

KITAMBAR SWITCHING FUEL PROJECT



Document Prepared By Sustainable Carbon – Projetos Ambientais Ltda

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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 *Kitambar Ceramic*, which is a red ceramic company located in Caruaru municipality, in the State of *Pernambuco*, in the northeast of Brazil. The ceramic company produces bricks and roof tiles, destined mainly for the regional market in *Pernambuco*.

The objective of this project activity in the ceramic is to stop using non-renewable native wood, which is a non-renewable fuel, and completely substitute it with renewable biomasses to feed their kilns. These measures can minimize the 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. In opposition to the identified baseline, the project activity generates thermal energy without causing deforestation and uses abundant renewable biomass.

Kitambar Ceramic Company continues with the same equipment employed in the last monitoring period: eight “Round Kilns”, with individual capacity of 42,000 devices per cycle, a wood shredder and a dosing machine that promotes an efficient consumption of biomass.

The emission reductions due to the switching of non-renewable fuel (non-renewable wood) to renewable biomasses were equal to **50,514 tCO₂e** during the monitoring period from 01-April-2015 to 31-March-2016.

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

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

Organization name	<i>Kitambar Artefatos de Cerâmica Ltda</i>
Contact person	<i>Mr. Antônio Marcos Tavares Barbosa and Mr. Severino Francisco Torres</i>

Title	<i>Mr. Antônio Marcos Tavares Barbosa</i>, Director and owner: Information about the ceramics, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramics devices market challenges. <i>Mr. Severino Francisco Torres</i>, Quality Controller, responsible for monitoring data: General data and information on inputs and outputs of the ceramic industry, detailed information on the acquisition of renewable biomasses and how this data is kept by the controller's office.
Address	Rodovia BR 232, Km 136, Distrito Industrial Caruaru - <i>Pernambuco</i> – Brazil Postal code: 55.000-000
Telephone	Ceramic phone number: +55 (81) 3722-7777
Email	financeiro.caruaru@kitambar.com.br http://www.kitambar.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 idealizer.
Contact person	Américo Varkulya Dênis Gonçalves dos Santos Fernanda Sayuri Suzuki Marcelo Hector Sabbagh Haddad Thiago de Ávila Othero
Title	Américo Varkulya: Technical consultant Dênis Gonçalves dos Santos: Technical analyst Fernanda Sayuri Suzuki: Technical analyst Marcelo Hector Sabbagh Haddad: Technical coordinator Thiago de Ávila Othero: Technical coordinator
Address	R. Doutor Bacelar. 368 – Conj. 23 – Vila Clementino Postal Code: 04.026-001 São Paulo – SP. Brazil
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Email	americo@sustainablecarbon.com denis@sustainablecarbon.com fernanda@sustainablecarbon.com marcelo@sustainablecarbon.com thiago.othero@sustainablecarbon.com
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1.4 Other Entities Involved in the Project

No other entity is involved in this project activity.

1.5 Project Start Date

According to version 02 of the VCS PD¹, project start date was defined as 01-December-2006. On this date, the project began reducing or removing GHG emissions, i.e. the ceramic started using renewable biomass as fuel.

1.6 Project Crediting Period

The crediting period for this project started on 01-January-2007 and ends on 31-December-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. Kitambar ceramic is located in Brazil, in the State of Pernambuco, which is indicated in Figure 01. The project site has the following postal address:

Kitambar Ceramic

Rodovia BR 232, Km 136, Distrito Industrial

Caruaru - *Pernambuco* – Brazil

Postal code: 55.000-000

¹ Document available at: < https://mer.markit.com/br-reg/public/project.jsp?project_id=100000000000032>. Last on: 12/05/2016.

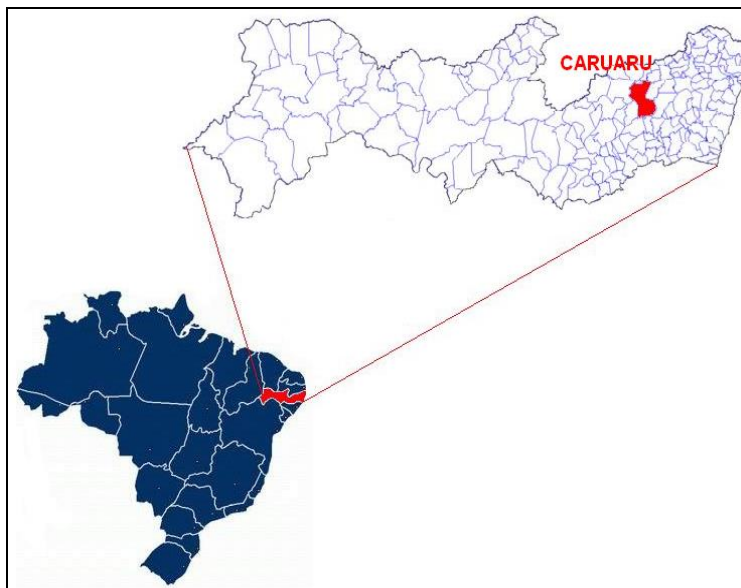


Figure 1. Geographic location of the city of the project activity that has the following coordinates in Pernambuco State: Caruaru: 8° 16' 58" S and 35° 58' 33" W.

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 08/04/2010². This category comprises small thermal appliances that displace the use of non-renewable biomass by introducing new renewable energy end-user technologies.

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 This version of the methodology is available at:
<http://cdm.unfccc.int/UserManagement/FileStorage/CDM_AMSP4VBBO5G54RXDE9KQ6FJWMGHZLHFA5>. Last visit on: 12/05/2016.

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 will be verified by the same Validation/Verification Body (VVB).

The project has been fully operational since the starting date of the crediting period. This means the ceramic is operating using exclusively renewable biomass, thus mitigating baseline emissions.

As described in the VCS PD version 02, the production process at *Kitambar Ceramic* encompasses eight “Round kilns” in order to burn the fuel and fire the ceramic units, which are mainly used in the construction sector. The “Round kilns” at *Kitambar Ceramic* have capacity for approximately 42,000 ceramic units per burning cycle, depending on the kind of the products that are fired, and approximately 28 burning cycles are done per month. The drying process occurs in a semi-continuous dryer which reuses the heat provided by the kilns to dry the ceramic units. In case no heat is being provided by the kilns, there is a separated furnace supplied only with renewable biomass.

Table 1. Emission reductions verified in the last monitored periods

Emission Reductions (tCO ₂ e)		
1st Monitoring Period	January to December of 2007	40,627
	January to September of 2008	33,122
Total in the 1st Monitoring Period		73,749
2nd Monitoring Period	October to December of 2008	10,203
	January to November of 2009	36,988
Total in the 2nd Monitoring Period		47,191
3rd Monitoring Period	December of 2009	3,801
	January to December of 2010	47,039
	January to December of 2011	47,025
	January to February of 2012	8,02
Total in the monitoring 3rd Monitoring Period		105,885
4th Monitoring Period	March to December of 2012	38,429
	January to December 2013	47,002
	January to May of 2014	20,209
Total in the monitoring 4th Monitoring Period		105,660
5th Monitoring Period	June to December 2014	31,249
	January to March 2015	12,695
Total in the monitoring 5th Monitoring Period		43,944

In the 5th monitoring period *Kitambar Ceramic* employed *Algaroba* wood, forest residues (sawdust and MDF residues) and Native Wood from forest management areas as renewable biomass. During the 6th monitoring period, from 01-April-2015 to 31-March-2016, the ceramic factory

utilized *Algaroba* wood, forest residues (sawdust and MDF residues) and a small amount of Coconut Husk.

The coconut husk was already used by Kitambar Ceramic during the third monitoring period. On such occasion, it was demonstrated that this fuel complies with the definition of renewable biomass and its use does not impact on the additionality of this project activity.

2.2 Deviations

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 02 establishes that the project proponent (meaning the ceramic owner) would measure the amount of renewable biomasses used (parameter $Q_{\text{renbiomass}}$). However, during the entire monitored period, this parameter was monitored through all the receipts and invoices of biomass received by the ceramic industries. This means the amount of renewable biomass is controlled by the ceramics owners, by storing receipts and invoices.

Moreover, the registered VCS PD version 02 did not consider the conversion factor from stereo meter (m^3 stereo) to cubic meter (m^3) for the amount of renewable biomass that arrives in volume units (parameter $Q_{\text{renbiomass}}$). Therefore, in this Monitoring Report, the values presented in the table $Q_{\text{renbiomass}}$ of the VCS PD (section 3.3) for *Algaroba* wood were corrected, according to the conversion factors presented in the section 3.2 of this Monitoring Report, table $Q_{\text{renbiomass}}$.

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:	$EF_{\text{projected fossil fuel}}$
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. IPCC. Last visit on: 19/05/2015
Value applied:	$77.4 \text{ tCO}_2/\text{TJ}$
Justification of choice of data or description of measurement methods and	In the baseline scenario, the fossil fuel that would probably 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 substitute of wood than

procedures applied	natural gas due to the risks involving natural gas distribution.
Purpose of the data:	The fossil fuel likely to be used by similar consumers is taken from the IPCC default value of residual fossil fuel. This parameter was used to calculate baseline emissions from the use of the fossil fuel that would be used in the baseline scenario, in the absence of non-renewable wood.
Any comment:	Applicable for stationary combustion in the manufacturing industries and construction.

Data Unit / Parameter:	NCV _{non-renewable wood}
Data unit:	TJ/tonne of wood
Description:	Net Calorific Value of non-renewable wood
Source of data:	Brazilian study carried out with <i>Caatinga</i> wood: 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/06-B&E-v1-n2-2004-173-182.pdf >. Last visit on: 19/05/2016. OLIVEIRA, E. et al. Estrutura anatômica da madeira e qualidade do carvão de Mimosa tenuiflora (Willd.) Poir. Revista Árvore, Viçosa-MG, v.30, n.2, p.311-318, 2006. Available at: < http://www.scielo.br/pdf/rarv/v30n2/a18v30n2.pdf >. Last visit on: 19/05/2016
Value applied:	0.019
Justification of choice of data or description of measurement methods and procedures applied	This value provided the energy generated by the amount of wood that would be used in the absence of the project. It differs from the IPCC value because represents the net calorific value of the local biome.
Purpose of the data:	Calculation of baseline emissions. This value provides the energy generated by the amount of wood that would be used in the absence of the project.
Any comment:	The species used to calculate the average value are typical trees of <i>Caatinga</i> Biome that are usually utilized as fuel in the ceramic industries of the region. IPCC default values shall be used only when country or project specific data are not available or difficult to obtain, according to "Guidance on IPCC default values" (Extract of the report of the twenty-fifth meeting of

	the Executive Board, paragraph 59).
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Data Unit / Parameter:	ρ_{wood}
Data unit:	tonne/m ³
Description:	Specific gravity of non-renewable wood
Source of data:	Brazilian studies carried out with <i>Caatinga</i> wood: - 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. - 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/06-B&E-v1-n2-2004-173-182.pdf >. Last visit on: 19/05/2016. - IPCC: Intergovernmental Panel on Climate Change. Orientación del IPCC sobre las buenas prácticas para UTCUTS - chapter3 – Table 3A.1.9-2. - OLIVEIRA, E. et al. Estrutura anatômica da madeira e qualidade do carvão de Mimosa tenuiflora (Willd.) Poir. Revista Árvore, Viçosa-MG, v.30, n.2, p.311-318, 2006. Available at: <http://www.scielo.br/pdf/rarv/v30n2/a18v30n2.pdf>. Last visit on: 19/05/2016 - IBAMA – Madeiras Brasileiras. <https://web.archive.org/web/20091226033704/http://www.ibama.gov.br/lpf/madeira/caracteristicas.php?ID=195&caracteristica=139>. Last visit on: 19/05/2016
Justification of choice of data or description of measurement methods and procedures applied	The amount of wood used in the baseline was measured in volume unit. This datum was used for unit conversion.
Value applied:	0.88
Purpose of the data:	Calculation of baseline emissions. 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 <i>Caatinga</i> Biome that are usually utilized as fuel in the ceramic industries of the region.

Data Unit / Parameter:	BF_y
Data unit:	Tonnes of wood per thousands of ceramic devices produced per year
Description:	Consumption of non-renewable biomass per thousand of ceramic devices produced per year
Source of data:	Historical data from ceramic owner
Value applied:	2.28
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 devices during the years when the ceramic used to consume non sustainable wood. This value is in accordance with the data acquired in other ceramics that 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.
Purpose of the data:	Calculation of baseline emissions. The value is utilized to calculate the real amount of wood displaced to maintain the ceramic production in the baseline scenario. This value is in accordance with the data acquired in other ceramics that employ the same type of kilns.
Any comment:	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.

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.
Description of measurement methods and procedures to be applied	The amount of biomass was monitored in accordance to the weight or volume described in the receipts from the providers. For Algaroba wood, the values in the receipts are described in m³. However, a conversion factor from m³st (m³ stereo) to m³ had to be applied, since the ceramic owners confirmed measurements were actually made in mst (m³ stereo), and that is common practice to talk about m³ when in reality they are m³st.

	The monitoring method applied is the same that started to be applied in the last monitoring period. The registered VCS PD version 02 did not consider the conversion factor from m³ stereo to m³ for the amount of renewable biomass that arrives in m³ stereo unit (parameter Qrenbiomass).								
Frequency of monitoring/recording	Monthly								
Value monitored:	Total amount of biomasses consumed during all months of the monitoring period (in tonnes): <table border="1"> <thead> <tr> <th>Biomass</th><th>Amount of biomass consumed (tonnes)</th></tr> </thead> <tbody> <tr> <td>Algaroba Wood</td><td>4,650.34</td></tr> <tr> <td>Forest Residues</td><td>566.42</td></tr> <tr> <td>Coconut husks</td><td>97.54</td></tr> </tbody> </table> More detailed information is available in Appendix 1.	Biomass	Amount of biomass consumed (tonnes)	Algaroba Wood	4,650.34	Forest Residues	566.42	Coconut husks	97.54
Biomass	Amount of biomass consumed (tonnes)								
Algaroba Wood	4,650.34								
Forest Residues	566.42								
Coconut husks	97.54								
Monitoring equipment	No monitoring equipment is used to determine this parameter.								
QA/QC procedures to be applied	Amount of biomass was checked according to receipts of purchase. The energy balance was verified according to the amount of biomass applied. The thermal energy generated with the use of <i>Algaroba</i> wood, forest residues (sawdust and MDF) and coconut husks per thousands of ceramic devices produced during the current monitoring period was compared to the VCS PD.								
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	The energy generated by the amount of renewable biomass during the current monitoring period was calculated based on the Net Calorific Value of each biomass, as can be seen on the VCS MR Calculation spreadsheet. Receipts registered on "stereo" as unit of measure were converted to "m³" using the Conversion Factors below.								

Conversion factor from "m³ stereo" to "m³"	
<i>Algaroba</i>	0.3745 ³
<i>Native Wood from forest management areas</i>	0.3388 ⁴

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 m³, therefore it is necessary the conversion to tonnes through the specific gravity of each biomass. In case of coconut husks the amount of biomass is already provides in tonnes, thus the conversion is not required. The specific gravity values of the renewable biomasses utilized in this project are:

Biomass	Specific gravity (tonne/m³)
<i>Algaroba</i> Wood	0.836
Forest Residues	0.35
Coconut Husk	0.5

Source of data:

- *Algaroba* wood:

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://ainfo.cnptia.embrapa.br/digital/bitstream/CNPFF-2009-09/33614/1/pag-99_106.pdf>. Last visit on: 19/05/2016.

- Forest residues:

PINHEIRO, G. F.; RENDEIRO, G.; PINHO J. T. **Densidade Energética de Resíduos Vegetais**. 2006. Available at: <

³ According to FERRAZ, Douglas Galvão. Inventário Florestal de Três Fragmentos com Candeia (*Eremanthus erythropappus*) no Município de Itajubá - MG. 2008. 26 f. Monografia (Conclusão de Curso) - Curso de Gestão Ambiental, Escola Agrotécnica Federal, Inconfidentes-mg, 2008. Page 15

⁴ Table 13, section 5.3.3.7, of the Boqueirão Forest Management Plan. (This Forest Management Plan belongs to CGM Ceramic, which is a ceramic factory located also in caatinga biome)

The conversion factor was calculated according to the average of the plots described in this table.

	http://www.renabio.org.br/03-B&E-014-GiorgianaFP-DensEn-2005-p113-123.pdf. Last visit on: 19/05/2016. - Algaroba wood (conversion factor): 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. P99-107 Available at: <http://web.archive.org/web/20070609133129/http://www.cnpf.embrapa.br/publica/boletim/boletarqv/bolet45/pag-99_106.pdf> Last visit on: 19/05/2016. - Coconut Husk PINHEIRO, G. F.; RENDEIRO, G.; PINHO J. T. Densidade Energética de Resíduos Vegetais. 2006. Available at: <www.ufpa.br/gedae/BIOMASSAEENERGIA2006.pdf>. Reference already verified in the Project - Bandeira and Capelli Ceramics Fuel Switching Project, available at: <http://www.vcsprojectdatabase.org/#/project_details/143>. Information available on document: "MONIT_REP_143_01MAY2010_29FEB2012.PDF" page 16. Last visit on 21/06/2016.
Comments	As stated in the VCS PD, the providers listed in the PD are only a few of those that work for the ceramic; nevertheless, it does not exclude the possibility of buying biomass from others. 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 pieces
Source of data:	Controlled by the project developer
Description of measurement methods and procedures to be applied:	This parameter is monitored by the project developer (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 is aggregated on a monthly and yearly basis. Measurements are done by an internal control sheet monitored by the project proponent.
Frequency of	Monthly

monitoring/recording:																																										
Value monitored:		<table><tr><th colspan="2">Period</th><th>PR_y - Production (ceramic units)</th></tr><tr><td rowspan="10">2015</td><td>April</td><td>964,050</td></tr><tr><td>May</td><td>1,227,916</td></tr><tr><td>June</td><td>1,176,500</td></tr><tr><td>July</td><td>1,442,600</td></tr><tr><td>August</td><td>1,287,650</td></tr><tr><td>September</td><td>1,306,800</td></tr><tr><td>October</td><td>1,198,000</td></tr><tr><td>November</td><td>1,223,660</td></tr><tr><td>December</td><td>1,315,300</td></tr><tr><td colspan="2">Total 2015</td><td>11,142,476</td></tr><tr><td rowspan="4">2016</td><td>January</td><td>1,293,350</td></tr><tr><td>February</td><td>1,218,730</td></tr><tr><td>March</td><td>1,380,600</td></tr><tr><td colspan="2">Total 2016</td><td>3,892,680</td></tr><tr><td colspan="2">Total in the monitoring period</td><td>15,035,156</td></tr></table>		Period		PR _y - Production (ceramic units)	2015	April	964,050	May	1,227,916	June	1,176,500	July	1,442,600	August	1,287,650	September	1,306,800	October	1,198,000	November	1,223,660	December	1,315,300	Total 2015		11,142,476	2016	January	1,293,350	February	1,218,730	March	1,380,600	Total 2016		3,892,680	Total in the monitoring period		15,035,156	
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	March	1,380,600																																								
	Total 2016		3,892,680																																							
Total in the monitoring period		15,035,156																																								
Monitoring equipment:	No monitoring equipment is used to determine this parameter. Production is counted by trained personnel on <i>Kitambar</i> ceramic.																																									
QA/QC procedures to be applied:	Data concerning <i>PR_y</i> measurement points are from an internal control documents used by <i>Kitambar</i> Ceramic. These documents are organized per month and daily filled according to data based on ceramic units 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:	The ceramic industry has an internal control of the quantity of ceramic units produced. It was rechecked according to the biomass employed in the ceramic kilns.																																									
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:	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:	This information was given by the biomasses providers. The guarantee of acquiring renewable wood was achieved by invoices from the providers. As stated in the section 2.2, the biomasses (Algaroba wood, forest residues and Coconut husks) are considered renewable as fulfilling the options described in the methodology applied. Compared with the last monitoring period, few of biomass suppliers were modified and most of them provided evidences on the origin of each type of biomass consumed by Kitambar Ceramic, through receipts and invoices. Aiming to assess if biomass are renewable, interviews were made by Sustainable Carbon with biomass suppliers. Such procedures were applied in the last monitoring period.
Frequency of monitoring/recording:	Annually
Value monitored:	Not applicable.
Monitoring equipment:	No monitoring equipment was used to determine this parameter.
QA/QC procedures to be applied:	The biomass is considered renewable as it is according to the definition given by the applied methodology.
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
Any comment:	All the renewable biomasses utilized are in accordance with definitions of renewable biomass set in the applied methodology. 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 m ³
Description:	Amount of renewable biomass available
Source of data:	Monitored
Description of	The sources of leakages predicted in "General guidance on leakage in

measurement methods and procedures to be applied:	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:	Detailed information in Section 4.3.: “Leakage”.
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.
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:	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.
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 ceramics owner. Thus, the totality of fuel employed in the baseline scenario is from non-renewable origin. According to Associação Plantas do Nordeste (APNE, 2016), the approximated area of the Caatinga biome with sustainable use corresponds to 393,995 ha⁵. Besides that, according to the same source, the approximate area of Caatinga biome is 850,000 km², which means 85,000,000 ha. Therefore, the percentage of wood with sustainable use in Caatinga Biome is around 0.46%. Two sheets were made to calculate the amount of wood consumed. The first one encompasses the amount of wood consumed by the ceramics located at the Caatinga biome. The other sheet calculates the amount of wood consumed regarding only Kitambar Ceramic. Dividing these values by the total of wood available, the amount of renewable biomass that has been saved by all the project activities or only by Kitambar project was achieved⁶. Afterwards, summing each value with the sustainable use areas defined by APNE (2016), two fractions of renewable biomass were acquired. Finally, each value was subtracted from 100% to achieve the $f_{NRB,y}$.

⁵ According to Associação Plantas do Nordeste 2016. Available at: <http://www.cnip.org.br/planos_manejo.html>. Last visited on: 27/07/2016.

⁶ According to data from project activities elaborated by Sustainable Carbon – Projetos Ambientais LTDA.

	Therefore, the smaller value was considered in order to be more conservative. These sheets are available at the VCU Estimates spreadsheet.
Frequency of monitoring/recording:	Annually
Value monitored:	99.3%
Monitoring equipment:	No monitoring equipment is 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 Caatinga biome. Wood saved from projects developed by Sustainable Carbon in the same biome and that have applied the same methodology was considered in this fraction ⁷ . CDM or VCS registered projects were also included in this fraction if placed in the same region and using 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.
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:	Values from wood residues should be determined ex ante ⁸ . Detailed information in Section 4.3 - Leakage.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

3.3 Monitoring Plan

The monitoring is carried out 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.

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.

⁷ Document available at: <http://mer.markit.com/br-reg/public/index.jsp?entity=project&sort=project_name&dir=ASC&start=0&acronym=&limit=15&name=sustainable+carbon&standardId> Last visit on: 12/05/2016.

⁸ According to CDM General guidance on leakage in biomass project activities, version 3. Available at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved/history/c_leak_biomass/guid_biomass_v03.pdf>. Last visited on: 13/05/2016.

Ceramic personnel register monitoring data regarding parameters $Q_{renbiomas}$ and PR_y on electronic spreadsheets, which are shared with Sustainable Carbon team using an internet cloud service (Dropbox). This gives Sustainable Carbon real time access to monitoring data.

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 current monitoring period Sustainable Carbon performed an analysis to verify if biomass and production data were 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 evaluate 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 origin of renewable biomass is given by the biomass providers. The guarantee of acquiring algaroba wood and forest residues (sawdust) is achieved by invoices from the providers and native wood from management areas is achieved by DOF (Forest Origin Documents). The amount of biomasses is monitored in accordance to the weight or volume described in the receipts from the providers.

Compared with the last monitoring period, few of biomass suppliers were modified and most of them provided evidences on the origin of each type of biomass consumed by Kitambar Ceramic, through receipts and invoices. Aiming to assess if biomass are renewable, interviews were made by Sustainable Carbon with biomass suppliers. Such procedures were applied in the last monitoring period.

The amount of products produced per year is acquired by counting the total production. The measurement is made by an internal control sheet monitored by the project proponent, which controls the amount of ceramic units that enter in the molding machine.

The three sources of leakages predicted in the applied methodology are monitored. Scientific articles official statistical data regional and national surveys are provided in order to ensure that there is no leakage from non-renewable biomass (or to estimate the leakage). 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 $f_{NRB,y}$. Sustainable Carbon also assists the Ceramic personnel to double check the monitored data on biomass consumption and ceramic devices production.

Non-conformities identified in the double check procedures were clarified between Sustainable Carbon technical team and the monitoring responsible on the ceramic during site visits for data collection, by reassessing existing documents and sources of information.

The responsible for the monitoring plan are *Mr. Severino Francisco Torres* and *Mr. Antônio Marcos Tavares Rocha* from *Kitambar* ceramic. 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 08/04/2010⁹. The project activity in this monitoring period (12 months) generated 105.29 TJ per year. Converting this number to MWh, it was generated 29,247.10 MWh per year, which corresponds to the use of 3.34 MW_{thermal} on average of the kilns capacity during the monitored period, which is less than the limits of 45 MW_{thermal} for Type I Small scale project activities.

Baseline emissions

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

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 tCO₂/TJ¹⁰.

B_y is determined using the option:

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

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

Where:

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

η_{old} : Efficiency of the system being replaced

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

Where:

⁹ Available at: <

http://web.archive.org/web/20090304141849/http://cdm.unfccc.int/UserManagement/FileStorage/CDM_AMSP4VBBO5G54RXDE9KQ6FJWMGHZLHFA5 >. Last visit on: 17/03/2015.

¹⁰ 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 thousand 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/ thousand 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 tonnes/thousand of ceramic devices

Using the Equations 3, 4 and 5 in the Equation 1, it results to:

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

As shown in the calculations above, the η_{old} and the NCV biomass are not required to calculate the Emission Reductions, thus they were excluded.

The exact production (PR_y) was monitored by the project proponent based on data from ceramic units burned in the kilns. Data is aggregated on a monthly and yearly basis. Measurements are done by an internal control sheet monitored by the project proponent.

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

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

Table 2. Baseline emissions for Kitambar ceramic

Year	Month	Baseline emissions (tCO ₂ e)
2015	April	3,239
	May	4,125
	June	3,953
	July	4,847
	August	4,326
	September	4,391
	October	4,025
	November	4,111
	December	4,419
	Total 2015	37,436
2016	January	4,345

	February	4,095
	March	4,638
	Total 2016	13,078
Total in the monitoring period		50,514

4.2 Project Emissions

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

4.3 Leakage

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

The Methodology AMS-I.E v.1 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 this project activity, should also be estimated according to the “General guidance on leakage in biomass project activities” (attachment C of appendix B) of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, which identifies different emission sources based on the type of biomass considered (described in the table below).

Table 3. 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 table 3, the possible sources of leakage of the present project activity is the competing use of *Algaroba* wood, forest residues (sawdust and MDF) and coconut husks. All of these biomasses have enough availability as showed below demonstrating the lack of leakage for each biomass.

Algaroba wood

According to Silva (2007)¹¹, *Algaroba*¹² (*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 areas¹³.

A research made by EMBRAPA¹⁴, which encompass the States of *Pernambuco* and *Bahia*, affirmed that *Algaroba* is characterized as an invasive exotic plant due to its fast expansion, which causes many environmental impacts¹⁵. This source stated that there were several centers of *Algaroba* operation highlighting the San Francisco Basin, which is comprised for many municipalities from the states of *Bahia* and *Pernambuco*, including this project region. Besides, *Algaroba* presents a considerable capacity of regeneration and dispersal¹⁶, which means that the plant does not die, it sprouts again stead.

The research's author reported that wood from *Algaroba* exploration on San Francisco Basin is mainly commercialized as fuel for industries of vegetable oil, leather, ceramic and bakeries. On the other hand, *Algaroba* wood is not sold for stake¹⁷, pegs and poles uses. *Algaroba* firewood is produced by the harvest of *Algaroba* trees occurring in certain areas. This is performed either by the land owner or by the biomass suppliers. In both cases, biomass suppliers purchase nearly all the wood harvested, leaving a small amount for the land owners to use as fencepost.

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 IBAMA¹⁸.

¹¹ 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.

¹² *Algaroba* may also be known as mesquite

¹³ EMBRAPA, Projeto vai definir manejo para evitar invasão da *Algaroba* no ambiente semi-árido.. Verified during the last monitoring period and headline available at <http://web.archive.org/web/20130618070649/http://www.cpatas.embrapa.br:8080/noticias/index.htm> Visited in: 24/05/2016.

¹⁴ 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.

¹⁵ 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.

¹⁶ EMBRAPA, EMBRAPA, Projeto vai definir manejo para evitar invasão da *Algaroba* no ambiente semi-árido.. Verified during the last monitoring period and headline available at <http://web.archive.org/web/20130618070649/http://www.cpatas.embrapa.br:8080/noticias/index.htm> Visited in: 24/05/2016

¹⁷ Heavy pole to which cattle is tied.

¹⁸ 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.

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)¹⁹, wood's production by *Algaroba* is at least 5 m³/ha/year.

The production of *Algaroba* wood in the project's region is about 2,500 thousands of m³ per year. During this monitoring period, *Kitambar* Ceramic consumed approximately 5,562.61 m³ of *Algaroba* wood per year, which represented less than 1% of the total.

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

Algaroba forest areas are usually not subject to formal forest management techniques, but left largely unmanaged between harvests. It is important to notice that there are no national or regional forest or nature conservation regulations applicable to *Algaroba* forests, since this is an exotic species.

However, it can be considered that sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time. This is so because *Algaroba* has a strong capacity of regeneration, vigorously sprouting after harvest. The sprouts grow very fast, and quickly accumulate wood, thus maintaining the carbon stocks even if no formal forest management techniques are applied. Therefore, *Algaroba* firewood could be considered a renewable biomass in accordance with option I from CDM definition of renewable biomass is available on Annex 18 of the 23rd Report from the Executive Board.

Forest Residues

Forest Residues are also a likely 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, considering that around 22% of the wood produced will generate sawdust²⁰. The production of wood in the state of *Pernambuco* was of 1,454,054 m³²¹ in 2007. Thus, the production of sawdust is around 319,891.88 m³ per year.

In this monitoring period *Kitambar* ceramic utilized 1,618.35 m³ per year of sawdust and MDF which represented less than 1% of the biomass availability in the state of *Pernambuco*. This way, this renewable biomass does not have potential to generate leakage emissions due to its high availability.

The forest residues (sawdust) are considered renewable according to option V of methodology definition of renewable biomass: "The biomass is the non-fossil fraction of an industrial or municipal waste".

Coconut husk

¹⁹ EMBRAPA, Comunicado Técnico Nº, Nov/92, p.1-2. Available at: <http://www.cpatsa.embrapa.br/public_eletronica/downloads/COT51.pdf>. Last visit on: 24/05/2016.

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.

²¹ According to Geographic and Statistic Brazilian Institute (IBGE). Available at: <<http://www.ibge.gov.br/estadosat/temas.php?sigla=pe&tema=extracaovegetal2007>>. Last visit on: 24/05/2016.

The coconut has diverse uses, which briefly is used for food, water, fiber among others. In the northeast region of Brazil, 6.7 millions of tonnes of coconut husks are generated yearly, which can be up to 70% of the solid residues of coastal cities²². During this monitoring period, Kitambar Ceramic utilized around 97 tonnes per year of Coconut Husk, which represented less than 1% of the coconut husk availability.

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 were already consuming wood from non-sustainable forest management (common practice).

The project will contribute to reduce the use of non-renewable biomass, especially due to the incentive of carbon credits. Therefore, it can be concluded that this source of leakage, until the date of this monitoring report, is not considered for 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.

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

²² Available at: <www.sbpcnet.org.br/livro/60ra/textos/SI-GoreteMacedo.pdf>. Last visit on: 21/06/2012.

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

Table 4. Production – $Q_{\text{renewable biomass}}$ - QA/QC Procedure

	VCS PD	Monitoring Period
Production (thousand of ceramic pieces)	12,600.00	15,035.16
Algaroba Wood Consumption (tonnes)	4,185.66	4,650.34
Cashew Tree Residues Consumption (tonnes)	808.79	0.00
Coconut husk (tonnes)	1,028.40	97.54
Forest Residues (tonnes)	0.00	566.42
Thermal Energy (TJ)	111.81	105.29
Thermal energy per thousand of pieces produced (TJ/thousand of pieces)	0.009	0.007

As can be verified on Table 4, the thermal energy generated by the use of renewable biomasses per thousands of ceramic devices produced during the current monitoring period was around 20% lower than the VCS PD version 02. This difference is likely caused by the efficiency increase throughout the years in comparison with the VCS PD version 02.

Therefore, based on Category AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User (Version 01, valid from 01/02/2008 to 08/04/2010) 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 5 below summarizes the emission reductions for this monitoring period²³.

Table 5. Emission reductions for the monitoring period.

Kitambar Ceramic Industry				
Period		PR _y - Production (ceramic units)	B _y (tons)	ER _y (tCO ₂ e)
2015	April	964,050	2,198	3,239

²³ 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.

	May	1,227,916	2,800	4,125
	June	1,176,500	2,682	3,953
	July	1,442,600	3,289	4,847
	August	1,287,650	2,936	4,326
	September	1,306,800	2,980	4,391
	October	1,198,000	2,731	4,025
	November	1,223,660	2,790	4,111
	December	1,315,300	2,999	4,419
	Total 2015	11,142,476	25,405	37,436
2016	January	1,293,350	2,949	4,345
	February	1,218,730	2,779	4,095
	March	1,380,600	3,148	4,638
	Total 2016	3,892,680	8,875	13,078
Total in the monitoring period		15,035,156	34,280.16	50,514

Table 6. Emission reductions for the monitoring period.

Year	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)
2015	37,436	0.00	0.00	37,436
2016	13,078	0.00	0.00	13,078
Total in the Monitoring Period	50,514	0.00	0.00	50,514

5 APPENDIX

5.1 Appendix 1

Table 7. Biomass per month for the monitoring period.

Period		Algaroba Wood (tonnes)	Coconut Husks (tonnes)	Forest Residues (tonnes)
2015	April	393.77	0.00	44.68
	May	382.63	0.00	31.08
	June	333.31	0.00	18.34
	July	476.34	0.00	11.16
	August	329.43	0.00	16.24
	September	361.57	0.00	42.23
	October	416.88	0.00	19.78
	November	332.77	96.00	44.92
	December	434.21	1.54	22.71
	Total 2015	3,460.91	97.54	251.14
2016	January	400.52	0.00	33.07
	February	381.23	0.00	55.58
	March	407.68	0.00	226.62
	Total 2016	1,189.43	0.00	315.28
Total during monitored period		4,650.34	97.54	566.42
Total during monitored period		5,314.30		