

CENOL AND TELHA FORTE CERAMICS SWITCHING FUEL PROJECT



Document Prepared By Sustainable Carbon – Projetos Ambientais Ltda

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1 PROJECT DETAILS

1.1 Summary Description of Project

This project activity was developed by Carbono Social Serviços Ambientais LTDA. (Social Carbon Company), which has changed its company name to Sustainable Carbon - Projetos Ambientais LTDA.

The project activity is the project of *Cenol* and *Telha Forte* Ceramics, which are two ceramic companies located in *São Miguel do Guamá* municipality, in the State of Pará, north of Brazil. Both ceramic companies produce structural ceramic pieces as bricks, mainly for the regional market in *Belém* and for the northeast region of the State.

The objective of the implementation of this project activity in these two ceramic companies is to stop using native wood, which is a non-renewable fuel, and completely substitute it with renewable biomasses to feed their kilns and fire their ceramic units, so that they can minimize environmental impacts related to the native wood deforestation and consumption.

This fuel switching project is reducing Greenhouse Gas (GHG) emissions through the substitution of native wood for renewable biomasses to generate thermal energy. It was concluded that this is feasible when considering the income derived from commercializing the resulting carbon credits. This move was originally unattractive due to the high investment costs of the adaptation of machineries to the new biomass and other barriers.

Therefore, the emissions launched during the combustion of wood were not compensated by the replanting. An opposite scenario occurs with the renewable biomasses employed in this project activity, which have carbon neutral lifecycle.

In opposition to the identified baseline, the project activity generates thermal energy without stimulating deforestation and uses abundant renewable biomass.

The emission reductions due to the switching of non-renewable to renewable biomasses were equal to **34,679 tCO₂e** during the monitoring period from 01/03/2011 to 30/04/2012. The contribution to sustainability is being monitored applying the SOCIALCARBON® Standard, which is based in six main pointers: Technology; Natural; Financial; Human; Social and Carbon Resources.

1.2 Sectoral Scope and Project Type

The project is associated to the following scope, as per UNFCCC definitions:

1 - Energy industries (renewable - / non-renewable sources);

This is not an AFOLU project. This is not a grouped project.

This is a bundled project of two ceramic companies located in the State of Pará, Brazil.

1.3 Project Proponent

Project Proponents

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

Cenol and Telha Forte Ceramics:

Industrial Establishment: Cenol Cerâmica do Norte Ltda

Industrial Establishment: Cerâmica Telha Forte Ltda

Mr. Francisco Valdir, Director and owner: Information about the ceramic companies, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramics devices market challenges.

Mrs. Heronita Silva Sobrinho. Secretary and Monitoring data responsible: General data and information on inputs and outputs of the ceramic companies, detailed information on the acquisition of renewable biomasses and how this data is kept by the controller's office.

Other information on the project's proponent¹:

Phone number: +55 (91) 3446-2341

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.

The fifth monitoring report was completed on 31/08/2012 by *Camila Vaccari, Mariana dos Santos Silva, Marcelo Hector Sabbagh Haddad, Felipe Sanchez A. Silva, Mariana Fieri, Larissa Tega da Fonseca* and *Thiago de Avila Othero*, from *Sustainable Carbon – Projetos Ambientais LTDA*.

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

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1.4 Other Entities Involved in the Project

No other entity was involved in the project.

¹ The address of the ceramic can be found on Section 1.7.

1.5 Project Start Date

According to version 05 of the VCS PD², project start date was defined as 01/03/2007. On this date, the project began reducing or removing GHG emissions. i.e. when the project proponent began employing renewable biomass.

VCS project crediting period: 10 years, two times renewable.

1.6 Project Crediting Period

The crediting period for this project starts on 01/11/2007 and ends on 31/10/2017.

VCS project crediting period: 10 years, two times renewable.

1.7 Project Location

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

The ceramic companies are located in Brazil, in the State of *Pará*, which is indicated in Figure 01. The project site has the following postal address:

Rodovia BR 010 – km 1808 – Bairro Industrial

São Miguel do Guamá – *Pará*, Brazil

Postal Code: 68660-000

Table 1. Localization of the ceramics companies

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

² Document available at: <http://mc.markit.com/br-reg/public/project.jsp?project_id=1000000000000007>. Last visited on 03/07/2012.

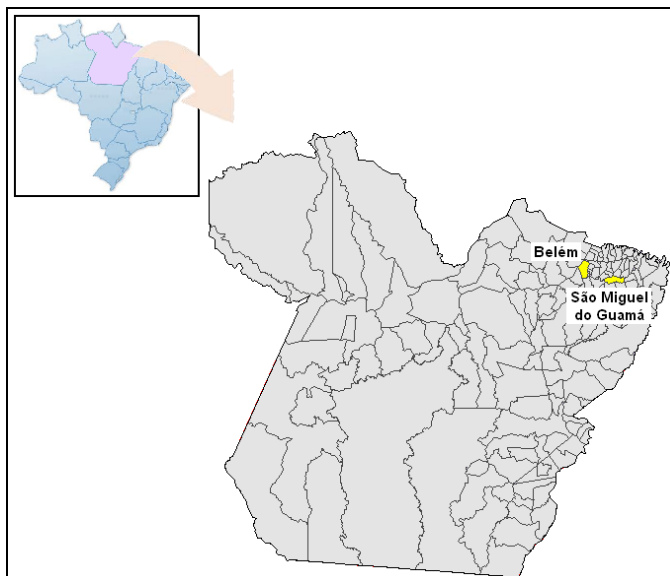


Figure 1. Geographic location of the city of the project activity that has the following coordinates in Pará State: São Miguel do Guamá: 01° 37' 09.22" S, 47° 28' 33.68" W.

1.8 Title and Reference of Methodology

The project applies a small scale methodology approved under the Clean Development Mechanism, as follows:

Category AMS-I.E.: Switch from Non-Renewable Biomass for Thermal Applications by the User – Version 01, valid from 01/02/2008 to 08/04/2010³. This category comprises small thermal appliances that displace the use of non-renewable biomass by introducing new renewable energy end-user technologies.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The VCS PD was validated by the Designated Operational Entity TÜV Nord Cert GmbH and this present monitoring report is being verified by Designated Operational Entity TÜV Rheinland (China) Ltd.

The project has been fully operational since the starting date of the crediting period. This means the ceramics is operating using exclusively renewable biomass (sawdust and *açaí* pits), thus mitigating their baseline emissions.

As described in the VCS PD v.05 during the validation process *Cenol* and *Telha Forte* ceramics utilized two different types of kilns in their burning process: *Round*⁴ kilns and *Paulista*⁵ kilns. During the period of

³ This version of the methodology is available at:

<http://cdm.unfccc.int/UserManagement/FileStorage/CDM_AMSP4VBBO5G54RXDE9KQ6FJWMGHZLHFA5>. Last visit on: 04/06/2012.

⁴ The "Round" kiln is a kind of intermittent kiln with Round shape and lateral furnaces. Its internal diameter is about 9 meters. It is usually employed to burn tiles and bricks.

VCS PD v.05, the production of Telha Forte encompassed eight Round kilns and 5 Paulista kilns. In the last period verified - 4th Monitoring Report - Telha Forte deactivated 8 Round kilns. Currently, in the 5th period of the Monitoring, Telha Forte constructed 3 Paulista kilns and operates with a total of 8 Paulista kilns. The production of these new kilns was excluded from the last monitoring report, since it was not possible to perform the additionality assessment due to the lack of data.

Even though the ceramic has operated exclusively with renewable biomass in the new kilns, the use of native wood was a credible and more financially attractive scenario. Therefore, the additionality assessment was made based on the use of renewable biomass in the new kilns, comparing fuel costs of the current scenario and the baseline scenario.

Regarding Cenol ceramic, in the VCS PD v.05 period, the company operated with 7 Round kilns and 3 Paulista kilns. In the past period – 4th Monitoring Report – the ceramic deactivated 1 Round kiln and 3 Paulista kilns resulting nowadays with 6 Round kilns operating.

The change in the kilns type does not interfere in the additionality of the project since both kilns are intermittent, achieves the same maximum temperature of 900° and have the same average of production per burning cycle. On the other hand, the only difference between the kilns is the shape, being one rectangular and the other one round. Also, the change in the number of kilns does not impact additionality because both ceramics still pay a higher cost in the renewable biomass than in the non-renewable biomass.

Below is Table 02 that illustrates the status of the project activity according to the kilns change during time.

Table 2 – Status of the Ceramic Project Activity

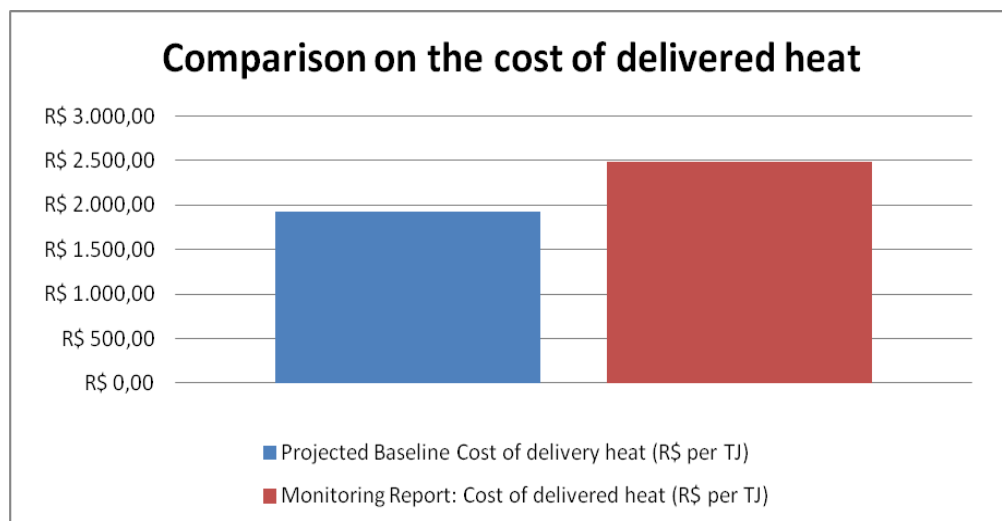
Ceramic	Quantity of kilns (units)			
	PD v.05	4th MR	5th MR	
		Kilns Deactivated	Kilns Constructed	Kilns currently active
Cenol	7 Round kilns	1 Round kiln	-	6 Round kilns
	3 Paulista kilns	3 Paulista kilns	-	-
Telha Forte	8 Round kilns	8 Round kilns	-	-
	5 Paulista kilns	-	3 Paulista kilns	8 Paulista kilns

Regarding the Financial Barrier, a comparison was made between the cost of energy generated on the baseline scenario of *Telha Forte* Ceramic and at the current monitoring period, detailed in Table 03. The cost of non-renewable wood was updated from the VCS PD v.05 by applying a conservative annual correction factor to the cost of the non-renewable biomass, in order to account for general price increase

⁵ The “Paulistinha” is a kind of intermittent kiln with rectangular shape and lateral furnaces. It is usually employed to burn tiles.

due to inflation. The annual rate of increase applied on the current monitoring period was 6.50%⁶, once it was the highest inflation rate evidenced in Brazil since 2004.

Chart 1. Comparison between the cost of delivered heat at the projected baseline and current monitored period for Telha Forte Ceramic.



The Chart above displays the comparison of cost of delivered heat at the projected baseline scenario (year 2012) and at the current monitoring period (from March 2011 to April 2012). It can be observed that non-renewable biomass is more financially attractive than using sawdust and açai pits.

With the project activity's implementation, the fuel spending has increased, as can be verified at the Table 03 below. Comparing the cost per energy generated, *Telha Forte* ceramic spent with renewable biomass BRL 2,489.77 per TJ generated, against BRL 1,932.79 per TJ that could be expected in case non-renewable wood was applied (projected baseline scenario for 2012). The operation of new kiln with renewable biomass appears to be less financially attractive due to the fact that the use of renewable biomass is more expensive than non-renewable wood.

According to the National Institute for Space Research⁷⁸, *Pará* State was responsible for almost one third of Amazonian deforestation recorded in August of 2011, despite the reduction in deforestation rates evidenced in the Amazonian biome from August, 2010 to July, 2011⁹. The consumption of non-renewable biomass by ceramic industry was noted by several authors (UHLIG, 2008¹⁰; NERI, 2003¹¹; BRITO¹²;

⁶ Available at: <<http://agenciabrasil.ebc.com.br/noticia/2012-01-06/inflacao-oficial-registra-em-2011-maior-taxa-desde-2004>>.

⁷ Instituto Nacional de Pesquisas Espaciais (INPE).

⁸ LOURENÇO, L. Agencia brasil. **Pará foi campeão de desmatamento em agosto**. Available at: <<http://agenciabrasil.ebc.com.br/noticia/2011-10-03/para-foi-campeao-de-desmatamento-em-agosto>>. Last visited on 12/07/2012.

⁹ BRASIL. Brasil.gov.br. **Desmatamento na Amazônia brasileira em 2011 apresenta menor taxa já registrada**. Available at: <<http://www.brasil.gov.br/noticias/arquivos/2011/12/6/desmatamento-na-amazonia-brasileira-em-2011-apresenta-menor-taxa-ja-registrada>>. Last visited on 12/07/2012.

¹⁰ 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:

BRASIL, 2001¹³; CARDOSO, 2008¹⁴). This was also observed in other industries, for example in production of steel¹⁵, which has a much better structure and internal organization when compared to ceramic factories that are generally small and family-run enterprises. BRASIL (2001)¹⁶, suggests that it is important to stimulate the miner sector, especially to respect the environment. Therefore, the statements described above evidence that the use of non-renewable wood still can be a hypothetically feasible scenario for the project activity.

Regarding the biomass storage, as described in the VCD PD v.05, both Cenol and Telha Forte ceramics have a shed where sawdust and açai pits are stored protecting the biomasses from the rain.

<http://www.teses.usp.br/teses/disponiveis/86/86131/tde-14052008-113901/publico/UHLIG_Tese1.pdf>. Last visited on 13/03/2011.

¹¹ NERI, J.T. **Energia Limpa, Sustentável ou de Subsistência? Cerâmica Industrial**, Rio Grande do Norte;V,8, n.1,35 -6,2003.

¹² BRITO, J.O. "The use of wood as energy". Available at: <http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&lng=ES>. Last visited on 23/03/2011.

¹³ 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%27%E3o%20e%20das%20Car%Eancias%20Tecnol%F3gicas%20dos%20Minerais%20Industriais%20Brasileiros.pdf>>. Last visited on 05/01/2012.

¹⁴ 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.

¹⁵ Instituto Observatório Social. O Aço da Devastação. Available at: <<http://www.observatoriosocial.org.br/portal/noticia/780>>. Last visited on 11/07/2011.

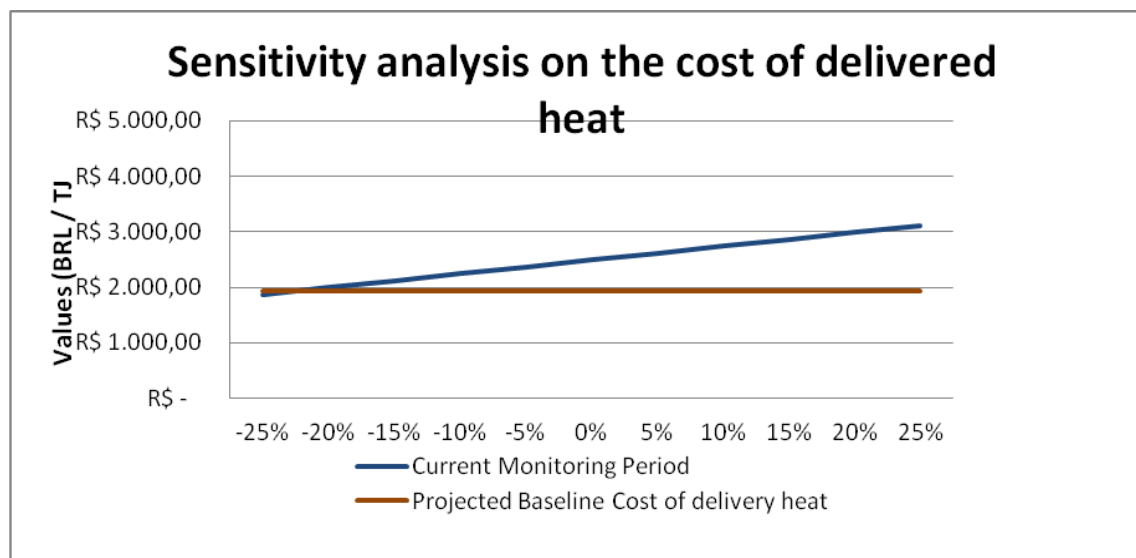
¹⁶ BRASIL. Ministério de Ciências e Tecnologias. **Levantamento da Situação e das Carências Tecnológicas dos Minerais Industriais Brasileiros: com enfoque na mineração de: Argila para cerâmica, Barita, Bentonita, Caulim para carga, Talco / Agalmatolito e Vermiculita**. Brasília, 2001. Available at:

<<ftp://ftp.mct.gov.br/Biblioteca/10674%20-%20Levantamento%20da%20Situa%27%E3o%20e%20das%20Car%Eancias%20Tecnol%F3gicas%20dos%20Minerais%20Industriais%20Brasileiros.pdf>>. Last visited on 13/03/2011.

Table 3. Cost of renewable biomass per energy generated at the baseline scenario and at the current monitoring period

Variation - Cost of delivered heat													
Current Monitoring Period	Renewable Biomass	Cost of delivered heat (R\$ per TJ)	-25%	-20%	-15%	-10%	-5%	0%	5%	10%	15%	20%	25%
	Açaí Pits	R\$ 767,15	R\$ 575,36	R\$ 613,72	R\$ 652,08	R\$ 690,43	R\$ 728,79	R\$ 767,15	R\$ 805,50	R\$ 843,86	R\$ 882,22	R\$ 920,58	R\$ 958,93
	Sawdust	R\$ 5.235,96	R\$ 3.926,97	R\$ 4.188,77	R\$ 4.450,57	R\$ 4.712,37	R\$ 4.974,17	R\$ 5.235,96	R\$ 5.497,76	R\$ 5.759,56	R\$ 6.021,36	R\$ 6.283,16	R\$ 6.544,96
	Total	R\$ 2.489,77	R\$ 1.867,33	R\$ 1.991,82	R\$ 2.116,31	R\$ 2.240,80	R\$ 2.365,29	R\$ 2.489,77	R\$ 2.614,26	R\$ 2.738,75	R\$ 2.863,24	R\$ 2.987,73	R\$ 3.112,22

Projected Baseline Cost of delivery heat	Non-renewable wood	R\$ 1.932,79	R\$ 1.932,79	R\$ 1.932,79	R\$ 1.932,79	R\$ 1.932,79	R\$ 1.932,79	R\$ 1.932,79	R\$ 1.932,79	R\$ 1.932,79	R\$ 1.932,79	R\$ 1.932,79	R\$ 1.932,79
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None of the changes described above have significant effects on the project monitoring or on its capacity to mitigate GHG emissions. Generally, the monitoring data was kept according to the monitoring plan described in the project description document. However, some exceptions to that statement have occurred.

Telha Forte Ceramic has failed to store documents regarding the purchase of sawdust from March-2011 to June-2011. Therefore, all biomass from these months was not considered. More details are available on the Monitoring Report spreadsheet.

Also, a correction of production values for Cenol Ceramic and Telha Forte Ceramic was made, as the ceramics have failed to monitor the amount of ceramic devices burned in the kilns directly. Instead, the production of ceramic pieces was measured as the production from the molding machine. To provide a conservative calculation of emission reductions, the production from the molding machine was multiplied by a correction factor that represents the ratio between the production output of the molding machine and the amount of ceramic devices actually burned in the kilns.

Such correction factor was based on monitored data by Telha Forte Ceramic from January 2012 to May 2012. Data from such period demonstrates that 88.92% of ceramic devices coming from the molding machines were burned in the kilns (the remaining being either production losses or stock of unburned devices). Hence, monitored data for parameter PRy during the entire monitoring period of Cenol Ceramic and Telha Forte Ceramic was multiplied by 88.92%. Such correction allows for a conservative estimate of the ceramics production and, consequently, of expected emission reductions. This approach was chosen because Cenol Ceramic has not monitored the amount of pieces burned in the kilns in 2011 and the monitoring for 2012 is inconsistent and Telha Forte has not monitored the amount of pieces burned in the kilns in 2011.

Even though these exceptions may affect a precise calculation of emission reductions, it is considered that a conservative approach has been used to avoid over estimating GHG emission reductions during the period. Also, the ceramics have used exclusively renewable biomass as fuel, thus mitigating their baseline emissions.

This Monitoring Report refers to the fifth monitoring period of this project and includes data from 01/03/2011 to 30/04/2012.

2.2 Project Description Deviations

The registered VCS PD version 05 establishes that the ceramic owner would measure the amount of renewable biomasses used (parameter $Q_{renbiomass}$). However, during the monitored period this parameter was monitored through all the receipts, invoices and written declaration of biomass received by the ceramic industry. This means the amount of renewable biomass is measured by each provider and controlled by the ceramic owner by storing such documents. This approach was chosen considering that it is the responsibility of the provider to measure the amount of biomass since this information needs to be available in the sale invoice or receipt. As this information is used for commercial purposes (to calculate due financial compensations), it is considered that data from the suppliers are a reliable source for this parameter.

Also, all biomass used by both ceramics is purchased by Telha Forte Ceramic and later transferred to Cenol Ceramic. As explained before, Telha Forte Ceramic has failed to store documents regarding the

purchase of biomass from March-2011 to June-2011, for that reason, the amount of biomass from this period was not considered.

Regarding the leakage of the non-renewable biomass, according to the AMS-IE, version 01, paragraph 9, “it shall be assessed from ex-post surveys of users and areas from where biomass is sourced”; however, the leakage of non-renewable biomass was not monitored as required, since it was not feasible due to the variety of sources of non-renewable biomass and the lack of information regarding its current users. Therefore, as an alternative, the project applied the requirements of the Methodology AMS-IE, version 05, paragraph 10, which determines that B_y should be multiplied by the correction factor of 0.95 to account for leakages, since surveys were not required.

2.3 Grouped Project

Not applicable. This is not a grouped project.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	EF_{projected_fossil fuel}
Data unit:	tCO ₂ /TJ
Description:	CO ₂ Emission factor of residual fuel oil
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Available at: < http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf >. Page 2.18. Table 2.3. Last visit on 16/04/2012.
Value applied:	77.4 tCO ₂ /TJ
Purpose of the data:	This parameter was used to calculate baseline emissions from the use of the fossil fuel that would be used in the baseline scenario.
Any comment:	For the fossil fuel likely to be used by similar consumers, IPCC default value of residual fossil fuel is used. Applicable for stationary combustion in the manufacturing industries and construction. 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 Unit / Parameter:	NCV_{biomass}
Data unit:	TJ/tonne of wood

Description:	Net Calorific Value
Source of data:	Sources: QUIRINO, W. F. et al. Poder Calorífico da Madeira e de Resíduos Lignocelulósicos. Biomassa & Energia, v.1, n.2, p. 173-182, 2004. Available at: <http://www.renabio.org.br/arquivos/p_poder_lignocelulosicos_11107.pdf>. Last visit on 03/07/2012. LORENZI, H. Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil, vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002.
Value applied:	0.0182 TJ/tonne
Purpose of the data:	This value provided the energy generated by the amount of wood that would be used in the absence of the project. The species used to calculate the average value are typical trees of Amazonian Biome that are usually utilized as fuel in the ceramic companies of the region.
Any comment:	IPCC default values shall be used only when country or project specific data are not available or difficult to obtain, according to "Guidance on IPCC default values" (Extract of the report of the twenty-fifth meeting of the Executive Board, paragraph 59). 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 Unit / Parameter:	P_{biomass}
Data unit:	tonne/m ³
Description:	Specific gravity
Source of data:	Sources: QUIRINO, W. F. et al. Poder Calorífico da Madeira e de Resíduos Lignocelulósicos. Biomassa & Energia, v.1, n.2, p. 173-182, 2004. Available at: <http://www.renabio.org.br/arquivos/p_poder_lignocelulosicos_11107.pdf>. Last visit on 16/05/2012. LORENZI, H. Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil, vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002.
Value applied:	0.6753 tonne/m ³

Purpose of the data:	The amount of wood used in the baseline was measured by volume units, so this data was used to the unity conversion.
Any comment:	The species used to calculate the average value are typical trees of Amazonian Biome that are usually utilized as fuel in the ceramic industries of the region. 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 Unit / Parameter:	BF _y								
Data unit:	Tonne of wood per thousand of devices								
Description:	Consumption of non-renewable biomass per thousand of ceramic devices								
Source of data:	Historical data from ceramic owner								
Value applied:	<table><tr><th>Ceramic</th><th>Cenol Ceramic</th><th>Telha Forte Ceramic</th></tr><tr><td>BF_y</td><td>1.00</td><td>1.00</td></tr></table>			Ceramic	Cenol Ceramic	Telha Forte Ceramic	BF _y	1.00	1.00
Ceramic	Cenol Ceramic	Telha Forte Ceramic							
BF _y	1.00	1.00							
Purpose of the data:	The value was acquired through the average consumption and production of ceramic devices during the years when the ceramics were used to consume non-renewable wood. This value is in accordance with the data acquired in other ceramics that utilize the same types of kiln in the region. The value is utilized to calculate the real amount of wood displaced to maintain the ceramic production in the baseline scenario.								
Any comment:	Cenol and Telha Forte Ceramics' kilns are within the average for "Paulistinha" and "Round" kilns. These values were not expected because of the lack of technology in the region, the indiscriminate use of the wood causing it surplus. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.								

3.2 Data and Parameters Monitored

Data Unit / Parameter:	Q_{renbiomass}
Data unit:	Tonnes per year

Description:	Amount of renewable biomasses						
Source of data:	Measured by the biomass providers and controlled by the ceramic owner. The registered VCS PD v.5 establishes that the ceramic owner would measure this parameter; however, during this monitoring period, this parameter was monitored through all the receipts and invoices of biomass received by the ceramic industry.						
Description of measurement methods and procedures to be applied:	The amount of biomasses was monitored in accordance to the weight or volume described in the receipts from the providers. Telha Forte Ceramic has failed to store documents regarding the purchase of biomass from March-2011 to June-2011, therefore the biomasses from this period were not considered. Telha Forte ceramic also buys all biomass used for both ceramics and then transfer the necessary amount of biomass to Cenol. For that reason, all biomass acquired during the period analyzed were classified on the behalf of Telha Forte. Where the values in the receipts are described in m³, it is necessary the conversion to tonnes through the specific gravity of each biomass. The specific gravity values of the renewable biomasses utilized in this project are: <table><tr><th>Biomass</th><th>Sawdust</th><th>Açaí Pits</th></tr><tr><td>Specific gravity (tonne/m³)</td><td>0.245</td><td>0.723</td></tr></table> The sources of these data are: <u>Sawdust:</u> Masses and Dead Loads of Concrete and Other Materials. Available at: <http://www.cca.org.nz/pdf/Masses.pdf>. Last visit on: March 10th, 2010. <u>Açaí pits:</u> PADILHA, J. L.; CANTO, S. A. E.; RENDEIRO, G. Avaliação do potencial dos caroços de açaí para geração de Energia. Biomassa & Energia, v. 2, n. 3, p. 231-239, 2005. Available from: <http://www.renabio.org.br/arquivos/p_avaliacao_energia_8340.pdf>. Last visit on: April 11th, 2011.	Biomass	Sawdust	Açaí Pits	Specific gravity (tonne/m ³)	0.245	0.723
Biomass	Sawdust	Açaí Pits					
Specific gravity (tonne/m ³)	0.245	0.723					
Frequency of monitoring/recording:	Monthly						

Value monitored:	Q_{renbiomass} - Amount of renewable biomass of <i>Telha Forte</i> ceramic (tonnes)			
	Period	Sawdust	Açaí pits	Total
	March 2011	0.00	0.00	0.00
	April 2011	0.00	0.00	0.00
	May 2011	0.00	0.00	0.00
	June 2011	0.00	0.00	0.00
	July 2011	231.84	0.00	231.84
	August 2011	759.52	281.97	1,041.49
	September 2011	548.89	469.95	1,018.84
	October 2011	544.24	695.53	1,239.77
	November 2011	1,144.41	1,954.99	3,099.41
	December 2011	1,645.81	3,748.05	5,393.85
	Total 2011	4,874.72	7,150.48	12,025.20
	January 2012	1,621.48	2,311.00	3,932.47
	February 2012	2,050.82	488.75	2,539.57
	March 2012	355.43	300.77	656.20
	April 2012	0.00	112.79	112.79
	Total 2012	4,027.73	3,213.30	7,241.03
	Total in monitoring period (tonnes)	8,902.4	10,364	19,266.2
More detailed information is available in Section 5.				
Monitoring equipment:	No monitoring equipment was used to determine this parameter.			
QA/QC procedures to be applied:	Amount of biomass was checked according to receipts of purchase and written declarations. The energy balance was verified according to the amount of biomass applied. The thermal energy generated with the use of the biomass per thousand of ceramic devices produced during the current monitoring period was compared to the VCS PD. The thermal energy generated per thousand of ceramic units produced at <i>Cenol Ceramic</i> and <i>Telha Forte Ceramic</i> was higher than estimated on the VCS PD.			
Calculation method:	Not applicable			
Any comment:	Data was measured for each purchase/acquisition of biomass and aggregated monthly. 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 Unit / Parameter:	PR _y																																															
Data unit:	Unity of ceramic pieces																																															
Description:	Production of ceramic devices																																															
Source of data:	Controlled by the project proponent																																															
Description of measurement methods and procedures to be applied:	This parameter was monitored by the ceramic owner. The amount was acquired by counting the total production of the period considered. Values used for the calculations are taken from production control documents. Data was aggregated on a monthly and yearly basis. Measurements were done by an internal control sheet monitored by the project proponent. A correction of production values for both ceramic was made, as the ceramics have failed to monitor the amount of ceramic devices burned in the kilns directly. Instead, the production of ceramic pieces was measured as the production from the molding machine. To provide a conservative calculation of emission reductions, the production from the molding machine was multiplied by a correction factor that represents the ratio between the production output of the molding machine and the amount of ceramic devices actually burned in the kilns. Also, the production of the period from March-2011 to June-2011 was not considered or used in the calculations due to the inconsistent register of biomass. More details are available on the Monitoring Report spreadsheet.																																															
Frequency of monitoring/recording:	Monthly																																															
Value monitored:	Total amount during the this monitoring period: <table><tr><th colspan="3">Production of Ceramic units</th></tr><tr><th rowspan="2">Period</th><th>Cenol Ceramic</th><th>Telha Forte Ceramic</th></tr><tr><th>Total</th><th>Total</th></tr><tr><td>March 2011</td><td>0</td><td>0</td></tr><tr><td>April 2011</td><td>0</td><td>0</td></tr><tr><td>May 2011</td><td>0</td><td>0</td></tr><tr><td>June 2011</td><td>0</td><td>0</td></tr><tr><td>July 2011</td><td>1,243,900</td><td>1,809,905</td></tr><tr><td>August 2011</td><td>1,188,165</td><td>1,843,630</td></tr><tr><td>September 2011</td><td>1,011,755</td><td>1,715,423</td></tr><tr><td>October 2011</td><td>1,081,963</td><td>1,682,000</td></tr><tr><td>November 2011</td><td>1,024,868</td><td>1,629,344</td></tr><tr><td>December 2011</td><td>1,127,392</td><td>1,900,812</td></tr><tr><td>Total 2011</td><td>6,678,043</td><td>10,581,114</td></tr><tr><td>January 2012</td><td>1,166,474</td><td>1,803,903</td></tr><tr><td>February 2012</td><td>1,163,545</td><td>1,792,326</td></tr></table>	Production of Ceramic units			Period	Cenol Ceramic	Telha Forte Ceramic	Total	Total	March 2011	0	0	April 2011	0	0	May 2011	0	0	June 2011	0	0	July 2011	1,243,900	1,809,905	August 2011	1,188,165	1,843,630	September 2011	1,011,755	1,715,423	October 2011	1,081,963	1,682,000	November 2011	1,024,868	1,629,344	December 2011	1,127,392	1,900,812	Total 2011	6,678,043	10,581,114	January 2012	1,166,474	1,803,903	February 2012	1,163,545	1,792,326
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	Total	Total																																														
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February 2012	1,163,545	1,792,326																																														

		March 2012	1,178,909	2,061,714	
		April 2012	1,032,625	1,578,671	
		Total 2012	4,541,553	7,236,614	
		Total in the monitoring period	11,219,596	17,817,728	
Monitoring equipment:	No monitoring equipment was used to determine this parameter.				
QA/QC procedures to be applied:	Data concerning PR _y measurement points are from internal control sheets used by <i>Cenol and Telha Forte</i> Ceramics. These sheets were organized per month and daily filled according to data based on ceramic units that are burned in the kilns. All the PR _y determined as the production coming from the molding machine had a correction factor applied, as explained on Section 2.1.				
Calculation method:	The ceramics have internal control of the quantity of ceramic units produced. It was rechecked according to the biomass employed in the ceramic kilns.				
Any comment:	An assessment of financial additionality was developed to include the production from kilns that were built after the VCS PD approval, as explained on Section 2.1. 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 Unit / Parameter:	Origin of renewable biomass
Data unit:	Not applicable
Description:	Renewable origin of the biomass
Source of data:	Controlled by the project proponents
Description of measurement methods and procedures to be applied:	This information was given by the biomasses providers. The guarantee of acquiring renewable biomass was achieved by invoices from the providers. As stated in the Section 2.2 of VCS PD version 2. The biomasses (sawdust and <i>açaí</i> pits) are considered renewable as fulfilling the options described in the methodology applied.
Frequency of monitoring/recording:	Annually
Value monitored:	Not applicable.
Monitoring equipment:	No monitoring equipment was used to determine this parameter.
QA/QC procedures to	The biomasses were considered renewable as they were in

be applied:	accordance with the definition given by the Annex 18, EB 23 of UNFCCC ¹⁷ .
Calculation method:	Not applicable
Any comment:	All the renewable biomasses utilized in the monitoring period were already described in the project design document. 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 Unit / Parameter:	Renewable biomass surplus											
Data unit:	Tonnes or m³											
Description:	Amount of renewable biomass available											
Source of data:	Monitored											
Description of measurement methods and procedures to be applied:	The sources of leakages predicted in “<i>General guidance on leakage in biomass project activities</i>” of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, were monitored. The measurement of the leakage was based in national and international articles and database every monitoring period. The sources provided information about the biomass availability in the project activity’s region. More information, please see Section 4.3 – Leakage.											
Frequency of monitoring/recording:	Annually											
Value monitored:	<table><tr><th>Biomass surplus</th><th>Surplus</th><th>Year</th></tr><tr><td>Açaí pits in tons</td><td>79,715.5</td><td>2007</td></tr><tr><td>Sawdust in m³</td><td>1,999,833</td><td>2007</td></tr></table>			Biomass surplus	Surplus	Year	Açaí pits in tons	79,715.5	2007	Sawdust in m³	1,999,833	2007
Biomass surplus	Surplus	Year										
Açaí pits in tons	79,715.5	2007										
Sawdust in m³	1,999,833	2007										
Monitoring equipment:	No monitoring equipment was used to determine this parameter.											
QA/QC procedures to be applied:	Data available regarding the ceramic industries fuel consumption was employed to monitor the leakage											
Calculation method:	The amount of biomass used by the project activity in each year of the crediting period was compared to total biomass available, as											

¹⁷ CDM – Executive Board. Annex 18 definition of renewable biomass. EB 23. Available at: < http://cdm.unfccc.int/EB/023/eb23_repan18.pdf>. Last visited on 21/05/2012.

	estimated on the VCS PD.
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 Unit / Parameter:	Leakage of non-renewable biomass
Data unit:	tCO ₂ e
Description:	Leakage resulted from the non-renewable biomass
Source of data:	AMS-IE, version 05, paragraph 10
Description of measurement methods and procedures to be applied:	The leakage of non-renewable biomass was not monitored as required by the Methodology AMS-IE, version 01, paragraph 09, since it is not feasible to perform such surveys, given the variety of sources of non-renewable biomass and the lack of information regarding its current users. Also, performing such surveys would not be financially feasible. As an alternative approach, the project applied the requirements of the Methodology AMS-IE, version 05, paragraph 10, which determines that 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.
Frequency of monitoring/recording:	Annually
Value monitored:	1,815
Monitoring equipment:	No monitoring equipment was used to determine this parameter.
QA/QC procedures to be applied:	Data available regarding the ceramic industry fuel consumption were employed to monitor the leakage.
Calculation method:	According to the Methodology AMS-IE, version 05, paragraph 10, 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.
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 Unit / Parameter:	$f_{NRB,y}$
Data unit:	Percentage
Description:	Fraction of biomass (wood) used in the absence of the project activity

	in year y that can be established as non-renewable biomass using survey methods
Source of data:	Survey methods
Description of measurement methods and procedures to be applied:	Before the project activity, wood from areas without forest management was offered with low prices and high viability to the ceramic facility owner. Thus, the totality of fuel employed in the baseline scenario is from non-renewable origin. However, according to SOCIOAMBIENTAL (2010)¹⁸, Amazonian Biome has 10.75% (or 53.829.235 ha) of its total area with sustainable use. According to a research made by Brazilian Environmental Ministry, there are around 60 m³ of wood per hectare in Amazonian biome¹⁹. Therefore, the amount of non-renewable woody biomass available at Amazonian biome is around 26.808.826.464 m³. Considering that 0.0089% of this biome has been saved by other project activities²⁰. Thus, the fraction of non-renewable biomass is around: 100% - (10.75% + 0.0089%) = 89.24%. Two sheets were made in order to calculate the amount of wood consumed. The first one encompasses the amount of wood consumed by the ceramics located at the Amazonian biome. The other sheet calculates the amount of wood consumed regarding only <i>Kamiranga Ceramic</i>. Dividing these values by the total of wood available, it was achieved the amount of renewable biomass that has been saved by all the project activities, or only by <i>Cenol and Telha Forte Ceramics Fuel Switching Project</i>, respectively.²¹ Finally, each value was subtracted from the fraction of non-renewable biomass to achieve the $f_{NRB,y}$, in order to be ensured that the proposed project activity is not saving the non-renewable biomass accounted for by the already registered project activities. Therefore, it was taken the smaller value in order to be more conservative. These sheets are available at the VCS MR Calculation

¹⁸SOCIOAMBIENTAL. Instituto Socioambiental, 2010. Unidades de Conservação na Amazônia Legal. Available at: <http://www.socioambiental.org/uc/quadro_geral>. Last visit on: 11/04/2011.

¹⁹ Source: Brazilian Environment Ministry, Normative Instruction nº 6 of 2006. Available at: <http://www.carvaomineral.com.br/abcm/meioambiente/legislacoes/bd_carboniferas/geral/in_06-2006_mma_n.pdf>. Last visit on: 21/05/2012.

²⁰ According to data from project activities at Sustainable Carbon Company. Available at: <http://mc.markit.com/br-reg/public/index.jsp?p=&r=100000000000007&u=&scolumn=project_name&sdir=ASC&s=cp&q=>>. Last visit on: 21/05/2012.

²¹ According to data from project activities at Sustainable Carbon Company. Available at: <http://mc.markit.com/br-reg/public/project.jsp?project_id=100000000000131>. Last visit on: 21/05/2012.

	spreadsheet.
Frequency of monitoring/recording:	Annually
Value monitored:	89.24%
Monitoring equipment:	No monitoring equipment is used to determine this parameter.
QA/QC procedures to be applied:	The monitoring of this parameter was based on national and international articles, databases and data monitored by the project developer, such as project activities at the same region. The sources provided information about the sustainable use of Amazonian biome. Wood saved from projects to which the same methodology was applied, which are in the same biome and that were developed by <i>Sustainable Carbon – Projetos Ambientais Ltda</i> was considered in this fraction²². CDM or VCS registered projects were also included in this fraction if placed in the same region and developed with the same methodology. Moreover the amount of non-renewable biomass applied in the project activity were monitored monthly and were considered in the value of $f_{NRB,y}$ parameter.
Calculation method:	Not applicable.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

3.3 Description of the Monitoring Plan

The monitoring is done with the aim of determining the most approximate quantity of non-renewable biomass that, in the absence of the project, would be used in the ceramics' kilns and consequently the amount of GHG that would be emitted in tonnes of CO₂e. Section 3.2 describes data and parameters monitored, as well as the procedures involved on the monitoring plan.

Ceramic personnel are responsible to monitor the operating conditions at each factory, including the amount of renewable biomass consumed and the monthly production of ceramic devices (parameters $Q_{renbiomass}$ and PR_y). Ceramic personnel are also responsible to store invoices, receipts of sales and other documents related to purchase or acquisition of biomass.

Based on this information, Sustainable Carbon is responsible to assess if the biomasses are from renewable origin, to evaluate if there is a surplus of renewable biomass and to calculate emission reductions, including an assessment of leakage emissions.

Sustainable Carbon assists the Ceramics' personnel to double check the monitored data on biomass consumption and ceramic devices production. However, no internal auditing was performed on data related to this monitoring period. Non-conformities identified in the double check procedures are clarified

²² Document available at: <<http://mc.markit.com/br-reg/public/index.jsp?s=cp>> Last visit on: 05/06/2012.

between Sustainable Carbon technical team and the monitoring responsible on each ceramic during site visits for data collection, by reassessing existing documents and sources of information.

The responsible for the monitoring plan are *Mrs. Heronita Silva Sobrinho* and *Mr. Francisco Valdir* from *Cenol* and *Telha Forte* ceramics. Sustainable Carbon technical team (including those members described on Section 1.3) was also involved in the project monitoring.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions are estimated following procedures of the applied methodology: AMS-I.E.: Switch from Non-Renewable Biomass for Thermal Applications by the User – Version 01, valid from 01/02/2008 to 08/04/2010²³. The project activity in the current monitoring period (14 months) generated 165.73 TJ per year. Converting this number to MWh it was generated 46,036.21 MWh per year, which corresponds to the use of 5.26 MWthermal. This is less than the limits of 45 MWthermal for Type I Small scale project activities.

Baseline

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

Where:

ER_y :	Emission reductions during the year y in tCO ₂ e
B_y :	Quantity of biomass that is substituted or displaced in tonnes
$f_{NRB,y}$:	Fraction of non-renewable biomass (wood) used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods
$NCV_{biomass}$:	Net calorific value of non-renewable biomass in TJ/tonne
$EF_{projected_fossil\ fuel}$:	Emission factor for the projected fossil fuel consumption in the baseline in tCO ₂ e/TJ ²⁴ .

B_y is determined using the option “b” of the applied Methodology:

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

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

Where:

²³ This version of the methodology is available at: http://cdm.unfccc.int/UserManagement/FileStorage/CDM_AMSP4VBBO5G54RXDE9KQ6FJWMGHZLHFA5. Last visited on 25/05/2012.

²⁴ The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel.

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

η_{old}: Efficiency of the system being replaced

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

Where:

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

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

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

Where:

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

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

Where:

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

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

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

The production (PR_y) was monitored on each ceramic through a sheet that was daily fed by an operator inside of the ceramic companies that counts the total of ceramic pieces that are burned in the kilns. The value of BF_y was determined through historical consumption of non-renewable biomass by the ceramics.

Baseline emissions during the monitored period are summarized in the following tables.

Table 4. Quantity of non-renewable wood that would be utilized in the absence of the project and emission reductions due to the project activity in *Cenol* ceramic: from 01/03/2011 to 30/04/2012.

<i>Cenol Ceramic</i>				
Period	PR _y (ceramic units)	B _y (ton)	Leakage (tCO ₂ e)	ER _y (tCO ₂ e)
March 2011	0	0	0	0
April 2011	0	0	0	0
May 2011	0	0	0	0
June 2011	0	0	0	0
July 2011	1.243.900	1.244	78	1.485
August 2011	1.188.165	1.188	74	1.419
September 2011	1.011.755	1.012	63	1.208
October 2011	1.081.963	1.082	68	1.292
November 2011	1.024.868	1.025	64	1.224
December 2011	1.127.392	1.127	70	1.347
Total 2011	6.678.043	6.678	417	7.975
January 2012	1.166.474	1.166	73	1.393
February 2012	1.163.545	1.164	73	1.389
March 2012	1.178.909	1.179	74	1.408
April 2012	1.032.625	1.033	64	1.234
Total 2012	4.541.553	4.542	284	5.424
Total Monitoring Period	11.219.596	11.220	701	13.399

Table 5. Quantity of non-renewable wood that would be utilized in the absence of the project and emission reductions due to the project activity in *Telha Forte* ceramic: from 01/03/2011 to 30/04/2012.

<i>Telha Forte Ceramic</i>				
Period	PR _y (ceramic units)	B _y (ton)	Leakage (tCO ₂ e)	ER _y (tCO ₂ e)
March 2011	0	0	0	0
April 2011	0	0	0	0
May 2011	0	0	0	0
June 2011	0	0	0	0
July 2011	1.809.905	1.810	113	2.162
August 2011	1.843.630	1.844	115	2.202
September 2011	1.715.423	1.715	107	2.049
October 2011	1.682.000	1.682	105	2.009
November 2011	1.629.344	1.629	102	1.946
December 2011	1.900.812	1.901	119	2.270
Total 2011	10.581.114	10.581	661	12.638
January 2012	1.803.903	1.804	113	2.154
February 2012	1.792.326	1.792	112	2.141
March 2012	2.061.714	2.062	129	2.462
April 2012	1.578.671	1.579	99	1.885
Total 2012	7.236.614	7.237	453	8.642
Total Monitoring Period	17.817.728	17.818	1.114	21.280

4.2 Project Emissions

The applied methodology does not include any source of project emissions.

4.3 Leakage

Leakage

The methodology AMS-I.E.-Switch from Non-Renewable Biomass for Thermal Applications by the User – Version 01 - Valid from February 01st, 2008 to April 08th, 2010 predicts the following possible three sources of leakage:

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

The leakage from biomass projects, like the project activity, shall also be estimated according to the “General guidance on leakage in biomass project activities” (attachment C of appendix B)²⁵ of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, which identifies different emission sources based on the type of biomass considered (described in the table 5).

Table 6. 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

²⁵ Document available at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentC.pdf>. Last visit on January 24th, 2011.

Observing the table above, the sources of leakage of the present project activity are the competing use of biomass for biomass residues. The source of leakage of the present project is showed below according to each type of biomass:

Sawdust

The production of wood generates a large amount of residues, which can be reused to generate thermal energy, considering that around 22% of the wood produced generates sawdust²⁶. The production of wood in the state of *Pará* (PA) was of 9,090,150 m³²⁷ in 2007. Thus, the production of sawdust was around 1,999,833 m³ per year.

Cenol and *Telha Forte* ceramics utilized around 30.522,67 m³ of sawdust per year. Thus, the project activity utilized around 1.53 % of the biomass availability in the state of *Pará*, as described in table 6. This way, this renewable biomass does not have potential to generate leakage emissions due to its high availability.

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

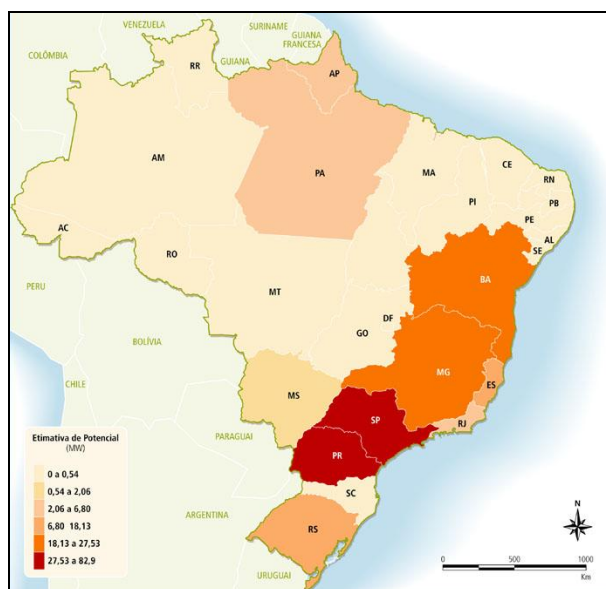


Figure 2. Woody Residues Potential for Energy Generation²⁸

Açaí pits

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

²⁷ According to IBGE (Geographic and Statistic Brazilian Institute). Available at: <<http://www.ibge.gov.br/estadosat/temas.php?sigla=pa&tema=extracaovegetal2007>>.

²⁸ CENTRO NACIONAL DE REFERÊNCIA EM BIOMASSA - CENBIO. Panorama do potencial de biomassa no Brasil. Brasília; Dupligráfica, 2003. 80 p.apud ELETROBRÁS 1ºFórum Capixaba de Energia. Available at: <<http://www.aspe.es.gov.br/PALESTRAS/Renata%20Falc%C3%A3o%20-%20Energias%20Renov%C3%A1veis-Vit%C3%B3ria%20Final.pdf>>. Last visit on April 11th, 2011.

In terms of *açaí* pits, the state of *Pará* is the largest producer of *açaí* (*Euterpe oleraceae*) in Brazil. The pits are easily found, especially in *Belém*, which is the major consumer of *açaí* in the State of *Pará*. The *açaí* is the basis of the daily alimentation of the population in this state, where is widely cultivated. Nevertheless, its residues are still without adequate economic destination²⁹.

The production of *açaí* in the State of *Pará* in the year of 2008 was 107,028 tonnes³⁰. The pit corresponds to 85% of the weight of *açaí*³¹; therefore the *açaí* pit production was around 90,973 tonnes in the year of 2008.

Cenol and *Telha Forte* ceramics employed approximately 8,883.24 tonnes of *açaí* pits per year³², representing around 9.76% of the total of the amount produced, as shown in table 6. Therefore, the project activity did not disturb in any aspects this renewable fuel market once there is plenty of this kind of biomass available.

Table 7. Renewable Biomass available in the region

Renewable Biomass Surplus - Period of 12 months					
Sawdust			Açaí Pits		
Amount of biomass available in the region (m³)	Total used by the Project (m³)	Total used by the Project (%)	Amount of biomass available in the region (tonnes)	Total used by the Project (tonnes)	Total used by the Project (%)
1.999.833,00	30.522,67	1,53	90.973,00	8.883,24	9,76

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

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

- Use/diversion of non-renewable biomass saved under the project activity by non-project households/users who previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable biomass used by the non-project households/users attributable to the project activity then baseline is adjusted to account for the quantified leakage.
- Use of non-renewable biomass saved under the project activity to justify the baseline of other project activities can also be potential source of leakage. If this leakage assessment quantifies a portion of non-renewable biomass saved under the project activity that is used as the baseline of other project activity then baseline is adjusted to account for the quantified leakage.

²⁹ SILVA, I. T. et al. Uso do caroço de *açaí* como possibilidade de desenvolvimento sustentável do meio rural, da agricultura familiar e de eletrificação rural no estado do *Pará*. 2004. Available at: <<http://www.feagri.unicamp.br/energia/agre2004/Fscommand/PDF/Agrener/Trabalho%2059.pdf>>. Last visit on 21/05/2012.

³⁰ Available at: <<http://www.sidra.ibge.gov.br/bda/extveg/default.asp?t=2&z=t&o=18&u1=1&u3=1&u2=15>>. Last visit on 21/05/2012.

³¹ Source: <<http://minhasfrutas.blogspot.com/2008/12/importancia-economica-do-aai.html>>. Last Visit on 21/05/2012.

³² Considering that the monitoring period encompasses 14 months, and it was utilized 5,569.99 tonnes of *açaí* pits.

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

The leakage of non-renewable biomass was not monitored as required by the Methodology AMS-IE, version 01, paragraph 09, since it is not feasible to perform such surveys, given the variety of sources of non-renewable biomass and the lack of information regarding its current users. Also, performing such surveys would not be financially feasible.

As an alternative approach, the project applied the requirements of the Methodology AMS-IE, version 05, paragraph 10, which determines that alternatively By is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required. As a result, the total ERY of the period analyzed was corrected to 34,679 tCO₂e.

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

This leakage is not applicable for this project activity as there was no transference of equipment, in spite of new equipments had to be acquired. Due to all the explanations described above, the present project activity did not encompass any type of leakage.

Table 8. Production – Q_{renbiomass} - QA/QC Procedure

		VCS PD	Monitoring Period	Double Check (QA/QC Procedure)
Cenol	Production (thousands of pieces)	16,800	11,220	The thermal energy generated per thousand of ceramic pieces produced at Cenol Ceramic during the monitored period was lower than the VCS PD.
	Sawdust Consumption (tonne)	11,083	0	
	Açaí Consumption (tonne)	2,333	0	
	Thermal Energy generated in this MR (TJ)	120	0.0	
	Thermal energy per thousand of pieces produced (TJ/thousands of pieces)	0.007	0.0000	
Telha Forte	Production (thousands of pieces)	35,000	17,818	The thermal energy generated per thousand of ceramic pieces produced at Telha Forte Ceramic during the monitored period was higher than the VCS PD.
	Sawdust Consumption (tonne/month)	14,000	8,902	
	Açaí Consumption (tonne/month)	2,917	10,364	
	Thermal Energy generated in this MR (TJ)	150.65	193.35	

Thermal energy per thousands of pieces produced (TJ/thousands of pieces)	0.004	0.011	
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As can be verified on Table 7, the thermal energy generated with the use of biomass per thousands of ceramic devices produced during the current monitoring period was lower than the VCS PD for Cenol Ceramic and higher for Telha Forte Ceramic. This has occurred because all biomass used by both ceramics is purchased by Telha Forte. The thermal energy for the bundled project is also higher than the VCS PD.

Therefore, based on Category AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User (Version 01, valid from February 01st, 2008 to April 08th, 2010) this project activity contributes to sustainable development, once the ceramic company is using renewable biomass and applying the SOCIALCARBON methodology.

4.4 Summary of GHG Emission Reductions and Removals

Table below summarizes the production of ceramic units for this monitoring period³³.

Table 9. Emission reductions for the monitoring period.

Cenol and Telha Forte Ceramics				
Period	PR _y (ceramic units)	B _y (ton)	Leakage (tCO ₂ e)	ER _y (tCO ₂ e)
March 2011	0	0	0	0
April 2011	0	0	0	0
May 2011	0	0	0	0
June 2011	0	0	0	0
July 2011	3,053,805	3,054	191	3,647
August 2011	3,031,795	3,032	189	3,621
September 2011	2,727,178	2,727	170	3,257
October 2011	2,763,963	2,764	173	3,301
November 2011	2,654,212	2,654	166	3,170
December 2011	3,028,204	3,028	189	3,617
Total 2011	17,259,157	17,259	1,078	20,613
January 2012	2,970,377	2,970	186	3,547
February 2012	2,955,871	2,956	185	3,530
March 2012	3,240,623	3,241	203	3,870
April 2012	2,611,296	2,611	163	3,119
Total 2012	11,778,167	11,778	737	14,066
Total Monitoring Period	29,037,324	29,037	1,815	34,679

³³ Emission reductions are equal to the baseline emissions, since there are no project emissions according to the applied methodology and since leakage emissions are estimated at zero tCO₂e.

5 ADDITIONAL INFORMATION

5.1 Production of ceramic pieces at Cenol Ceramic.

Table 10. Cenol production of ceramic units based on measurement of the molding machine.

Production of ceramic units - production of the molding machine				
Period	Cenol Ceramic			
	Roof Tile "Colonial"	Roof Tile "Canal"	Brick	Total
March 2011	682,920	443,016	204,000	1,329,936
April 2011	615,510	320,650	140,130	1,076,290
May 2011	691,740	462,294	251,400	1,405,434
June 2011	681,660	438,102	251,670	1,371,432
July 2011	665,910	473,256	259,800	1,398,966
August 2011	628,740	433,944	273,600	1,336,284
September 2011	563,220	349,272	225,390	1,137,882
October 2011	611,100	392,742	213,000	1,216,842
November 2011	612,360	336,105	204,165	1,152,630
December 2011	664,650	377,685	225,600	1,267,935
Total 2011	6,417,810	4,027,066	2,248,755	12,693,631
January 2012	682,920	436,968	192,000	1,311,888
February 2012	693,000	430,794	184,800	1,308,594
March 2012	670,200	466,074	189,600	1,325,874
April 2012	604,170	388,584	168,600	1,161,354
Total 2012	2,650,290	1,722,420	735,000	5,107,710

Table 11. Estimation of Ceramic pieces fired per month at Cenol Ceramic.

Cenol Ceramic	
Period	Total
March 2011	1,182,521
April 2011	956,990
May 2011	1,249,651
June 2011	1,219,418
July 2011	1,243,900
August 2011	1,188,165
September 2011	1,011,755
October 2011	1,081,963
November 2011	1,024,868
December 2011	1,127,392
Total 2011	11,286,623

January 2012	1,166,474
February 2012	1,163,545
March 2012	1,178,909
April 2012	1,032,625
Total 2012	4,541,553

5.2 Production of ceramic pieces at Telha Forte Ceramic.

Table 12. Telha Forte production of ceramic units based on measurement of the molding machine.

Production of ceramic units - Production of the molding machine			
Telha Forte Ceramic			
Roof Tile "Plan"	Brick	Capote	Total
2,102,310	0.00	17,430	2,119,740
1,972,530	0.00	4,200	1,976,730
1,508,220	0.00	14,070	1,522,290
1,992,690	0.00	17,220	2,009,910
2,020,410	0.00	15,120	2,035,530
2,041,120	0.00	32,340	2,073,460
1,904,490	0.00	24,780	1,929,270
1,863,540	0.00	28,140	1,891,680
1,792,350	0.00	40,110	1,832,460
2,011,200	102,000	24,570	2,137,770
19,208,860	102,000	217,980	19,528,840
1,983,000	0	45,780	2,028,780
1,936,800	0	78,960	2,015,760
2,212,560	14,400	91,770	2,318,730
1,690,000	0	85,470	1,775,470
7,822,360	14,400	301,980	8,138,740

Table 13. Estimation of Ceramic pieces fired per month at Telha Forte Ceramic.

Production of Ceramic units		
Period	Cenol Ceramic	Telha Forte Ceramic
	Total	Total
March 2011	1,182,521	1,884,781
April 2011	956,990	1,757,622
May 2011	1,249,651	1,353,554
June 2011	1,219,418	1,787,125
July 2011	1,243,900	1,809,905
August 2011	1,188,165	1,843,630
September 2011	1,011,755	1,715,423
October 2011	1,081,963	1,682,000
November 2011	1,024,868	1,629,344
December 2011	1,127,392	1,900,812
Total 2011	11,286,623	17,364,196
January 2012	1,166,474	1,803,903
February 2012	1,163,545	1,792,326
March 2012	1,178,909	2,061,714
April 2012	1,032,625	1,578,671
Total 2012	4,541,553	7,236,614
Total in the monitoring period	15,828,176	24,600,810