

GOMES DE MATTOS CERAMIC FUEL SWITCHING PROJECT



Document Prepared By Sustainable Carbon – Projetos Ambientais Ltda.

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Table of Contents

1	Project Details	3
1.1	Summary Description of the Implementation Status of the Project	3
1.2	Sectoral Scope and Project Type.....	3
1.3	Project Proponent	4
1.4	Other Entities Involved in the Project.....	5
1.5	Project Start Date.....	5
1.6	Project Crediting Period	5
1.7	Project Location.....	5
1.8	Title and Reference of Methodology	6
1.9	Other Programs.....	6
2	Implementation Status.....	6
2.1	Implementation Status of the Project Activity.....	6
2.2	Deviation	7
2.2.1	Methodology Deviations	7
2.2.2	Project Description Deviations	7
2.3	Grouped Project	7
3	Data and Parameters	8
3.1	Data and Parameters Available at Validation	8
3.2	Data and Parameters Monitored	11
3.3	Monitoring Plan	20
4	Quantification of GHG Emission Reductions and Removals	21
4.1	Baseline Emissions	21
4.2	Project Emissions.....	23
4.3	Leakage.....	23
4.4	Net GHG Emission Reductions and Removals.....	30
	APPENDIX I: Amount of renewable biomass consumed per month on CGM ceramic	32

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the 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 *Gomes de Mattos* ceramic, which is a red ceramic factory located in *Crato* municipality, in the State of *Ceará*, northeast region of Brazil. The ceramic factory produces ceramic tiles and bricks, destined mainly for the regional market in *Ceará*.

The objective of the implementation of this project activity in the *Gomes de Mattos* ceramic is to stop using the native firewood (without sustainable management plan), which is a non-renewable fuel, and completely substitute it with renewable biomasses to feed the ceramic 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 the 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 production process at *Gomes de Mattos* ceramic encompasses two Hoffman kilns and one Câmara kiln in order to burn the fuel and fire the ceramic units, which are mainly used in the construction sector. Due to the fuel switch, the Ceramic had to acquire two mechanic burners to feed the Hoffman Kilns with the renewable biomasses.

The proposed project started the fuel switch in April of 2003 (which was defined as the project start date), and this was completely achieved by the end of April 2006. The project crediting period is 10 years, i.e., from 01-May-2006 to 30-April-2016.

The emission reductions due to the switching of non-renewable fuel (native wood) to renewable biomasses resulted in **67,409 tCO₂e** during the monitoring period from 01-January-2013 to 28-February-2014. The contribution to sustainability will be 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.

1.3 Project Proponent

Organization name	CERÂMICA GOMES DE MATTOS LTDA - ME
Contact person	Mr. Stephenson Ramalho de Lacerda and Mr. Ronaldo Sampaio Gomes de Mattos
Title	Mr. <i>Ronaldo Sampaio Gomes de Mattos</i> , Director and owner: Information about the ceramic factory, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramic devices market challenges. Mr. <i>Stephenson Ramalho de Lacerda</i> , Manager and monitoring data responsible: General data and information on inputs and outputs of the ceramic factory, detailed information on acquisition of renewable biomasses and how this data is kept by the controller's office.
Address	Rodovia CE 55, Km 06 Crato – Pernambuco – Brazil Postal Code: 63105-330
Telephone	+55 (88) 3521-6580
Email	ceramicacgm@yahoo.com.br

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.

Organization name	Sustainable Carbon – Projetos Ambientais Ltda.
Role in the project	Project developer, Project participant and Project proponent.
Contact person	Thiago de Ávila Othero Marcelo Hector Sabbagh Haddad Larissa Tega da Fonseca Dênis Gonçalves dos Santos
Title	Thiago de Ávila Othero: Technical coordinator Marcelo Hector Sabbagh Haddad: Technical coordinator Larissa Tega da Fonseca: Technical analyst Dênis Gonçalves dos Santos: Technical analyst
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1.4 Other Entities Involved in the Project

No other entity was involved in the project.

1.5 Project Start Date

According to version 05 of the VCS PD¹, project start date was defined as 01-April-2006. On this date, the project began reducing or removing GHG emissions, i.e. the ceramic factory started using renewable biomass as fuel.

1.6 Project Crediting Period

The crediting period for this project starts on 01-May-2006 and ends on 30-April-2016.

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

1.7 Project Location

According to the applied methodology, the project boundaries for the project are the physical, geographical areas of the renewable energy generation, thus, the ceramic limits. Gomes de Mattos ceramic is located in Brazil, State of Ceará, municipality of Crato. The geographic location is indicated in Figure 1. The project site has the following postal address:

GOMES DE MATTOS CERAMIC

Rodovia CE 55, Km 06

Crato – Pernambuco – Brazil

Postal Code: 63105-330



Figure 1. Geographic location of Gomes de Mattos Ceramic: 7°10'36.50" S; 39°24'49.23" W

¹ Document available at: <http://mer.markit.com/br-reg/public/project.jsp?project_id=100000000000135>. Last visited on 20/03/2014.

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-February-2008 to 08-April-2010². This category comprises small thermal appliances that displace the use of non-renewable biomass by introducing new renewable energy end-user technologies.

The SOCIALCARBON Methodology³ is being applied as a sustainability tool in association with VCS Standard 2013, version 3.4.

1.9 Other Programs

- Emission Trading Programs and Other Binding Limits: The project activity is not included in an emission trading program or any other mechanism that includes GHG allowance trading.
- Other Forms of Environmental Credit: The project activity is not creating any other form of environmental credit under any specific program.
- Participation under Other GHG Programs: The project activity is not registered under any other GHG program.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The VCS PD project was validated by the Designated Operational Entity TÜV Nord CERT GmbH and this present monitoring report is being verified by Instituto Brasileiro de Opinião Pública e Estatística Ltda. (IBOPE).

As described on the VCS PD version 05, the production process at Gomes de Mattos ceramic encompasses two Hoffman kilns and one Câmara kiln in order to burn the fuel and fire the ceramic units, which are mainly used in the construction sector. According to the VCS PD, the both Hoffman kilns and the Câmara kiln produce together approximately 1,500,000 of ceramic units per month or 2,949 tonnes of ceramic units monthly.

The ceramic units that are cooked in the kilns can be dried using two drying systems. The first one is held in a covered area which allows the ceramic units to be naturally dried. The second is an artificial dryer which, besides using biomass as fuel to supply the energy that will dry the ceramic pieces, also reuses the energy generated by the kilns.

In the current monitoring period, as renewable biomasses, the ceramic factory is employing native firewood from sustainable management plan, Algaroba wood, sawdust, municipal wood residues, residues from cashew trees and Eucalyptus Wood from forest management plan.

² This version of the methodology is available at:

<http://cdm.unfccc.int/UserManagement/FileStorage/CDM_AMSP4VBBO5G54RXDE9KQ6FJWMGHZLHFA5>. Last visit on: 20/03/2014.

³ SOCIALCARBON Methodology was developed by Ecológica Institute (www.ecologica.org.br). It was founded on the principle that transparent assessment and monitoring of the social and environmental performance of projects improves their long-term effectiveness. The methodology uses a set of analytical tools that assess the social, environmental and economic conditions of communities affected by the project, and demonstrates through continuous monitoring the project's contribution to sustainable development.

The Table 1 below demonstrates the emission reductions verified in the last monitored period (from 01-August-2011 to 31-December-2012):

Table 1. Emission reductions verified in the last monitored period

4 th Monitoring Period	Emission Reduction (tCO ₂ e)
August to December- 2011	25,129
January to December- 2012	63,797
Total in the monitoring period	88,926

None of these changes have significant effects on the project monitoring or on its capacity to mitigate GHG emissions. The monitoring data was kept according to the monitoring plan described in the project description document. This Monitoring Report refers to the fifth monitoring period of this project, and includes data from 01-January-2013 to 28-February-2014.

2.2 Deviation

2.2.1 Methodology Deviations

There were no methodology deviations during this monitoring period.

2.2.2 Project Description Deviations

The registered VCS PD version 05 establishes that the project proponent (meaning the ceramic owner) would measure the amount of renewable biomasses used (parameter Qrenbiomass). However, during the entire monitored period, this parameter was monitored through all the receipts and invoices of biomass received by the ceramic company. This means the amount of renewable biomass is measured by provider and controlled by the ceramic owner, by storing receipts and invoices.

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.

It was identified a mistake in the NCV value of native firewood validated in the in the VCS PD version 05 and in the spreadsheet VCU estimates CGM_v.05, tab Native species considered. The equation applied in column "E" to calculate NCV value was corrected according to the Content of Hydrogen indicated on cell "F27". Therefore, the NCV value for native firewood with no forest management plan as well as the NCV of native wood from forest management plan were updated in this monitoring period.

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 / 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. Source: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf . Page 2.18. Table 2.3. IPCC. Last visited on 21/03/2014
Value applied	77.4 tCO ₂ /TJ
Justification of choice of data or description of measurement methods and procedures applied	In the baseline scenario, the probable fossil fuel that would be consumed in the absence of native wood without sustainable forest management would be the heavy oil. This fuel is more expensive than wood, however it can be a more plausible of substitute of wood than natural gas due to risks involving natural gas distribution.
Purpose of the data	Calculation of baseline emissions. In the baseline scenario, the probable fossil fuel that would be consumed in the absence of native wood without sustainable forest management would be the heavy oil. This fuel is more expensive than wood, however it can be a more plausible of substitute of wood than natural gas due to risks involving natural gas distribution.
Comments	Applicable for stationary combustion in the manufacturing industries and construction. The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

Data / Parameter	NCV_{biomass}
Data unit	TJ/tonne of wood
Description	Net Calorific Value
Source of data	National data
Value applied	0.020
Justification of choice of data or description of measurement methods and procedures applied	This value will provide the energy generated by the amount of wood that would be used in the absence of the project.

Purpose of the data	Calculation of baseline emissions. 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 <i>Caatinga</i> Biome that are usually utilized as fuel in the ceramic industries of the region. Sources: - Poder Calorífico da Madeira e de Resíduos Lignocelulósicos. Available at: http://web.archive.org/web/20101218120618/http://www.renabio.org.br/arquivos/p_poder_lignocelulosicos_11107.pdf. Last visit on: 21/03/2014. - Estrutura anatômica da madeira e qualidade do carvão de Mimosa tenuiflora (Willd.) Poir. Available at: http://www.scielo.br/pdf/rarv/v30n2/a18v30n2.pdf. Last visit on: 21/03/2014. A mistake was identified in the NCV value of native firewood validated in the in the VCS PD version 05 and in the spreadsheet VCU estimates CGM_v.05, tab Native species considered. The equation applied in column "E" to calculate NCV value was corrected according to the Content of Hydrogen indicated on cell "F27". Therefore, the NCV value for native firewood with no forest management plan as well as the NCV of native wood from forest management plan were updated in this monitoring period.
Comments	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 / Parameter	ρ biomass
Data unit	tonne/m ³
Description	Specific gravity
Source of data	- IPCC: Intergovernmental Panel on Climate Change. Orientación del IPCC sobre las buenas prácticas para UTCUTS - chapter 3 – Table 3A.1.9-2 - 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. -Estrutura anatômica da madeira e qualidade do carvão de Mimosa tenuiflora (Willd). Available at http://www.scielo.br/pdf/rarv/v30n2/a18v30n2.pdf. Last visit on: 21/03/2014. - Poder Calorífico da Madeira e de Resíduos Lignocelulósicos.

	Available at: http://www.renabio.org.br/06-B&E-v1-n2-2004-173-182.pdf > Last visit on: 21/03/2014. - IBAMA. Madeiras Brasileiras. Available at: < https://web.archive.org/web/20091226033704/http://www.ibama.gov.br/lpf/madeira/caracteristicas.php?ID=195&caracteristica=139> last visited on 21/03/2014 - Algaroba wood: The value applied is an average among all species founded in the source: <http://www.cnpf.embrapa.br/publica/boletim/boletarqv/bolet45/pag-99_106.pdf> Last visited on 21/03/2014
Value applied	0.88 tonne/m ³ .
Justification of choice of data or description of measurement methods and procedures applied	The amount of wood used in the baseline was measured by volume units, so this data is used to the unity conversion.
Purpose of the data	Calculation of baseline emissions. The amount of wood used in the baseline was measured in volume units. This datum was used for the unit conversion.
Comments	The species used to calculate de average value are typical trees of <i>Caatinga</i> Biome and usually utilized as fuel in the ceramic industries of the region.

Data / Parameter	BF_y
Data unit	m ³ of wood per tonne of ceramic devices.
Description	Consumption of non-renewable biomass per tonne of ceramic devices
Source of data	Historical data from the project proponent
Value applied	0.64 m ³ of wood per tonne of ceramic devices.
Justification of choice of data or description of measurement methods and procedures applied	The value was acquired through the average consumption and production of ceramic units during the years when the ceramic facilities used to consume non-sustainable wood. This value is in accordance with the data acquired in other ceramics that employ the same type of kiln. If nowadays the plants still used native firewood their consumption would be around 1,944 tonnes of native firewood (per month) to produce 2,780 ceramic units. These values are employed to calculate the real amount of wood displaced to maintain the ceramic units' production in the baseline

	scenario.
Purpose of the data	Calculation of baseline emissions. The value was acquired through the average consumption and production of ceramic devices during the years when the ceramic used to consume non renewable wood. This value is in accordance with the data acquired in other ceramics that employ the same type of kilns. The value is employed to calculate the real amount of wood displaced to maintain the ceramic production in the baseline scenario. .
Comments	The efficiency of the kiln is around 1.29 m³ of wood per thousand of ceramic devices, which presents a lower efficiency when compared with the value of Hoffman consumption found on literature which is between 0.5 and 0.9 m³ of wood per thousand of pieces. That occurs since <i>Gomes de Mattos</i> used to employ wood in their dryers as well and because of the lower efficiency of <i>Gomes de Mattos</i>' kilns. Source with TAPIAS, 2000.

3.2 Data and Parameters Monitored

Data / Parameter	$Q_{renbiomass}$					
Data unit	Tonnes per month					
Description	Amount of renewable biomasses					
Source of data	Measured by the biomass providers and controlled by the ceramic owner. The registered VCS PD version 05 establishes that the ceramic owner would measure this parameter; however, during the entire monitored period, this parameter was monitored through all the receipts and invoices of biomass received by the ceramic company.					
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. The values in the receipts may be described in m ³ , therefore 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 is:					
	Biomass	Native firewood from sustainable management plan/ Municipal wood residues	Residues from cashew tree	Eucalyptus	Sawdust	Algaroba wood

	Specific gravity (tonnes/ m³)	0.88	0.42	0.0191	0.245	0.756					
	The sources of these data are:										
	Sawdust:										
	Masses and Dead Loads of Concrete and Other Materials- https://web.archive.org/web/20100602112534/http://www.cca.org.nz/pdf/Masses.pdf Last visit on 21/03/2014										
	Eucalyptus:										
	The value applied is an average among all species founded in the source: < http://www.ipef.br/publicacoes/scientia/nr23/cap08.pdf >. Last visit on 21/03/2014										
	Residues from cashew tree:										
	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.										
	Native firewood from sustainable management plans/ Municipal wood residues:										
	Considered to be the same as for native firewood. Please check parameter <i>pbiomass</i> on section 3.3 (under fixed parameters) of the VCS PD version 05 for more information.										
Algaroba wood:											
The value applied is an average value of the specific gravities of all the species of <i>Algaroba</i> founded.											
PEREIRA, J. C. D.; LIMA, P. C. F. Comparação da Qualidade da Madeira de seis Espécies de Algarobeira para a Produção de Energia. Colombo: Embrapa Florestas, 2002. p. 99-107. Available at: < http://www.cnpf.embrapa.br/publica/boletim/boletarqv/bolet45/pag-99_106.pdf >. Last visit on 22/10/2012.											
Receipts registered like "stereo" as unit of measure was converted to "m³" using the Conversion Factors above											
<table><tr><th colspan="2">Conversion factor from "st" to "m³"</th></tr><tr><td>Native Wood from forest management areas</td><td>0.3388</td></tr><tr><td>Algaroba and Cashew tree wood</td><td>0.3745</td></tr></table>						Conversion factor from "st" to "m³"		Native Wood from forest management areas	0.3388	Algaroba and Cashew tree wood	0.3745
Conversion factor from "st" to "m³"											
Native Wood from forest management areas	0.3388										
Algaroba and Cashew tree wood	0.3745										
The sources of these data are:											

	Native Wood from forest management areas: Table 13, section 5.3.3.7, of the Boqueirão Forest Management Plan. The conversion factor was calculated according to the average of the plots described in this table. Algaroba and Cashew tree wood: FERRAZ, Douglas Galvão. Inventário Florestal de Três Fragmentos com Candeia (<i>Eremanthus erythropappus</i>) no Município de Itajubá - MG. 2008. 26 f. Monografia (Conclusão de Curso) - Curso de Gestão Ambiental, Escola Agrotécnica Federal, Inconfidentes-mg, 2008. Available at: <a .="" 03="" 2014<="" 21="" a="" href="http://docs.google.com/viewer?a=v&q=cache:mNfJBYKgNNMJ:www.ifsuldeminas.edu.br/pesquisas/TCC/TCC_Douglas.pdf+conver%C3%A7%C3%A3o+mst+m3&hl=pt-BR&gl=br&pid=bl&srcid=ADGEESiMIDtbGvrwKnI888t-ddbzBkGnc2hYaTXhq3GtXUOg1wbAbYIk1f2UWhdIIHsWCyfjYtfFgNboU_qeG8hcJf5fAzliJlJP3Z451eltDC6xOwmnW_X7D6HN69DDfUPbjq60wes&sig=AHIEtbTwzpj3zy7n6nlZFDM3-djyemLmDg>" last="" on:="" visit=""> Moreover, the registered VCS PD v.5 did not consider the conversion factor from mst to m³ for the amount of renewable biomass that arrives in mst unit (parameter Qrenbiomass). Therefore, in this Monitoring Report, the values presented in the table Qrenbiomass of the VCS PD (section 3.3) for cashew wood and native wood from management areas were corrected, according to the conversion factors presented in the section 3.2 of this Monitoring Report, table Qrenbiomass. To testify the renewability of the native wood from forest management areas is necessary the use of DOF (Forest Origin Document) to prove the regular origin of the biomass. Besides that, the Sustainable Management Plans ensure that the native wood is taken from land areas with sustainable management practices
Frequency of monitoring/recording	Monthly
Value monitored	Total amount during the this monitoring period (tonnes):

		2013	2014	Total in the period (tonnes)
	Native wood from forest management plan	4,150.2	811.0	4,961.1
	Algaroba wood	485.7		485.7
	Residues from cashew tree	196.5		196.5
	Sawdust (tonnes)	583.5	106.3	689.8
	Municipal wood residues (tonnes)	186.1		186.1
	Eucalyptus (tonnes)	49.0		49.0
	More detailed information (per month) is available in Annex I.			
Monitoring equipment	No monitoring equipment was used to determine this parameter			
QA/QC procedures to be applied	It was monitored through receipts of purchase from the biomass providers. The ceramic factory controls the quantity of biomass through an internal spreadsheet, which is fed with the measured values of all the biomass that arrive from the providers. These internal spreadsheets were double checked with all the receipts and invoices of biomass employed. The energy balance was verified according to the amount of biomass applied.			
Purpose of the data	This parameter was used to : - Compare the total energy produced in the current monitoring period to the thermal energy that would be necessary according to the VCS PD estimates (QA/QC table); - Demonstrate that the Project fits in small scale category (<45MWth/year); - Calculation of leakage emissions due to competing use of biomass.			
Calculation method	Not applicable.			
Comments	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 / Parameter	PR _y (ceramic devices)
Data unit	Unity of ceramic devices or tonnes of ceramic devices.
Description	Production of ceramic devices
Source of data	Controlled by the project developer.

Description of measurement methods and procedures to be applied	The measurement was done by an internal control sheet monitored by the project proponent, which was daily filled.		
	The production is a representative sample to ensure that all appliances are still in operation.		
	The weights of the ceramic units produced in this monitoring period were measured by a calibrated scale from Federal University of Ceará's Quality Laboratory ⁴ . These values are used to convert production from units to tonnes.		
	Ceramic device	Weight (kg per ceramic units)	
	Blocks with 8 orifices	1.935	
	Blocks with 6 orifices	1.47	
	Flagstones	2.541	
	Decor Revetment	0.286	
Colonial Tile	1.282		
Pressed Tile	2.836		
Frequency of monitoring/recording	Monthly		
Value monitored	Total amount during the this monitoring period:		
		Period	PR _y (tonnes)
	2013	January	5,807.4
		February	4,947.3
		March	5,998.2
		April	5,393.6
		May	6,175.8
		June	5,356.8
		July	5,431.0
		August	5,408.1
		September	5,431.7
		October	5,736.9
		November	5,197.7
		December	4,108.9
	Total 2013		64,993
	2014	January	6,333.4
		February	4,752.4
		Total 2014	
	Total in the monitoring period		76,079
	More detailed information, please see VCS MR Calculation CGM spreadsheet.		

⁴ National Service of Industrial Learning.

Monitoring equipment	No monitoring equipment is used to determine this parameter. Production is counted by trained personnel in the ceramic.
QA/QC procedures to be applied	The ceramics have an internal control of the quantity of pieces produced. It was rechecked according to the biomass employed and the kiln consumption of renewable biomass. This notebook is organized per month and daily filled according to data based on ceramic tonnes burned in the kilns.
Purpose of the data	This parameter is used to calculate baseline emissions and the total energy produced in the current monitoring period in order to compare to the thermal energy necessary in the VCS PD (QA/QC table).
Calculation method	Not applicable
Comments	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	Controlled by the project developer
Description of measurement methods and procedures to be applied	The guarantee of acquiring renewable wood was achieved by invoices from the providers. The origin of the cashew tree pruning was evidenced with a declaration from the provider that the sustainable plan had been followed. The biomasses (native firewood from sustainable management plan, Algaroba wood, sawdust, municipal wood residues, residues from cashew trees and Eucalyptus firewood) are considered renewable as fulfilling the options described in the applied methodology.
Frequency of monitoring/recording	Annually
Value monitored	Not directly applied for the calculation. It is considered that all biomass used is renewable.
Monitoring equipment	No monitoring equipment was used to determine this parameter.
QA/QC procedures to be applied	The biomass was considered renewable if it is according to the definition given by Methodology AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User – Version 01 valid from 01-February-2008 to 08-April-2010.
Purpose of the data	Not directly applied for the calculation. This parameter is used to guarantee that the amount of biomass acquired by the project proponent has a renewable origin. It is also necessary to comply with procedures required by the methodology AMS-I.E, Version 01.
Calculation method	Not applicable.

Comments	All the renewable biomasses utilized in the monitoring period are in accordance with definitions of renewable biomass set in the applied methodology. All these biomasses were already described in the project description 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.
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Data / 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	It is used to calculate the leakage of renewable biomass. The sources of leakages predicted in “General guidance on leakage in biomass project activities” of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories 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. The bibliographic references are described on the section 4.3 “Leakage”.																
Frequency of monitoring/recording	Annually																
Value monitored		<table><tr><th>Biomass</th><th>Surplus</th></tr><tr><td>Sawdust (m³)</td><td>1,058,032.36</td></tr><tr><td>Wood from sustainable management areas (m³)</td><td>4,595,695</td></tr><tr><td>Residues from cashew trees (tonnes)</td><td>162,500</td></tr><tr><td>Algaroba wood (m³)</td><td>2,500,000</td></tr><tr><td>Eucalyptus (m³)</td><td>13,259,341</td></tr><tr><td>Municipal wood residues⁵</td><td>Not measured</td></tr></table>	Biomass	Surplus	Sawdust (m³)	1,058,032.36	Wood from sustainable management areas (m³)	4,595,695	Residues from cashew trees (tonnes)	162,500	Algaroba wood (m³)	2,500,000	Eucalyptus (m³)	13,259,341	Municipal wood residues ⁵	Not measured	
Biomass	Surplus																
Sawdust (m³)	1,058,032.36																
Wood from sustainable management areas (m³)	4,595,695																
Residues from cashew trees (tonnes)	162,500																
Algaroba wood (m³)	2,500,000																
Eucalyptus (m³)	13,259,341																
Municipal wood residues ⁵	Not measured																
Detailed information in Section 4.3.: “Leakage”.																	

⁵ Data not available. It is assumed that the municipal wood residues are continuously generated by the municipality and region. According to CENBIO (2008), the lack of sites for the final disposal of the municipal wood residues, combined to the high cost of treatment techniques, constitute one of the largest and main problems faced today. Source: <http://cenbio.iee.usp.br/download/documentos/notatecnica_ix.pdf>. Last visited on 24/06/2012.

Monitoring equipment	No monitoring equipment is 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
Purpose of the data	Calculation of leakage emissions due to competing use of biomass.
Calculation method	The amount of biomass used by the project activity in each year of the crediting period is compared to total biomass available, as estimated on the VCS PD.
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	Leakage of non-renewable biomass
Data unit	tCO ₂ e
Description	Leakage resulted from the non-renewable biomass
Source of data	Monitored
Description of measurement methods and procedures to be applied	The three sources of leakages predicted in the applied methodology were monitored. Scientific articles official statistical data regional and national surveys were provided in order to ensure that there was no leakage from non-renewable biomass (or to estimate the leakage). Please see Section 4.3: "Leakage".
Frequency of monitoring/recording	Annually
Value monitored	0
Monitoring equipment	No monitoring equipment is used to determine this parameter.
QA/QC procedures to be applied	Data available regarding the ceramic industries fuel consumption were utilized to monitor the leakage.
Purpose of the data	Calculation of leakage emissions. This parameter is used to evaluate if there is any source of indirect emission related to non-renewable biomass. If applicable, leakage emissions are used to adjust emission reductions resulting from the project.
Calculation method	Not applicable.
Comments	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction of biomass or percentage

Description	Fraction of biomass (wood) used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods. It was also discounted the amount of wood saved by similar projects in the same biome.
Source of data	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 ceramics owner. Thus, the totality of fuel employed in the baseline scenario is from non-renewable origin. According to CNIP⁶ The total area of sustainable forest management plans in Caatinga corresponds to 278,000 ha. Besides that, according to IBGE, the approximate area of <i>Caatinga</i> biome is 844,453 km², which means 84,445,300 ha. Therefore, the amount of wood with sustainable use in <i>Caatinga</i> Biome is 0.35%. It was made two sheets to calculate the amount of wood consumed. The first one encompasses the amount of wood consumed by the ceramics located at the <i>Caatinga</i> biome. The other sheet calculates the amount of wood consumed regarding only <i>CGM</i> Ceramic. Dividing these values by the total of wood available, it was achieved the amount of renewable biomass that has been saved by all the project activities or only by <i>CGM</i> project, respectively. Afterwards, summing each value with the sustainable use areas defined by CNIP (2012), it was acquired two fraction of renewable biomass. Finally, each value was subtracted from 100% to achieve the $f_{NRB,y}$. Therefore, it was taken the smaller value in order to be more conservative. These sheets are available at the VCU Estimates spreadsheet.
Frequency of monitoring/recording	Annually
Value monitored:	99.4%
Monitoring equipment	No monitoring equipment was used to determine this parameter.
QA/QC procedures to be applied	The monitoring of this parameter was based in national and international articles and database every monitoring period. The sources provided information about the sustainable use of <i>Caatinga</i> biome. Wood saved from projects located in the same biome and that applied the same methodology developed by <i>Sustainable Carbon</i> was considered in this fraction. CDM or VCS registered projects with the same methodology were also included in this fraction if placed in the

⁶ Available at: <http://www.cnip.org.br/planos_manejo.html>. The total area of sustainable forest management plans in Caatinga biome was utilized due to be more conservative. Last visited on 24/03/2014.

	same region.
Purpose of the data	This parameter is used to calculate Baseline emissions. The $f_{NRB,y}$ determines the fraction of biomass (wood) used in the absence of the project activity that can be established as non-renewable biomass.
Calculation method	Calculation methods are described under the description of the measurement methods and procedures to be applied.
Comments	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 Monitoring Plan

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

Ceramic personnel are responsible to monitor the operating conditions on the 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. All this information was shared with Sustainable Carbon with dropbox program, which was daily fed by the ceramic factory responsible.

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 and the determination of parameter $f_{NRB,y}$.

In the currently monitoring period Sustainable Carbon performed an analysis to verify if biomass and production data are being correctly filled in the monitoring spreadsheets.

Analysis on production data is performed by a series of comparisons between different measurement points of production (molding machine, kiln loading and kiln unloading) to detect inconsistencies or suspicious data. Analysis on biomass data is performed by a series of comparisons between the amount of biomass and the cost over months to identify inconsistencies or unexpected variations in these parameters.

Sustainable Carbon is responsible for providing the required guidance to the ceramic factory, to register Biomass and Production data, in order to minimize errors, including assisting the ceramic in case the person in charge of the project monitoring is replaced.

The responsible for the monitoring plan is: Mr Stephenson Ramalho de Lacerda from Gomes de Mattos ceramic. Sustainable Carbon technical team (including those members described on Section 1.3) was also involved in the project monitoring.

Sustainable Carbon personnel involved on this monitoring report (as described on Section 1.3) includes holders of undergraduate degrees on Environmental Management, Environmental Engineering and Biological Sciences. All member of Sustainable Carbon technical team have

significant experience with similar projects, having developed many monitoring reports in the past three years.

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- February-2008 to 08-April-2010⁷. The project activity in the current monitoring period (14 months) generated around 110.13 TJ per year. Converting this number to MWh it was generated 30,590.51 MWh per year, which corresponds to the use of 3.49 MW_{thermal}. This is less than the limits of 45 MW_{thermal} for Type I Small scale project activities.

Baseline emissions are calculated as:

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

Where:

- ER_y:** Emission reductions during the year y in tCO₂e
- 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
- 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 tCO₂e/TJ⁸.

B_y is determined using option (b) of the methodology, as follows:

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

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

Where:

- HG_{p,y}:** Quantity of thermal energy generated by the renewable energy in the project in year y in TJ.
- η_{old}:** Efficiency of the system being replaced

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

Where:

⁷ Available at: This version of the methodology is available at: http://cdm.unfccc.int/UserManagement/FileStorage/CDM_AMSP4VBBO5G54RXDE9KQ6FJWMGHZLHFA5. Last visited on 24/03/2014

⁸ The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel.

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

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

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

Where:

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

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

Where:

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

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

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

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

Baseline emissions during the monitored period are summarized in the following table:

Table 2. Baseline emissions for CGM Ceramic

	Period	Baseline emissions (tCO ₂ e)
2013	January	5,146
	February	4,383
	March	5,315
	April	4,779
	May	5,472
	June	4,746
	July	4,812
	August	4,792
	September	4,813
	October	5,083
	November	4,605
	December	3,640
	Total 2013	57,586

2014	January	5,612
	February	4,211
	Total 2014	9,823
Total in the monitoring period		67,409

4.2 Project Emissions

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

4.3 Leakage

Leakage is estimated at 0 (zero) tCO₂e during the entire monitoring period.

The Category AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User (Version 01 valid from 01-February-2008 to 08-April-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” of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, which identifies different emission sources based on type of biomass considered (described in the table below).

Table 2. 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 3, the possible sources of leakage of the present project activity is the competing use of biomass, such as native firewood from sustainable management plan, *Algaroba* wood, *Eucalyptus* wood, sawdust, municipal wood residues, residues from cashew trees. All of these biomasses have enough availability as showed below demonstrating the lack of leakage for each biomass.

Algaroba wood

According to Silva (2007)⁹, *Algaroba*¹⁰ (*Prosopis juliflora* (Sw.) D.C.) is a tropical tree legume fairly common in the semi-arid region of Brazil, which thrives in dry environments where other plants would hardly survive.

At the beginning of 1940's, this specie was introduced in the Northeast region of Brazil with the aim of providing food to animals and to be utilized for reforestation actions. However, currently, due to its competitive skills, *Algaroba* spreads through several regions of Brazilian semi-arid areas¹¹.

A research made by EMBRAPA¹², which encompass the States of the northeast region of Brazil, affirmed that *Algaroba* is characterized as an invasive exotic plant due to its fast expansion, which causes many environmental impacts¹³. Besides, *Algaroba* presents a considerable capacity of regeneration and dispersal¹⁴, which means that the plant does not die, it sprouts again instead.

The research's author reported that wood from *Algaroba* exploration is mainly commercialized as fuel for industries of vegetable oil, leather, ceramic and bakeries. On the other hand, *Algaroba* wood is not sold for stake¹⁵, pegs and poles uses.

The factors which contribute most to the expansion of *Algaroba* uses, as firewood in these industries sectors, were its wide availability in the region and its legal release extraction from IBAMA¹⁶. This way, in order to control the decrease of biologic diversity in *Caatinga* biome, which has been occasioned from *Algaroba*'s genre invasion, the government started to stimulate the *Algaroba* exploration in order to avoid it's noxious effects¹⁷.

⁹ Silva, C. G. M, Melo Filho, A. B., Pires, E. F., Stamford M. Physicochemical and microbiological characterization of mesquite flour (*Prosopis juliflora* (Sw.) DC). Ciênc. Tecnol. Aliment., Campinas, 27(4): 733-736, out.-dez. 2007.

¹⁰ *Algaroba* may also be known as mesquite.

¹¹ EMBRAPA, Projeto vai definir manejo para evitar invasão da Algaroba no ambiente semi-árido. Available at: <<http://www.embrapa.gov.br/imprensa/noticias/2002/agosto/bn.2004-11-25.4648301041/>>. Last visit on: 25/03/2014.

¹² EMBRAPA is the Brazilian Agricultural Research Corporation's which its mission is to provide feasible solutions for the sustainable development of Brazilian agribusiness through knowledge and technology generation and transfer.

¹³ Araujo, J. L. P., Correia, R. C., Araujo, E. P., Lima, P. C. F. Cadeia Produtiva da Algaroba no Pólo de Produção da Bacia do Submédio São Francisco. EMBRAPA. Petrolina -PE – Brazil.

¹⁴ EMBRAPA, Projeto vai definir manejo para evitar invasão da Algaroba no ambiente semi-árido. Available at: <<http://www.embrapa.gov.br/imprensa/noticias/2002/agosto/bn.2004-11-25.4648301041/>>. Last visit on: 25/03/2014.

¹⁵ Heavy pole to which cattle is tied.

¹⁶ IBAMA (Brazilian Institute for Environment and the Renewable Natural Resource) is the environmental agency of Brazil affiliated with Ministry of Environment. The main missions of IBAMA are: Environmental Protection, Environmental Licensing, Environmental Quality and Sustainable Use of Forest Management and Animal Resources. More information about IBAMA is available at: <www.ibama.gov.br>.

¹⁷ *Algaroba* extraction is authorized in the State of Ceará, and it may be checked at normative instruction number 08 from 24/08/2004, developed by SEMACE.

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

The same research estimated that in the Northeast semi-arid region there were about 500 hundreds hectares spread through every type of its region land. Moreover, according to EMBRAPA (1992)¹⁸, wood's production by *Algaroba* is at least 5 m³/ha/year. i.e. the production in the project's region is about 2,500 thousands of m³ per year.

The project activity used during the current monitoring period around 550.6 m³ per year which represented less than 1% of the total amount of *Algaroba* wood produced.

Therefore, this kind of fuel did not encompass any type of leakage since there was a great amount of this renewable biomass available locally as described before.

Sawdust

Sawdust is also a probable fuel to be used for the ceramic devices burning. The production of wood generates a large amount of residues, which can be reused to generate thermal energy. As can be observed in the Figure 2, the potential of energy generation in the State of Ceará is plentiful, which means that there is an enormous availability of this kind of fuel to be employed in the project activity.

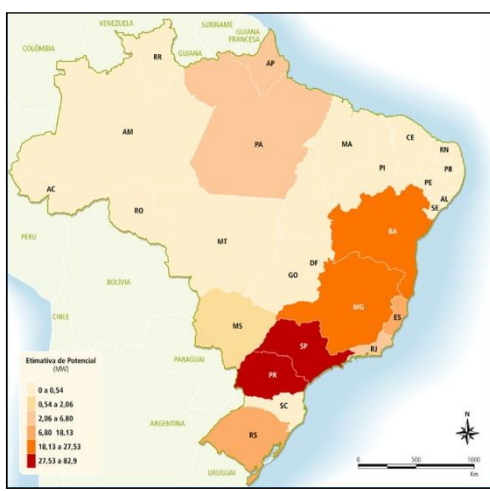


Figure 1. Forest Residues Potential for Energy Generation¹⁹

Considering that around 22% of the wood produced will generate sawdust²⁰. The production of wood in the State of Ceará was of 4,809,238 m³²¹ in 2011, thus, it generated 1,058,032.36 m³ of sawdust.

¹⁸ EMBRAPA, Comunicado Técnico Nº, Nov/92, p.1-2. Available at: <http://www.cpatas.embrapa.br/public_eletronica/downloads/COT51.pdf>. Last visit on: 25/03/2014.

¹⁹ Source: CENTRO NACIONAL DE REFERÊNCIA EM BIOMASSA - CENBIO. Panorama do potencial de biomassa no Brasil. Brasília; Dupligráfica, 2003. 80 p.

²⁰ 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.

The project activity utilized approximately 591.30 tonnes per year, which corresponds to around 2,413.47 m³ per year, representing less than 1% of the total of these residues generated in the State of Ceará.

This way, this renewable biomass did not have potential to generate leakage emissions.

Residues from cashew tree

Since *Gomes de Mattos Ceramic* utilizes wood residues from cashew trees, it is important to analyze the cashew scenario within Brazilian borders. The cashews cultivation is extremely important to Brazilian economy, where it is responsible for generate 150 million dollars per year. The cashew production is important especially in the northeast region, representing about 95% of Brazilian's cashew production. Besides, cashew production is responsible for generating job opportunities for 35,000 fieldworkers, 15,000 in the manufacturing process and 200,000 indirect job opportunities. The Brazilian production achieved 143,000 tonnes of cashew-nuts in 2005 spread in an area of 650,000 hectares²².

Besides, Brazilian's production presents the tendency of increasing so far, carried by the new technologies utilized and the higher national and international demand of cashew nuts²³. This way, the Brazilian sources of residues from cashew trees will increase following the Brazilian production, due the fact that cashew cultivation request continuous cut of cashew trees. The cut of cashew trees is necessary in order to allow an appropriate formation of the tree and maintaining favorable conditions for the next harvest time. This way, in cashew cultivation must be cut undesirable branches of the cashew trees²⁴. Moreover, dry branches on the ground compound a considerable amount of residues from cashew trees cultivation.

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

According to "*Estudo Setorial Cajucultura*" cashew trees cultivation presents a density of 100 units of trees per hectare²⁵, and the production of firewood residues from each tree is 2.5 kg per year²⁶. The cultivation of cashew is located in an area of 650,000 hectares. This way, the Brazilian production of residues from cashew trees is around 162,500 tonnes per year.

²¹ According to IBGE

²² According with EMBRAPA (Brazilian Agricultural Research Corporation's). Available at: <<http://sistemasdeproducao.cnptia.embrapa.br/FontesHTML/Caju/CultivodoCajueiro/index.htm>>. Last visited on: 25/03/2014

²³ Available at: <<http://www.nordeste rural.com.br/nordeste rural/matLerdest.asp?newsId=2219>>. Last visited on: 25/03/2014.

²⁴ According with EMBRAPA (Brazilian Agricultural Research Corporation's). Available at: <<http://sistemasdeproducao.cnptia.embrapa.br/FontesHTML/Caju/CultivodoCajueiro/tratamentos culturais.htm>>. Last visit on: 25/03/2014.

²⁵ According to SEBRAE, CE. "Estudo Setorial Cajucultura". According to the study, the spacing of planting cashew is 10m by 10m, which means one tree occupies 100m². Considering a hectare is 10,000 m², the amount of cashew tree per hectare is 100. Please see page 19 of the study.

²⁶ CEPEL. Technical Report ADG-A / PER – 789/00. Manual de Aplicação de sistemas descentralizados de Geração de Energia Elétrica para Projetos de Eletrificação Rural, Energia Biomassa. 2000." Available at: <<http://web.archive.org/web/20050226123608/http://www.cepel.br/~per/download/rer/rt-789-00.pdf>>. Last visited on: 25/03/2014.

Therefore, *Gomes de Mattos's* consumption of residues from cashew trees was around 196.50 tonnes per year, which represented less than 1% of the total production of residues from cashew trees.

Thus, the amount of residues from cashew trees necessary to provide thermal energy in *Gomes de Mattos's* kilns represented a non-representative quantity of this kind of biomass, which avoids the possibility of leakage.

Native wood from forest management plan

In 2007, *Ceará* State presented a production of 4,595,695 m³ of firewood²⁷, being one of the largest productions among Brazilian's states. In the current monitoring period the project activity used around 4,832.3 m³ of wood from management areas per year.

In this way, the project used less than 1% of the total biomass availability in *Ceará* State.

Thus, the amount of fire wood from management areas necessary to provide thermal energy in *Gomes de Mattos's* kilns represents a non-representative quantity of this kind of biomass, which avoids the possibility of leakage.

Eucalyptus

The area destined for afforestation in Brazil corresponds to 5.6 millions of hectares, where the *Eucalyptus* genus corresponds to 3.5 millions of this area, and can generate 23 to 25 tonnes of biomass per hectare²⁸. The grand majority of these cultivations were established in the middle of 1970 to 1980. The *Eucalyptus* and *Pinus* genres correspond to 80% of the afforestation in Brazil.

In addition, sustainable management practices of the afforestation in Brazil (as the techniques of preparation, fertilization, control of weeds, improved seeds, cloning and reform) were introduced and constantly improved in order to increase its productivity²⁹. As a consequence, Brazil withholds the best productivity rates (in m³/ha/year) over the world due to the adaptation of these species to the Brazilian territory and the success of the experiments of genetic improvement³⁰.

The production of wood from afforestation in the state of *Bahia*, which is a bordering state in the northeast region of Brazil, was of 13,259,341 m³ in 2007.³¹ The annual consumption of this kind of fuel by CGM Ceramic during the monitoring period was around 85 m³, representing less than 1% of the total of *Eucalyptus* wood produced in the region.

Municipal wood residues

Urban gardens residues are very usual residue over Brazilian's countries where around 70% of the amount of this kind of biomass is left in open dumps or landfills. This way the urban garden

²⁷ According to IBGE

²⁸ Brazilian Society of Forestry. Source: <<http://www.sbs.org.br/atualidades.php>>. Last visited on 25/03/2014

²⁹ MCT/IPLEF. *Silvicultura e Manejo*

³⁰ JUVENAL, T. L.; MATTOS, R. L. G. *O setor florestal no Brasil e a importância do reflorestamento*. BNDES Setorial, Rio de Janeiro, n. 16, p. 3-30, set. 2002.

³¹ According to IBGE (Geographic and Statistic Brazilian Institute).

residue does not have any kind of utilization turning out in an residue which may originate problems such as high costs for its correct disposal or treatment or result in negative environmental effects when not disposed correctly³².

For all this reasons the utilization of Urban gardens residues as fuel turn out be a considerable destination for these kind of residue, and would provide an abundant source of renewable biomass if utilized in the proposed project activity.

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

The following potential sources of this type of leakage could be identified:

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

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

The project is expected to decrease the use of non-renewable biomass by similar users, especially due to the incentive of carbon credits.

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

This leakage was monitored in order to guarantee the project conservativeness.

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

³² Available at: <http://cenbio.iee.usp.br/download/documentos/notatecnica_ix.pdf>. Last visit on: 25/03/2014

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

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

Table 4. Production – Q_{renbiomass} - QA/QC Procedure

	VCS PD	Monitored Period
PRy- Production (tonnes of ceramic units)	41,286	76,079
Sawdust (tonnes)	70	690
Municipal wood residues (tonnes)	0	186
Native wood from forest management plan (tonnes)	2,670	4,961
Eucalyptus Wood from forest management plan (tonnes)	252	49
Algaroba wood (tonnes)	671	486
Residues from cashew tree (tonnes)	551	196
Babaçu coconut husk (tonnes)	70	0
Thermal Energy (TJ)	85	128
Thermal energy per tonnes of pieces produced (TJ/tonnes of pieces)	0.002	0.002

As can be verified on Table 4, The thermal energy generated per tonne of ceramic units produced at CGM Ceramic in the monitored period was similar to the VCS PD. During this monitored period, there was verified an increase in the thermal efficiency per tonnes of pieces produced, mainly due to the higher consumption of sawdust. The ceramic factory invested in some improvements to use this type of biomass, which increased the burning efficiency.

In addition, the production of CGM ceramic factory was similar to what was verified in the last monitoring period, which was almost the double than the validated in the VCS PD v5. The main reason was due to market conditions.

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 Net GHG Emission Reductions and Removals

Table below summarizes the emission reductions for this monitoring period³³.

Table 5. Emission reductions for the monitoring period

	Period	PR _y (tonnes)	By (tonnes)	ER _y (tCO ₂ e)
2013	January	5,807.4	3,271	5,146
	February	4,947.3	2,786	4,383
	March	5,998.2	3,378	5,315
	April	5,393.6	3,038	4,779
	May	6,175.8	3,478	5,472
	June	5,356.8	3,017	4,746
	July	5,431.0	3,059	4,812
	August	5,408.1	3,046	4,792
	September	5,431.7	3,059	4,813
	October	5,736.9	3,231	5,083
	November	5,197.7	2,927	4,605
	December	4,108.9	2,314	3,640
	Total 2013	64,993	36,604	57,586
2014	January	6,333.4	3,567	5,612
	February	4,752.4	2,677	4,211
	Total 2014	11,086	6,244	9,823
Total in the monitoring period		76,079	42,848	67,409

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.

Table 6. Emission reductions for the monitoring period

Year	Month	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2013	January	5,146	0	0	5,146
	February	4,383	0	0	4,383
	March	5,315	0	0	5,315
	April	4,779	0	0	4,779
	May	5,472	0	0	5,472
	June	4,746	0	0	4,746
	July	4,812	0	0	4,812
	August	4,792	0	0	4,792
	September	4,813	0	0	4,813
	October	5,083	0	0	5,083
	November	4,605	0	0	4,605
	December	3,640	0	0	3,640
	Total 2013	57,586	0	0	57,586
2014	January	5,612	0	0	5,612
	February	4,211	0	0	4,211
	Total 2014	9,823	0	0	9,823

APPENDIX I: AMOUNT OF RENEWABLE BIOMASS CONSUMED PER MONTH ON CGM CERAMIC

	Period	Native wood from forest management plan	Algaroba wood	Residues from cashew tree	Sawdust (tonnes)	Municipal wood residues (tonnes)	Eucalyptus (tonnes)	Total (tonnes)
		tonnes	tonnes	tonnes				
2013	January	477.03	7.08	27.31	54.88	10.80		577.10
	February	393.55	7.83		40.89			442.27
	March	178.89	6.90	155.98	50.88	155.91		548.56
	April	119.26			48.39			167.65
	May	381.62			30.45	2.98		415.06
	June	596.29			86.81			683.10
	July	655.92	18.67	13.18	42.81	4.47		735.05
	August	256.40		0.02	122.09			378.51
	September	336.90	23.32		38.10	4.47		402.79
	October	149.07	85.85		28.85			263.77
	November	518.77	140.60		11.80	7.45		678.63
	December	86.46	195.42		27.60		49.00	358.48
	Total 2013	4,150.2	485.7	196.5	583.55	186.09	49.00	5,650.97
2014	January	535.17			41.70			576.87
	February	275.78			64.60			340.38
	Total 2014	811.0	0.0	0.0	106.3	0.0	0.0	917.25
Total in the period (tonnes)		4,961.12	485.67	196.50	689.85	186.09	49.00	6,568.22