5. Baseline scenario of the project activity.[16]

	***Balsas* Ceramic**
Production (thousands of ceramic pieces per month)	959.66
Consumption of non-renewable woody biomass (native firewood) without the project activity (tonnes per month)	413.83
BF_y (quantity of woody biomass per thousand of ceramic units fired)	0.4312

The identified barriers are described in Section B.5. Please refer to this Section to obtain more information on the criteria for the elimination and ranking of the identified alternatives. As a result of the barriers test, only one alternative remains: the continuation of the practice observed prior to the project initiation, which involves the use of non-renewable biomass to provide thermal energy.

[16] In the absence of the project activity, the fuel utilized to fire the ceramic units would be native firewood. This biomass is classified as woody biomass.

This situation was also the scenario existing prior to the initiation of the project and is the prevailing practice in the project region. Native firewood has been used to provide most of the thermal energy for the production process.

Therefore, the baseline presents the use of around 0.4312 tonnes of woody biomass per thousands of ceramic pieces produced. During the project, the annual production is expected to vary based on market demand. Annual production will be monitored during the crediting period to transparently calculate emission reductions. Emission reductions will be claimed for the amount of non-renewable fuel that would otherwise be used in the absence of the project activity.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered micro-scale project activity:

The methodology applied is "**AMS-I.E: Switch from Non-Renewable Biomass for Thermal Applications by the User**", version 05, which comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies. The technology in case of this project activity is determined as the ceramic facilities, which utilize thermal energy generated by the new renewable energy technology. The project involves the substitution of non-renewable biomass with renewable biomass in existing red ceramic factories, thus complying with the referred methodology.

The starting date of the project activity (as defined in Section C.1.1) is considered 01/04/2009. The starting date of the project is before the "*Time of first submission*" as per Gold Standard definitions. Hence, the project is applying for retroactive registration according to Gold Standard Toolkit Section 1.2.6.

The baseline scenario is the use of non-renewable biomass to provide thermal energy during the production process of the ceramic factories. This is a common practice in ceramic factories in Brazil, as related by several authors (UHLIG, 2008[17]; NERI, 2003[18]; BRITO[19]; BRASIL, 2001[20]; CARDOSO, 2008[21]). Project additionality is explained according to the Tool for the

[17] UHLIG, A. **Lenha e carvão vegetal no Brasil: balanço oferta-demanda e métodos para a estimação do consumo**.2008, 156f. Dissertação (Pós graduação em Energia) – Universidade de São Paulo. Available at: <http://www.teses.usp.br/teses/disponiveis/86/86131/tde-14052008-113901/publico/UHLIG_Tese1.pdf>. Last visited on 18/05/2012.

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

[19] BRITO, J.O. "The use of wood as energy". Available at: <http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&tlng=ES>. Last visited on 18/05/2012.

[20] BRASIL. Ministério de Ciências e Tecnologias. **Levantamento da Situação e das Carências Tecnológicas dos Minerais Industriais Brasileiros**: com enfoque na mineração de: Argila para cerâmica, Barita, Bentonita, Caulim para carga, Talco / Agalmatolito e Vermiculita. Brasília, 2001. Available at: <http://www.cgee.org.br/prospeccao/doc_arq/prod/registro/pdf/regdoc710.pdf> . Last visited on 18/05/2012.

[21] 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.

demonstration and assessment of additionality, version 06. This tool provides for a step-wise approach to demonstrate and assess additionality. The steps are described below:

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity:

The identified alternatives to the project activity consist in the use of different types of fuels to obtain thermal energy. More specifically, this includes:

a. The continuation of the current (pre-project) practice, where no project is undertaken and non-renewable biomass remains being the fuel used.
b. The extensive use of renewable biomasses without being undertaken as a GHG emission reduction project;
c. The use of fossil fuels commonly used by the ceramic sector in Brazil.

As described in Section B.4, common fuels employed by the ceramic sector in Brazil include natural gas, charcoal, wood, other recuperations, diesel oil, fuel oil, liquefied petroleum gas, others from petroleum, piped gas, electricity and others none specified. As available on table 6, fossil fuels are the main energy source when native firewood is excluded from consideration. These fuels are locally available and could provide the same levels of activity of the project. The use of natural gas is not considered the most probable alternative to this project activity. The Brazilian Energy Balance results (available in Table 6) showed significant percentage of natural gas consumption for production of ceramic tiles (used to finish floor or wall).

On the other hand, in the case of structural ceramic, the use of natural gas is restricted by the absence of pipes and its high costs[22]. The use of natural gas also involves risks of insufficient supply and higher costs when compared to other fuels, thus discouraging investment in this scenario even in places with piped gas availability. Electricity is shown on Table 6 as an important energy source for the ceramic sector, but it is not considered a credible alternative because it cannot be used in kilns to provide thermal energy. Hence, the use of fossil fuels is considered the most likely scenario in the absence of the non-renewable biomass.

Outcome of Step 1a: At the end of Step 1, realistic and credible alternatives that could provide the same levels of activity than the project are identified. These include the use of fossil fuels, the extensive use of renewable biomass without being undertaken as a GHG emission reduction project and the continuation of the pre-project situation, where non-renewable biomass is used as fuel.

[22]Revista Brasil Energia Percalços do gás natural na indústria. Available at: <http://www.energiahoje.com/brasilenergia/noticiario/2002/12/01/361782/percalcos-do-gas-natural-na-industria.html>. Last visited on 18/05/2012.

Sub-step 1b: Consistency with mandatory laws and regulations:

There are legal 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[23]. *Maranhão* is the state with the largest number of municipalities which contribute for *Cerrado* deforestation[24]. The consumption of non-renewable biomass by ceramic industry was noted by several authors (UHLIG, 2008[25]; NERI, 2003[26]; BRITO[27]; BRASIL, 2001[28]; CARDOSO, 2008[29]). This was also observed in other industries, for example in production of steel[30], which has a much better structure and internal organization when compared to ceramic factories that are generally small and family-run enterprises. BRASIL (2001)[31], suggests that it is important to stimulate the miner sector, especially to respect the environment.

According to Sub-step 1b, paragraph (3), if an alternative does not comply with all mandatory applicable legislation and regulations, then it must be demonstrated, based on an examination of current practice in the country or region in which the law or regulation applies, that those applicable legal or regulatory requirements are systematically not enforced and that

[23] Jornal Grande CPA. Corte e poda de árvores pelo Dnit na BR-158 é considerado crime ambiental. Available at: <http://www.grandecpa.com.br/?p=noticia&id_noticia=129>. Last visited on 18/05/2012.

[24] Envolverde. **Maranhão é o Estado com o maior número de municípios que desmatam o Cerrado**. Available at: <http://envolverde.com.br/noticias/maranhao-e-o-estado-com-o-maior-numero-de-municipios-que-desmatam-o-cerrado/?utm_source=CRM&utm_medium=cpc&utm_campaign=02-%5B2012-04-02-11%3A44%3A22%5D>. Last visited on 15/06/2012.

[25] UHLIG, A. **Lenha e carvão vegetal no Brasil: balanço oferta-demanda e métodos para a estimação do consumo**.2008, 156f. Dissertação (Pós graduação em Energia) – Universidade de São Paulo. Available at: <http://www.teses.usp.br/teses/disponiveis/86/86131/tde-14052008-113901/publico/UHLIG_Tese1.pdf>. Last visited on 18/05/2012.

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

[27] BRITO, J.O. "The use of wood as energy". Available at: <http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&tlng=ES>. Last visited on 18/05/2012.

[28] BRASIL. Ministério de Ciências e Tecnologias. **Levantamento da Situação e das Carências Tecnológicas dos Minerais Industriais Brasileiros**: com enfoque na mineração de: Argila para cerâmica, Barita, Bentonita, Caulim para carga, Talco / Agalmatolito e Vermiculita. Brasília, 2001. Available at: <ftp://ftp.mct.gov.br/Biblioteca/10674%20-%20Levantamento%20da%20Situa%E7%E3o%20e%20das%20Car%EAncias%20Tecnol%F3gicas%20dos%20Minerais%20Industriais%20Brasileiros.pdf>. Last visited on 18/05/2012.

[29] 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.

[30] Instituto Observatório Social. O Aço da Devastação. Available at: <http://www.observatoriosocial.org.br/portal/noticia/780>. Last visited on 18/05/2012.

[31] BRASIL. Ministério de Ciências e Tecnologias. **Levantamento da Situação e das Carências Tecnológicas dos Minerais Industriais Brasileiros**: com enfoque na mineração de: Argila para cerâmica, Barita, Bentonita, Caulim para carga, Talco / Agalmatolito e Vermiculita. Brasília, 2001. Available at: <ftp://ftp.mct.gov.br/Biblioteca/10674%20-%20Levantamento%20da%20Situa%E7%E3o%20e%20das%20Car%EAncias%20Tecnol%F3gicas%20dos%20Minerais%20Industriais%20Brasileiros.pdf> . Last visited on 18/05/2012.

noncompliance with those requirements is widespread in the country. Given the exposed above, it is evidenced that restrictions on the use of non-renewable biomass is widely not enforced in Brazil.

There are no other legal requirements demanding ceramic industries to mitigate GHG emission or to use renewable sources of fuel. Therefore, it is considered that all alternatives identified in sub-step 1a are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country.

Outcome of Step 1b: At the end of Step 1, credible alternatives to the project activity that are consistent with current laws and regulations (taking into account the enforcement in the region or country) have been identified. All three alternatives identified in 1a are considered credible alternatives to the project activity. The additionality assessment will now move to Step 2 – Investment analysis.

Step 2: Investment analysis

According to the referenced tool, the investment analysis is used to determine whether the project activity is not:

(a) The most economically or financially attractive; or

(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

The project proponents have chosen to follow option (a), and shall demonstrate that the project activity is not the most economically attractive following the sub-steps of the tool described below.

Sub-step 2a: Determine appropriate analysis method

There are three possible methods to demonstrate the investment analysis, according to the referred tool: simple cost analysis, investment comparison analysis or benchmark analysis. Simple cost analysis is applicable to projects that generate no financial or economic benefits other than CDM (or carbon credits) related income. As the proposed project activity includes fuel switching, a possible income arises from saving on fuel purchase, in case the new fuel is cheaper than the baseline fuel. Hence, simple cost analysis is not appropriate.

According to the Guidelines on the assessment of investment analysis (version 05, EB62, Annex 5)[32], the investment comparison analysis shall be applied if the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services. As the proposed baseline (as any of its credible alternatives) demands investments in the purchase of fuel to produce ceramic pieces, investment comparison analysis is considered the most appropriate method to perform the investment analysis.

[32] Available at: <http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf> Last visited on: 18/05/2012.

Sub-step 2b: Option II. Apply investment comparison analysis:

The financial indicator most suited for the investment comparison analysis is the unit cost of service, more specifically the cost of delivered heat, measured in R$ per TJ of thermal energy delivered. This indicator is the most appropriate since fuel purchase is one of the major cost components of the ceramic factories and the one most affected by this project, which involves fuel switching.

The most important parameters determining the cost of delivered heat are the unit cost of fuel (R$ per ton or m³ of each fuel), the Net Calorific Value of each fuel (in TJ per ton) and the total amount of fuel to be employed (in tonnes or m³). These parameters combined determine the total cost of fuel for a given production output.

Sub-step 2c: Calculation and comparison of financial indicators

Table below provides data on the non-renewable fuel costs[33].

Table 6. Data determining baseline fuel costs.

Parameter	**Unit**	***Balsas* Ceramic**
Non-renewable fuel used	N/A	Native firewood
Production	Thousand pieces per month	959.660
Monthly consumption of fuel	Tonnes	413.83
Cost of fuel	R$/ton	R$ 21.04
Net Calorif Value of the fuel[34]	TJ/ton	0.0150
Thermal energy delivered	TJ	6.21
Monthly fuel cost	R$	**R$ 8,708.04**
Cost of delivered heat	**R$/TJ**	**R$ 1,402.84**

As demonstrated above, fuel costs for the baseline scenario were BRL 1,402 per TJ of thermal energy. As the project activity, the baseline non-renewable fuel is being replaced by renewable biomasses such as rice husks[35].

An investment comparison is made to demonstrate how these fuels compare to native firewood in terms of cost per energy delivered. Table below provide the parameters used for such analysis.

[33] Historical data from each ceramic are used for the quantification of these parameters, including the cost of fuel. Evidences are available for the validation team.

[34] Please check Section B.6.2, item $NCV_{biomass}$ for more information on the determination of this parameter.

[35] During the crediting period other types of renewable biomasses can also be used, such as: wood residues, biomass from forests, biomass from cropland and/or grasslands and glycerin.

Table 7. Data determining fuel costs for renewable biomasses.

Fuel type	Cost of fuel[36] (R$/ton)	Net Calorific Value (TJ/ton)	Energy demand (TJ)[37]	Necessary monthly consumption to meet energy demand (tonnes)[38]	Cost of delivered heat (R$/TJ)
Rice Husk	R$ 40.00	0.0138	1.00	72.46	R$ 2,898.55
Forest Residues (sawdust/MDF/woodchips)	R$ 60.00	0.0146	1.00	68.49	R$ 4,109.59
Elephant grass	R$ 67.45	0.0134	1.00	74.63	R$ 5,033.58
Wood from areas with sustainable forest management plan	R$ 34.69	0.0150	1.00	66.67	R$ 2,312.67
Glycerin	R$ 250.00	0.0219	1.00	45.63	R$ 11,407.74

As the tables above show, the fuels applied by the project are more costly on an energy basis than the baseline non-renewable fuel. This represents a significant barrier for the fuel switching. The continuation of the current practice, where no project is undertaken and non-renewable biomass remains being the fuel used is therefore a more economically attractive scenario than the measures proposed by the project activity.

Also, the use of renewable biomass as a fuel involves significant risks, such as the risk of instability of energy flow rates. Alternative fuels, such as biomass residues, are naturally subject to significant variation on its chemical and energy properties. Such materials might present variations in terms of density, particle size, humidity and other characteristics that affect its

[36] Fuel costs of Rice Husks were determined based on purchases of biomass by *Balsas* Ceramic during 2009. The fuel costs of Forest Residues and Wood from areas with sustainable forest management plan were taken of the *Ceará* Renewable Energy Bundled Project. And costs with Elephant grass and Glycerin were taken of the *Buenos Aires* Ceramic Fuel Switching Project. Evidences are available for the validation team.

[37] This table provides the calculation on the cost of fuel to provide 1 TJ of energy, in order to compare such cost with the baseline cost of delivered heat.

[38] This parameter is calculated based on the Net Calorific Value of each fuel and represents the amount of fuel needed to obtain 1 TJ of thermal energy.

efficiency as fuel. These risks are only mitigated if proper handling and storage of biomass is continuously observed, thus demanding increased efforts from the ceramics employees[39].

Finally, the fuel switch to renewable biomass also demanded other costs besides the increase in fuel cost, such as the purchase of automatic feeders and thermocouples. These equipments were needed to allow the efficient use of biomass and would not be necessary if the ceramic owners remained using native firewood as fuel. These costs will likely result in energy efficiency (and consequently in reduced costs on fuel purchase). However, savings from energy efficiency are not easy to be determined upfront, since these measures follow the application of a new type of fuel (renewable biomass) which is more expensive than the baseline fuel.

The fuel switching also involves a period of adaptation until the kiln operators learned to operate with the new fuel. In this adaptation period, income loss generally results from losses of fuel and losses of ceramic pieces damaged by irregular burning cycles. All these additional costs would not be needed if the fuel switching did not occur making the continued use of non-renewable fuels an attractive scenario.

Sub-step 2d: Sensitivity analysis

The objective of this sub step is to show that the conclusion regarding the financial attractiveness of the project is robust to reasonable variations of the critical assumptions. According to the Guidelines on the assessment of investment analysis, variables that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation, the results of which should be presented in the PDD.

However, for the calculation of the selected indicator (cost of delivered heat), it is considered that the variation of only one variable, namely the cost of fuel (in R$ per ton), is sufficient for the sensitivity analysis. This is because in this case the variation of any of the other variables, such as the Net Calorific Value would provide redundant results, as the indicator (expressed in R$/TJ) is directly proportional to both the cost of fuel and the Net Calorific Value. Tables below provide the sensitivity analysis on the cost of delivered heat based on the variation on the cost of fuels.

[39] Such barriers are commonly attributed to the use of biomass as fuel. See for instance the following presentation on biomass as fuel: <http://www.unep.org/ClimateChange/LinkClick.aspx?fileticket=JDGR4kratWY%3D&tabid=4845&language=en-US>. Last visit on 23/03/2011.

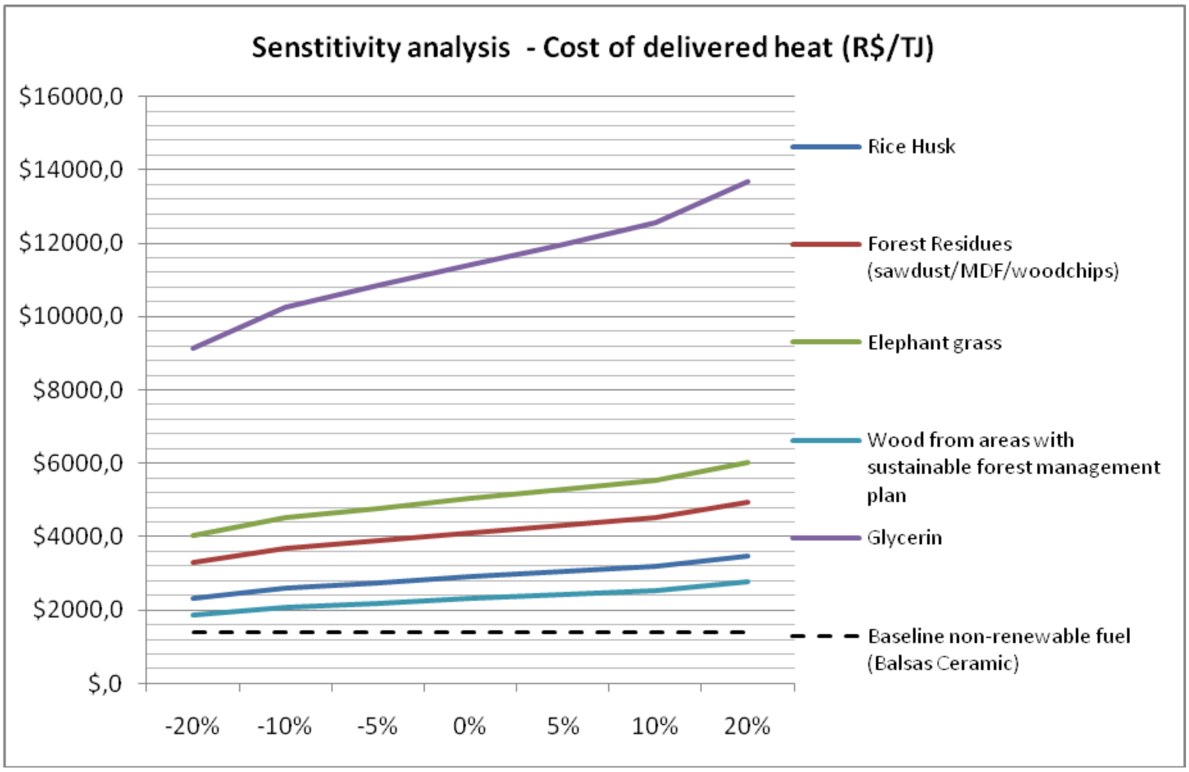
Table 8. Sensitivity analysis based on the variation on the cost of fuels.

	Cost of delivered heat according to variation on the cost of fuel						
Fuel type	**-20%**	**-10%**	**-5%**	**0%**	**5%**	**10%**	**20%**
Rice Husk	R$ 2,318.84	R$ 2,608.70	R$ 2,753.62	R$ 2,898.55	R$ 3,043.48	R$ 3,188.41	R$ 3,478.26
Forest Residues (sawdust/MDF/woodchips)	R$ 3,287.67	R$ 3,698.63	R$ 3,904.11	R$ 4,109.59	R$ 4,315.07	R$ 4,520.55	R$ 4,931.51
Elephant grass	R$ 4,026.87	R$ 4,530.22	R$ 4,781.90	R$ 5,033.58	R$ 5,285.26	R$ 5,536.94	R$ 6,040.30
Wood from areas with sustainable forest management plan	R$ 1,850.13	R$ 2,081.40	R$ 2,197.03	R$ 2,312.67	R$ 2,428.30	R$ 2,543.93	R$ 2,775.20
Glycerin	R$ 9,126.19	R$ 10,266.97	R$ 10,837.36	R$ 11,407.74	R$ 11,978.13	R$ 12,548.52	R$ 13,689.29
Baseline non-renewable fuel (***Balsas*** **Ceramic)**	R$ 1,402.84						

The sensitivity analysis shows that the fuels proposed by the project activity are significantly more costly than the baseline non-renewable fuel (native firewood).

The graphic below provides a summary of the sensitivity analysis.

Figure 2. Sensitivity analysis on the cost of delivered heat for renewable biomasses.



The sensitivity analysis demonstrates the cost of delivered heat is likely to increase due to the project implementation, since the use of biomass is more costly on an energy basis than the baseline fuel. An analysis on the fuels used by *Balsas* Ceramic indicates that the cost of delivered heat has indeed increased, going above R$ 2,500.00 per TJ, which is quite above baseline costs. Information on this analysis was made available to the validation team.

Step 4: Common Practice analysis

This Step is a credibility check to complement the investment analysis (Step 2) or barrier analysis (Step 3).

Sub-step 4a: Analyze other activities similar to the proposed project activity

In Brazil, the red ceramic pieces are produced through an inefficient and traditional processes using predominantly wood without forest management to generate thermal energy[40]. It happens because wood without forest management is offered for much lower prices than wood from areas

[40] ABREU, Y. V.; GUERRA, S. M. G. **Indústria de Cerâmica no Brasil e o Meio Ambient**e. Chile: IV Congreso Nacional de Energía, 2000. Available at: <http://www.nuca.ie.ufrj.br/bgn/bv/abreu2.htm>. Last visited on 15/3/2011. See also Ïnforme Setorial Cerâmica Vermelha", from Banco do Nordeste (Sectorial Information Report from Bank of Northeast). Available at: <http://www.bnb.com.br/content/aplicacao/etene/etene/docs/ano4_n21_informe_setorial_ceramica_vermelha.pdf >. Last visited on 18/05/2012.

with forest management[41]. Furthermore, using non-renewable wood is a simple procedure and well known by the kiln operators.

The native forest without any kind of sustainable management has traditionally been a source of firewood for the ceramic sector[42], which seemed inexhaustible, due to the amounts generated due to an expansion of the agriculture frontier. Unfortunately, hand in hand with it came environmental impacts like soil degradation, change in the rainfall regime and consequent desertification.

The ceramic industry sector has practically not evolved compared to the past, mainly due to the simple manufacturing techniques. Moreover, the major equipments (chiefly kilns) of the production process have not improved significantly in terms of technology or efficiency recently. Many of the ceramics factories still use non-renewable wood in their kilns and the drying process occurs naturally, without any energy utilization. Also, the influence of the market as a drive for improvements in this sector is very insignificant[43].

Thus, the common practice is the use of wood – more precisely its non-renewable fraction, which is the fuel most often employed, most viable and associated with the lower risks. Similar activities to the project were not found in the region, except those being developed within the carbon market[44] (as voluntary project activities) and hence cannot be included in this analysis.

Sub-step 4b: Discuss any similar Options that are occurring:

As described above, similar activities are not widely observed in the project region. According to the referenced tool for the demonstration and assessment of additionality, if similar activities cannot be observed then the proposed project activity is additional.

B.6 Emission reductions:

B.6.1. Explanation of methodological options or description of new proposed approach:

Below, a description of the equations and procedures used for the calculation of emission reductions follows:

<u>Emission Reductions</u>

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

[41] Seye, Omar. **Análise de ciclo de vida aplicada ao processo produtivo de cerâmica estrutural tendo como insumo energético capim elefante** (Pennisetum Purpureum Schaum) / Omar Seye. Campinas, SP: [s.n.], 2003. Available at: <http://libdigi.unicamp.br/document/?code=vtls000411276>. Last visited on 18/05/2012.

[42] UHLIG, A. **Lenha e carvão vegetal no Brasil: balanço oferta-demanda e métodos para a estimação do consumo**.2008, 156f. Dissertação (Pós graduação em Energia) – Universidade de São Paulo. Available at: <http://www.teses.usp.br/teses/disponiveis/86/86131/tde-14052008-113901/publico/UHLIG_Tese1.pdf>. Last visited on 18/05/2012.

[43] PAULETTI, M. C. **Modelo para Introdução de Nova Tecnologia em Agrupamentos de Micro e Pequenas Empresas: Estudo de Caso das indústrias de Cerâmica Vermelha no Vale do Rio Tijucas**. 2001. Available at: <http://biblioteca.universia.net/html_bura/ficha/params/id/597230.html>. Last visited on 18/05/2012.

[44] Such as several projects developed by Sustainable Carbon under the Voluntary Carbon Standard. Information on such projects available at: <http://www.markit.com/en/products/registry/markit-environmental-registry-public-view-reports.page#registered_projects>. Access this site and type Sustainable Carbon in the search field. Last visit on 18/05/2012.

Where:

ER_y: Emission reductions during the year y in tCO_2e

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

$f_{NRB,y}$: Fraction of woody biomass used in the absence of the project activity in year *y* that can be established as non-renewable biomass using survey methods

$NCV_{biomass}$: Net calorific value of non-renewable woody biomass that is substituted, in TJ/ton

$EF_{projected\ fossil\ fuel}$: Emission factor for substitution of non-renewable woody biomass by similar consumers, in tCO_2e/TJ[45].

B_y is calculated according to option (a) of the selected methodology, as follows:

(a) **B_y** is calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year);
More specifically, appliances are the kilns producing ceramic pieces in each ceramic. The consumption of woody biomass in the kilns is calculated as the amount of products (ceramic pieces) produced and the consumption of woody biomass per thousand of ceramic pieces fired in year y, as follows:

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

Where:

PR_y: Amount of products produced in year y, in thousand of ceramic pieces

BF_y: Quantity of woody biomass per thousand of ceramic units fired in year y.

The value of BF_y was determined with the use of the historical records from the ceramics included in the project, by dividing monthly average consumption in the baseline by monthly average baseline production.

According to procedures on the applied methodology, the project participants shall determine the shares of renewable and non-renewable woody biomass in B_y using nationally approved methods. Also, the following principles shall be taken into account:

Demonstrably Renewable woody biomass[46] (DRB)

Woody biomass is “renewable” if one of the following two conditions is satisfied:

1. The woody biomass is originating from land areas that are forests[47] where:

(a) The land area remains a forest;

(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

[45] According to the applied methodology, a value of 81.6 tCO2/TJ shall be used for this emission factor, representing the mix of fossil fuels to be used for the present and future.

[46] This definition uses elements of Annex 18, EB 23. Document available at: <http://cdm.unfccc.int/EB/Meetings/023/eb23_repan18.pdf>. Last visit on 15/03/2011.

[47] The forest definitions as established by the country in accordance with the Decisions 11/CP.7 and 19/CP.9 should apply.

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

2. The biomass is woody biomass and originates from non-forest areas (e.g. croplands, grasslands) where:
(a) The land area remains cropland and/or grasslands or is reverted to forest;
(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.

Non-renewable biomass

Non-renewable woody biomass (*NRB*) is the quantity of woody biomass used in the absence of the project activity (B_y) minus the *DRB* component, as long as at least two of the following supporting indicators are shown to exist:

- A trend showing an increase in time spent or distance travelled for gathering fuel-wood by users (or fuel-wood suppliers) or alternatively, a trend showing an increase in the distance the fuel wood is transported to the project area;
- Survey results, national or local statistics, studies, maps or other sources of information such as remote sensing data that show that carbon stocks are depleting in the project area;
- Increasing trends in fuel wood prices indicating a scarcity of fuel-wood;
- Trends in the types of cooking fuel collected by users, suggesting scarcity of woody biomass.

Thus the fraction of woody biomass saved by the project activity in year *y* that can be established as non-renewable is:

$$f_{NRB,y} = \frac{NRB}{NRB + DRB} \qquad \text{(Equation 3)}$$

Before the project activity, wood from areas without forest management was offered with low prices and high viability to the ceramic owner. According to the IBAMA Normative Instruction Nº 112 from 21/08/2006[48], the entrepreneur who uses raw material from native forests is obliged to use the DOF to control the origin, transportation, and storage of forest products and by-products. This document ensures that the related forest products were obtained from legalized areas where conservation measures are applied. Therefore, firewood with DOF is considered renewable, since it complies with item 1 of the definition of renewable biomass. On the other hand, no native firewood with no DOF is considered a non-renewable biomass. Thus, the fuel employed in the baseline scenario by *Balsas* ceramic was from non-renewable origin.

The $f_{NRB,y}$ parameter is determined in two steps: the first step is based on project specific information regarding the amount of native firewood from areas without forest management and the amount of firewood with DOF. This provides a fraction of non-renewable biomass used in the baseline

[48] *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* 18/05/2012.

scenario based on the origin of the firewood. The second step is an assessment on the fraction of woody biomass used that can be established as non-renewable biomass using survey methods applied to the *Cerrado* biome, where the project is located. Such assessment was based on Annex 20 of the 35th meeting of the Small Scale Working Group of the Clean Development Mechanism, which provides a methodology for the calculation of $f_{NRB,y}$[49]. A description of such methodology follows:

On a project-specific basis, project participants determine the shares of renewable (DRB) and non-renewable woody biomass (NRB) in the total biomass consumption. This has been performed in the first step, as described above.

A default value for $f_{NRB,y}$ in the *Cerrado* biome is derived by calculating Total Annual Biomass Removals (R) in this biome as a proxy for By and estimating the proportion of R that is demonstrably renewable (DRB) and non-renewable (NRB). The following equation is used:

$$NRB = R - DRB \qquad \text{(equation 4)}$$

Where:

R Total annual biomass removals (tonnes/year)

Total Annual Biomass Removals (R) for each country is inferred by calculating the sum of the Mean Annual Increment in biomass growth (MAI) and the Annual Change in Living Forest Biomass stocks (ΔF). Given biomass growth (MAI) and change in stock (ΔF) are both known, the balancing removals (R) can be calculated as the sum of the two, as below:

$$R = MAI + \Delta F \qquad \text{(equation 5)}$$

Where:

MAI Mean Annual Increment of biomass growth (tonnes/year)

ΔF Annual change in living Forest biomass (tonnes/year)

Mean Annual Increment of biomass growth (MAI) is calculated in equation below as the product of the Extent of Forest (F) in hectares and the country-specific Growth Rate (GR) of the Mean Annual Increment:

$$MAI = F \times GR \qquad \text{(equation 6)}$$

Where:

F Extent of forest (ha)

GR Annual growth rate of biomass (t/ha-yr)

Demonstrably renewable biomass (DRB) is calculated in equation below as the product of Protected Area Extent of Forest (PA) in hectares and the country-specific Growth Rate (GR) of the Mean Annual Increment:

$$DRB = PA \times GR \qquad \text{(equation 7)}$$

[49] *Document is available at: <http://cdm.unfccc.int/Panels/ssc_wg/meetings/035/ssc_035_an20.pdf>. Last visited on 18/05/2012.*

Where:
PA Protected Area Extent of Forest (ha)

This approach is considered appropriate since it takes in consideration historical practices of the ceramics involved in the project in regard to fuel usage, meaning only native firewood from areas without forest management will be considered as non-renewable. Also, choosing the biome where the project is located as the geographical boundary for the second step is a more accurate approach than performing a national assessment, given the dimensions and peculiarities of each biome in Brazil and considering that sub-regional information is not available nor feasible to obtain. Also, there is evidence to support that carbon stocks are depleting in the project area[50] and that there is a trend showing an increase in time spent or distance travelled for gathering fuel-wood by users[51] [52].

Leakage (LE_y)

According to the applied methodology, leakage relating to the non-renewable woody biomass saved by the project activity shall be assessed based on *ex post* surveys of users and the areas from which this woody biomass is sourced (using 90/30 precision for a selection of samples). The following potential source of leakage shall be considered:

(a) The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass used by the non-project households/users, that is attributable to the project activity, then B_y is adjusted to account for the quantified leakage. Alternatively, B_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

This source of leakage shall be assessed for each crediting period, but leakage emissions from this source are not expected since the common practice in the region (especially for ceramic industries) is the use of non-renewable biomasses. The fuel switching project is not expected to result in local alteration on fuel prices, since the volume of fuels used in the project are not significant compared to total availability of both baseline fuels (native firewood) and project fuels (renewable biomasses).

Leakage from the use of renewable biomass must be considered using the general guidance on leakage in biomass project activities (attachment C of Appendix B)[53]. Also, the specific rules on

[50] The Brazilian Forestry Service provides data regarding estimates of carbon pools in million metric tonnes for natural forests per biome, per category and per year, showing that the net carbon emissions for the *Cerrado* biome in the measured carbon pools constantly decreased between 1990 and 2005. Document available at: <http://www.florestal.gov.br/snif/recursos-florestais/estoque-das-florestas>. Last visited on 18/06/2012.

[51] EMBRAPA. **Manejo Florestal ou Silvicultura?** Information on third paragraph shows increasing distances to obtain firewood in the *Cerrado* biome. Document available at: <http://www.embrapa.br/imprensa/artigos/2003/artigo.2004-12-07.2303694691/>. Last visited on 18/06/2012.

[52] REINATO, Carlos H. R. et al. **Consumo de energia e custo de secagem de café cereja em propriedades agrícolas do sul de Minas Gerais.** Information on third paragraph shows increasing distances to obtain firewood in the *Cerrado* biome Document available at: <http://www.scielo.br/pdf/rbeaa/v6n1/v6n1a20.pdf>. Last visited on 18/06/2012.

[53] Document available at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentC.pdf>. Last visit on 18/05/2012.

biomass resources as set out in the applicable version of the Gold Standard, especially ToolKit Annex C shall be complied with.

For this project activity, the following sources of leakage are included:

A. *Shifts of pre-project activities*;

B. *Emissions related to the production of Biomass*, and;

C. *Competing uses for the biomass*.

The Attachement C to Appendix B of the Indicative simplified baseline and monitoring methodologies provides different emission sources based on type of biomass being considered. For biomass from forests and biomass from croplands or grasslands, the project boundary shall include the area where the biomass is extracted or produced. Table below summarizes the sources of leakage.

Table 9. 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 relevant to the present project activity are the competing use of biomass for biomass from existing forests and for biomass residues or waste. The source of leakage of the present project is assessed below, for each type of biomass:

<u>Rice Husk</u>

The project activity is switching native firewood to rice husk, an abundant biomass in the region. The state of *Maranhão* is one of the main producers of rice in Brazil and, consequently, a great supplier of rice husk.

Table 10 shows production of rice and rice husk in the state of *Maranhão* in the years of 2010 and 2011[54]. Each tonne of produced rice leads to the supply of 0.22 tonne of rice husk[55].

[54] Source:<http://cepa.epagri.sc.gov.br/Publicacoes/Sintese_2011/Arroz%20sintese%202011.pdf>. Visited in: 26/04/2012.

[55]Source: EMBRAPA. Available in: <http://sistemasdeproducao.cnptia.embrapa.br/>. Visited in: September 06th, 2008.

Table 10. Rice and rice husk production in 2010 e 2011.

Harvest	Rice (tonnes)	Rice husk (tonnes)
2009/10	590 thousand	129.8 thousand
2010/11	704 thousand	154.9 thousand

The harvest of 2010/11 produced 704 thousand tonnes, generating around 154.9 thousand tonnes of rice husks. The project activity will employ approximately 354.57 tonnes[56] of biomass per month which leads to the fraction of 0.23% of the total availability of this kind of biomass in the region. Thus, It can be concluded that the biomass available is widely superior then the amount required for this project i.e. leakage from rice husk can be neglected.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**$EF_{projected\_fossilfuel}$**
Data unit:	tCO_2/TJ
Description:	Emission factor for substitution of non-renewable woody biomass by similar consumers.
Source of data used:	Approved small scale methodology AMS-I.E "Switch from Non-Renewable Biomass for Thermal Applications by the User", version 05.
Value applied:	81.6 tCO_2/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	In the baseline scenario, non-renewable biomass was used as an energy source. This is the common practice for the red ceramic sector in the project region. As described in Section B.5, the use of fossil fuels is the most likely scenario in the absence of non-renewable biomass. This emission factor is recommended by the applied methodology to represent the mix of fossil fuels to be used for the present and future.
Any comment:	

Data / Parameter:	**$NCV_{biomass}$**
Data unit:	TJ/ton
Description:	Net calorific value of the non-renewable woody biomass that is substituted
Source of data used:	Approved small scale methodology AMS-I.E "Switch from Non-Renewable Biomass for Thermal Applications by the User", version 05.
Value applied:	0.015
Justification of the choice of data or description of measurement methods and procedures	In the baseline scenario, non-renewable biomass was used as an energy source. This is the common practice for the red ceramic sector in the project region. Applied value is recommended by the approved methodology.

[56] Source: According to the average of rice husks consumed by *Velotex* ceramic during 2011 and 2012.

actually applied :	
Any comment:	

Data / Parameter:	$\rho_{biomass}$
Data unit:	Tonnes/m³
Description:	Specific gravity of non-renewable biomass type *j*
Source of data used:	Brazilian study carried out with Cerrado wood: VALE, A.T; BRASIL, M.A.M; LEÃO, A.L. **Quantificação e caracterização energética da madeira e casca de espécies de Cerrado**. Ciência Florestal, Santa Maria; v.12, n.1, p. 71-80; 2002. Available at: <http://www.ufsm.br/cienciaflorestal/artigos/v12n1/A8V12N1.pdf>. Visited on: 27/04/2012.
Value applied:	0.5702
Justification of the choice of data or description of measurement methods and procedures actually applied :	The amount of wood used in the baseline was measured in volume units. This data is used for the unit conversion. The species used to calculate the average value of this parameter are typical trees of *Cerrado* Biome that are usually utilized as fuel in the ceramic industries of the region.
Any comment:	

Data / Parameter:	BF_y
Data unit:	Tonnes of wood per thousand of ceramic pieces
Description:	Quantity of woody biomass per thousand of ceramic units fired in year y
Source of data used:	Historical data from project proponent
Value of data	0.4312
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value was acquired using historical data on woody biomass consumption and production of ceramic pieces when the ceramic used to consume non-renewable wood. Data from 2009 was used. The value is employed to calculate the real amount of wood displaced to maintain the ceramic production in the baseline scenario.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Emission reductions are calculated with equations described in Section B.6.1. The quantity of woody biomass per thousand of ceramic units fired (BF_y) is calculated based on historical information on production and fuel consumption in *Balsas* ceramic. Internal data is partially used to determine baseline emissions (such as the production of bricks in the baseline period), but are considered to be of a reliable nature since they are used to assess the *Balsas* ceramic productivity.

The consumption of non-renewable fuels during the baseline period was taken from receipts signed by fuel suppliers, a third party information which is used for commercial purposes (to determine financial compensations between the ceramic owners and the suppliers). Hence, this information is also considered to be reliable.

Data from 2008 (the last year before the project measures became operational) was used. Data used to calculate baseline emissions were doubled checked by Sustainable Carbon in order to minimize the likelihood of data errors. This set of data was chosen based on the prerogative of conservativeness and is considered to be the most reliable data available to determine baseline emissions. Margins of error are not quantified but are expected to be small, (lower than 10%) due to the reliable nature of the data used. Table below provides information on production and fuel consumption for *Balsas* ceramic.

Table 11. Baseline information for each *Balsas* ceramic.

Parameter	*Balsas* Ceramic
2008 production (thousands of ceramic pieces)	11,516
2008 consumption of non-renewable native firewood (tonnes)	413.83
Quantity of woody biomass per thousand of ceramic units fired in year y (BF_y)	0.4312
Quantity of woody biomass that is substituted or displaced in tonnes (B_y)	4,965.69

Balsas ceramic have used exclusively native firewood prior to the project initiation. This type of biomass is considered non-renewable woody biomass.

The $f_{NRB,y}$ parameter is determined in two steps: the first step is based on project specific information regarding the amount of native firewood from areas without forest management plan. This provides a fraction of non-renewable biomass used in the baseline scenario based on the origin of the firewood. The second step is an assessment on the fraction of woody biomass used that can be established as non-renewable biomass using survey methods applied to the *Cerrado* biome, where the project is located. Such assessment was based on Annex 20 of the 35th meeting of the Small Scale Working Group of the Clean Development Mechanism, which provides a methodology for the calculation of $f_{NRB,y}$[57]. Table below summarizes project specific data used for the calculation of $f_{NRB,y}$.

[57] Document is available at: <http://cdm.unfccc.int/Panels/ssc_wg/meetings/035/ssc_035_an20.pdf>. Last visited on 18/05/2012.

Table 12. Project specific data used for the determination of $f_{NRB,y}$.

Parameter	*Balsas* ceramic
Consumption of non-renewable woody biomass for 2008 (tonnes)	413.83
Fraction of non-renewable woody biomass used in 2008 (calculated with equation 3)	0.8368

Figures on the table above were calculated from historical records of *Balsas* ceramic. Data on the fuels used in 2008 was considered. Receipts of sale from native firewood providers were used to determine the amount of non-renewable woody biomass used by *Balsas* ceramic. All of the providers considered for the quantification of non-renewable biomass were extracting firewood from the *Cerrado* biome without any forest management or conservation methods. Receipts of sale were made available to the validation team.

Table 13. Data used for determination of $f_{NRB,y}$ for the *Cerrado* biome.

Parameter	Unit	Value	Source
Non-renewable biomass in the *Cerrado* biome (NRB)	tonnes/year	525,078,686	Calculated by Project Participants.
Demonstrably renewable biomass in the *Cerrado* biome (DRB)	tonnes/year	96,280,135	Calculated by Project Participants.
Extent of natural forests in the *Cerrado* biome	Hectares	70,007,832	FAO. Global Forest Resources Assessment 2010: Brazil. Table "Result of forest area estimation data for 1990, 2000, 2005, and 2010", Pag 17. Available at: <http://www.fao.org/docrep/013/al464E/al464E.pdf>. Last visited: 18/06/2012
Extent of planted forests in the *Cerrado* biome	Hectares	4,804,350	ABRAF Statistical Yearbook 2010. Publication available at: http://www.abraflor.org.br/estatisticas/ABRAF10-EN.pdf. Information on Table 1.01.
Growth rate of natural forests	tonnes d.m./ha/year	7.4	Second National Inventory of Greenhouse Gas Emissions. Document available at: http://www.mct.gov.br/upd_blob/0215/215037.pdf. Information taken from Section 3.5.2.3, page 239 of the report. A value of 3.7 tC/hectare/year was chosen, which is applicable to forest areas with above ground biomass below 93 tC/hectare. This parameter was divided by 0.5 to convert from

Parameter	Unit	Value	Source
			tonnes of carbon to tonnes of dry biomass.
Growth rate of planted forests	tonnes d.m./ha/year	20.33	ABRAF Statistical Yearbook 2010. Publication available at: http://www.abraflor.org.br/estatisticas/ABRAF10-EN.pdf. Information on Graph 2.05 .
Protected Area Extent of Forest	Hectares	13,010,829	Ministério do Meio Ambiente. *Florestas do Brasil em resumo* (Brazilian Ministry of the Environment. *Brazilian forests in brief*). Publication available at: http://www.ciflorestas.com.br/arquivos/doc_florestas_resumo_22648.pdf. Information available on page 39 of the report.
Fraction of non-renewable woody biomass in the Cerrado biome	%	84.50%	Calculated by Project Participants.

Finally, table below provides values applied for the calculation of emission reductions according to equation 1.

Table 14. Data used for the calculation of emission reductions.

Parameter		*Balsas* Ceramic
B_y	Quantity of woody biomass that is substituted or displaced in tonnes	4,965.69
$f_{NRB,y}$	Fraction of woody biomass used in the absence of the project activity in year *y* that can be established as non-renewable biomass	0.8450
$NCV_{biomass}$	Net calorific value of non-renewable woody biomass that is substituted, in TJ/ton	0.015
$EF_{projected\ fossil\ fuel}$	Emission factor for substitution of non-renewable woody biomass by similar consumers, in tCO_2e/TJ	81.6
ER_y	Emission reductions in the year y	5,136

It is important to state that the actual production and use of renewable biomass might be different during the crediting period. Production naturally fluctuates according to market demand. The ceramics might manage to use higher amounts of renewable biomass in case the production increases, which is expected to occur during the crediting period. The ceramics may use different kinds of renewable biomass during the crediting period, as long as its origin is verifiable. The consumption of each type of renewable biomass will be monitored during the crediting period. Emission reductions will be calculated based on monitored values of production and fuel usage.

Therefore, baseline emissions are calculated based on historical data on production levels and fuel consumption in *Balsas* ceramic. Tables below provide the calculated baseline emissions. More information on baseline emissions can be found in Annex 3. Project emissions are not considered according to the approved methodology. Emissions due to transportation of the renewable biomasses are not expected to significantly increase compared to emissions resulting from the transportation of the baseline fuel (non-renewable biomass). Leakage emissions are estimated to be zero, since the project will use primarily abundant biomass residues, thus not causing emissions from any of the leakage sources described in Section B.6.1. Table below provides information on baseline emissions for each ceramic across the crediting period.

Table 15. Baseline emissions of each ceramic (in tCO_2e).

Year	Total Baseline emissions of *Balsas* ceramic
2011	5,136
2012	5,136
2013	5,136
2014	5,136
2015	5,136
2016	5,136
2017	5,136
2018	5,136
2019	5,136
2020	5,086
Total baseline emissions (tCO2e)	**51,360**
Number of years of the crediting period	10
Annual average of estimated baseline emissions for the 10 years of crediting period (tCO2e)	**5,136**

The project capacity for thermal energy generation was calculated based on the amount of woody biomass used as fuel in 2008 and on the net calorific value of such fuel. These parameters allow quantifying the amount of thermal energy produced (in TJ). A conversion factor was used to obtain the amount of energy produced in 2008 in $MWh_{thermal}$. This value was divided by 8,760 hours per year to determine the equivalent capacity of the project. Table below provides more information on such calculation.

Table 16. Data used for the calculation of the project thermal energy capacity.

Parameter	Unit	Value	Source
Amount of woody biomass fired in 2008	Tonnes	413.83	Historical data from the ceramics
Net calorific value of	TJ/ton	0.015	Please see Section B.6.2, item $NCV_{biomass}$

Parameter	Unit	Value	Source
woody biomass			
Energy generated from woody biomass	TJ	74.49	Calculated with the information above
Energy generated from woody biomass	MWh	20,691.55	Calculated with a conversion factor of 277.78 MWh/TJ was used. Source: ANEEL (Brazilian Electricity Regulatory Agency). Available at: <http://www.aneel.gov.br/arquivos/PDF/atlas_fatoresdeconversao_indice.pdf>
Equivalent energy capacity (bundled project)	MW	2.36	Calculated as the energy generated (in MWh) divided by 8,760 hours per year.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Total Baseline emissions (tCO_2e)	Total Project emissions (tCO_2e)	Leakage (tCO_2e)	Total emission reductions (tCO_2e)
2011	5,136	0	0	5,136
2012	5,136	0	0	5,136
2013	5,136	0	0	5,136
2014	5,136	0	0	5,136
2015	5,136	0	0	5,136
2016	5,136	0	0	5,136
2017	5,136	0	0	5,136
2018	5,136	0	0	5,136
2019	5,136	0	0	5,136
2020	5,136	0	0	5,136
Total Emission Reductions (tCO_2e)	**51,360**	**0**	**0**	**51,360**
Number of years of the crediting period	10	10	10	10
Annual average of estimated emissions reductions for the 10 years of crediting period (tCO_2e)	**5,136**	**0**	**0**	**5,136**

B.7 Application of a monitoring methodology and description of the monitoring plan as per the existing or new methodology applied to the micro-scale project activity:

B.7.1 Data and parameters monitored:

Data / Parameter:	**PR_y**
Data unit:	Thousands of ceramic pieces
Description:	Amount of products produced in year y
Source of data to be used:	Controlled by the ceramic owners
Value of data	Values applied for ex-ante calculation are described in Section B.6.3. Detailed information is available in Annex 3.
Brief description of measurement methods and procedures to be applied:	This parameter is monitored by employees on *Balsas* ceramic, counting the total production on a daily or weekly basis. Values used for the calculations are taken either from sales reports or from production control documents. Data will be aggregated on a monthly and yearly basis. Measurements are done by an internal control sheet monitored by the project proponent. The production might also be used to ensure that all appliances are still in operation.
QA/QC procedures to be applied:	*Balsas* ceramic have internal controls to assure proper monitoring of this parameter. Data will be compared to the amount of renewable biomass employed.
Any comment:	Although this information originates from internal data, margins of error for this parameter are expected to be small, since they are used to assess the productivity of *Balsas* Ceramic. Hence, this information is considered to be from a reliable nature. 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:	**$Q_{renbiomass}$**
Data unit:	Tonnes
Description:	Amount of renewable biomass used during year y of the crediting period
Source of data to be used:	Measured by the biomass providers and controlled by the ceramic owners
Value of data	This parameter is not directly used for the calculation of emission reductions. It is assumed that the consumption of renewable biomass will be enough to provide 100% of the energy demand for the production of ceramic pieces.
Brief description of measurement methods and procedures to be applied:	It is monitored through purchase invoice, delivery notes or other documents concerning the acquisition of renewable biomasses. Biomass providers measure the amount of products delivered to the ceramics to determine due financial compensation. In case any renewable biomass is measured in volume, default values of specific gravity shall be used to convert it to tonnes. Values below might be

	applied for the given biomass types: **Biomass type** / **Specific gravity (tonnes/m³)** Rice husks / 1.458 These value were taken from the source below: **Rice husks:** SILVA, A. P., AKASAKI, J. L. *Produção de tijolos de solo-cal + resíduos agroindustriais.* Available at: <http://www.ppgec.feis.unesp.br/producao2004/Produ%E7%E3o%20de%20tijolos%20de%20solo-cal%20+%20res%EDduos%20agroindustriais.pdf>.
QA/QC procedures to be applied:	*Balsas* ceramic shall store all documents related to the purchase or acquisition of renewable biomass. Data will be compared to production output.
Any comment:	Monitored data for this parameter comes from third party information, which is used for commercial purposes (to determine financial compensations between the ceramic owners and the suppliers). Hence, this information is considered to be reliable. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	$f_{NRB,y}$
Data unit:	Fraction or percentage
Description:	Fraction of woody biomass used in the absence of the project activity in year *y* that can be established as non-renewable using survey methods
Source of data to be used:	Survey methods.
Value of data	0.8450 or 84.50%
Brief description of measurement methods and procedures to be applied:	The monitoring of this parameter will be based on national and international articles, databases and data monitored by the project developer such as project activities at the same region. The sources will provide information about the availability of woody biomass in the *Cerrado* biome.
QA/QC procedures to be applied:	Data from published sources will be used to determine this parameter.
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:	***Origin of Renewable Biomass***
Data unit:	Not applicable
Description:	Renewable origin of the biomass
Source of data to be	Controlled by the ceramic owners

used:	
Value of data	Not applied for the calculation. It is assumed that all biomass used during the crediting period is demonstrably renewable.
Brief 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 section B.6.1, the biomasses are considered renewable as fulfilling definitions of renewable biomass approved by the CDM Executive Board.
QA/QC procedures to be applied:	Ceramic owner shall store invoices, receipt of sales or other documents to allow the traceability of the renewable biomass.
Any comment:	The biomasses will be considered as renewable if they are in accordance to the definition by the CDM Executive Board. 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>Leakage due to competing uses of biomass</td></tr>
<tr><td>Data unit:</td><td>tCO_2e</td></tr>
<tr><td>Description:</td><td>This source of leakage is relevant for biomass residues and biomass from existing forests, according to the general guidance on leakage in biomass project activities. The quantity of renewable biomass available will be assessed annually to determine the occurrence of leakage.</td></tr>
<tr><td>Source of data to be used:</td><td>Monitored by surveys and publications</td></tr>
<tr><td>Value of data</td><td>0 (zero). The amount of biomass available is described in Section B.6.1. It is considered that there is sufficient biomass surplus in the region to avoid the occurrence of leakage. The following biomass availability in the project region is considered:
<table>
<tr><th>Biomass type</th><th>Availability</th><th>Year</th></tr>
<tr><td>Rice husks</td><td>154.9 thousand tonnes</td><td>2010/11</td></tr>
<tr><td>Woody residues (Sawdust, MDF and Wood chips)</td><td>40,160.78 m^3</td><td>2010</td></tr>
<tr><td>Wood from management areas</td><td>1,625,674 m^3</td><td>2011</td></tr>
<tr><td>Glycerin</td><td>266,666.67 m^3</td><td>2010</td></tr>
<tr><td>Elephant grass</td><td>Not applicable.</td><td>-</td></tr>
</table></td></tr>
<tr><td>Brief description of measurement methods and procedures to be applied:</td><td>Biomass availability will be used to calculate leakage from renewable biomass.
Surveys and publications shall be used to determine the availability of each type of biomass in the project region (the State of Maranhão and neighboring States). Sources of information shall provided figures that allow for the estimation of the availability of the types of biomass residues used by the</td></tr>
</table>

	ceramics. Project Proponents consider it is a conservative measure to estimate leakage emissions from competing use of biomass in case both the following conditions are met: (i) there is insufficient data to determine the total amount of biomass that is utilized in the project region (including non-project users); (ii) the project use is equal to or above 10% of total biomass availability in the project region; The sources of leakages predicted in the 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's regions.
QA/QC procedures to be applied:	Data available regarding the ceramic industry fuel consumption will be utilized to monitor the leakage.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	***Leakage of non-renewable woody biomass***
Data unit:	tCO_2e
Description:	Leakage relating to non-renewable woody biomass
Source of data to be used:	Monitored
Value of data	0 (zero). It is assumed that no emissions occur due to this source, as explained in Section B.6.1.
Brief description of measurement methods and procedures to be applied:	The source of leakage from non-renewable biomass will be monitored according to the applied methodology.
QA/QC procedures to be applied:	Data available regarding the ceramic industry fuel consumption will be employed to monitor the leakage.
Any comment:	The biomasses will be considered as renewable if they are in accordance to the definition by the CDM Executive Board. 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.

Monitoring shall also include checking of all appliances or a representative sample thereof, at least once every two years to ensure that they are still operating or are replaced by an equivalent in service appliance. Checking will consist of visual inspections and interviews with the employees of *Balsas* ceramic to confirm the kilns are still operating or were replaced by an equivalent in service kiln.

B.7.2 Description of the monitoring plan:

The party responsible for implementing the monitoring plan will be the owner of *Balsas* ceramic. The ceramic owner will also be responsible for developing the forms and registration formats for data collection and further classification. Monitored 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. For this purpose, the authority for the registration, monitoring, measurement and reporting will be *Mr. José Thyrson Ladeira da Paz*. 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. Monitored parameters are described in Section B.7.1 and will be monitored with the frequency described in Table below.

Table 17. Further information on the monitored parameters.

Parameters	Description	Units	Origin	Frequency
PR_y	Amount of products produced in year y	Thousands of ceramic pieces	This parameter is monitored by employees on *Balsas* ceramic, counting the total production. Measurements are done by an internal control sheet monitored by the project proponent. Values used during the project monitoring might be taken either from sales reports or from production control documents.	Measured on a daily or weekly basis. Data will be aggregated on a monthly and yearly basis.
$Q_{renbiomass}$	Amount of renewable biomass used during year *y* of the crediting period	Tonnes	Measured by the biomass providers and controlled by the ceramic owner. Data is calculated from receipts, invoices and other documents regarding the acquisition of biomass.	Monthly
$f_{NRB,y}$	Fraction of woody biomass used in the absence of the project activity in year *y* that can be established as non-renewable	Fraction	Survey methods, as described in Section B.7.1	Annually
Origin of Renewable Biomass	Renewable origin of the biomass	Not applicable	Controlled by the ceramic owner	Annually
Leakage due to competing	This source of leakage is relevant	tCO_2e	Monitored by surveys and publications	Annually

Parameters	Description	Units	Origin	Frequency
uses of biomass	for biomass residues and biomass from existing forests. The quantity of renewable biomass available will be assessed annually to determine the occurrence of leakage			
Leakage of non-renewable woody biomass	This source of leakage assesses the use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources.	tCO_2e	Monitored by surveys and publications	Annually
Checking of all appliances (kiln)	According to the applied methodology, monitoring shall include checking of all appliances or a representative sample thereof, to ensure that they are still operating or are replaced by an equivalent in service appliance.	Not applicable	Sustainable Carbon shall perform visual inspections and interviews with the employees on each ceramic factory to confirm the kilns are still operating or were replaced by an equivalent in service kiln.	Once every two years

B.8 Date of completion of the application of the existing or new baseline and monitoring methodology and name of the responsible person(s)/entity(ies)

The application of the baseline and monitoring methodology was finalized on 10/08/2012. The following entity is responsible for applying the baseline and monitoring methodology:

SUSTAINABLE CARBON - PROJETOS AMBIENTAIS LTDA

Project developers: Thiago de Avila Othero and Marcelo Hector Sabbagh Haddad: Technical Coordinators.

Camila Vaccari and Mariana dos Santos Silva, Technical Analysts.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/04/2009. On this date, *Balsas* ceramic starts to use exclusively renewable biomass in the ceramic kilns. The starting date of the project is before the "*Time of first submission*" as per Gold Standard definitions[58]. Hence, the project is applying for retroactive registration according to Gold Standard Toolkit Section 1.2.6.

C.1.2. Expected operational lifetime of the project activity:

30 years 0 months.

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

Not applicable.

C.2.1.2. Length of the first crediting period:

Not applicable.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/01/2011. The starting date of the crediting period was defined to ensure the project is able to request retroactive credits in line with Gold Standard requirements version 2.2. Such date was defined based on a conservative estimate on the likely date of project registration under the Gold Standard (around January 2013). On this date, the ceramic factories were already reducing their baseline emissions due to the use of renewable biomass.

C.2.2.2. Length:

10 years, 0 months.

[58] According to Gold Standard Requirements version 2.2, the time of first submission means submission of the Local Stakeholder Consultation Report for projects proceeding under the regular project cycle, and submission of the required Gold Standard project activity documentation for a Pre-Feasibility Assessment and payment of the applicable fee under the retroactive project cycle.

SECTION D. Stakeholders' comments

D.1. Brief description how comments by local stakeholders have been invited and compiled:

Stakeholders have not yet been consulted. However, a Stakeholder Feedback Round is been planned. As requested during the pre-feasibility assessment, project proponents will develop the Stakeholder Feedback Round in accordance to Gold Standard recommendations of for the Local Stakeholder Consultation process including a physical meeting with the stakeholders.

D.2. Summary of the comments received:

No comments received, since stakeholder consultation was not yet performed.

D.3. Report on how due account was taken of any comments received and on measures taken to address concerns raised:

No comments received, since stakeholder consultation was not yet performed.

D.4. Report on the Continuous input / grievance mechanism:

Discuss the Continuous input / grievance mechanism expression method and details, as discussed with local stakeholders.

	Method Chosen (include all known details e.g. location of book, phone, number, identity of mediator)	Justification
Continuous Input / Grievance Expression Process Book	Continuous Input will be defined during the Stakeholder Feedback Round.	Telephone and email access are considered by the project participants as a reliable method to allow continuous input from stakeholders. Additional methods will be discussed during the Stakeholder Feedback Round.
Telephone access	+55 11 2649-0036	
Internet/email access	thiago.othero@sustainablecarbon.com	
Nominated Independent Mediator (optional)	The Nominated Independent Mediator will be defined if necessary during the Stakeholder Feedback Round.	

All issues identified during the crediting period through any of the Methods shall have a mitigation measure in place that should be added to the monitoring plan.

D.5. Report on stakeholder consultation feedback round:

No comments received, since stakeholder consultation was not yet performed.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Represented by:	Mr. Stefano Merlin
Title:	CEO
Salutation:	Mr.
Last Name:	Merlin
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Building:	Not applicable.
City:	*Balsas*
State/Region:	Maranhão
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URL:	Not Available
Represented by:	José Thyrson Ladeira da Paz
Title:	Director
Salutation:	Mr.
Last Name:	da Paz
Middle Name:	Ladeira
First Name:	José Thyrson

Department:	General Management
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Annex 2 - **Information regarding Public Funding**

There is no public funding involved in this project activity. The project does not receive Official Development Assistance.

Annex 3 – **Baseline Information**

Consumption of woody biomass:

Year	Month	Native Firewood (non-renewable biomass) used [m³]	Total of non-renewable biomass [t]
2008	January	360.05	205.31
	February	750.00	427.66
	March	207.92	118.56
	April	202.93	115.71
	May	326.60	186.23
	June	751.12	428.30
	July	1,008.12	574.84
	August	1,086.96	619.80
	September	1,135.10	647.25
	October	1,028.04	586.20
	November	1,059.78	604.30
	December	792.36	451.81
	Total	**8,708.98**	**4,965.97**
	Average	**725.75**	**413.83**

Baseline production:

Baseline historical data		
Year	**Month**	**Production [thousands]**
2008	January	851
	February	922
	March	870
	April	1,002
	May	935
	June	1,045
	July	967
	August	958
	September	940
	October	994
	November	1,028
	December	1,003
	Total	**11,516**
	Average	**959.664**

Annex 4 – **Monitoring Information**

Monitoring information is available on Section B.7.