

KITAMBAR SWITCHING FUEL PROJECT



Document Prepared By Sustainable Carbon – Projetos Ambientais Ltda

Project Title	<i>Kitambar Switching Fuel Project</i>
Version	03.0
Date of Issue	15-January-2013
Project ID	33
Monitoring Period	01-December-2009 to 29-February-2012
Prepared By	Sustainable Carbon – Projetos Ambientais Ltda
Contact	Rua Doutor Bacelar, 368 Conjunto 54 Vila Clementino - São Paulo, SP CEP: 04026-001 Brazil T: +55 (11) 2649-0036 F: +55 (11) 2649-0042 camila@sustainablecarbon.com

Table of Contents

1	Project Details	3
1.1	Summary Description of Project.....	3
1.3	Project Proponent	3
1.4	Other Entities Involved in the Project.....	4
1.5	Project Start Date	4
1.6	Project Crediting Period	5
1.7	Project Location	5
1.8	Title and Reference of Methodology	5
2	Implementation Status.....	6
2.1	Implementation Status of the Project Activity.....	6
2.2	Deviations from the Monitoring Plan	7
2.3	Grouped Project	7
3	Data and Parameters	7
3.1	Data and Parameters Available at Validation	7
3.2	Data and Parameters Monitored	10
3.3	Description of the Monitoring Plan	18
4	Quantification of GHG Emission Reductions and Removals	18
4.1	Baseline Emissions	18
4.2	Project Emissions.....	21
4.3	Leakage.....	21
4.4	Summary of GHG Emission Reductions and Removals.....	27
5	Additional Information.....	28
5.1	5.1 Amount of renewable biomass consumed per month on <i>Kitambar</i> ceramic	28

1 PROJECT DETAILS

1.1 Summary Description of Project

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

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

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

This fuel switching project is reducing 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 an abundant renewable biomass.

The emission reductions due to the switching of non-renewable fuel (non-renewable wood) to renewable biomasses resulted in **105,885 tCO₂e** during the monitoring period from 01/12/2009 to 29/02/2012. The contribution to sustainability is being monitored applying the SOCIALCARBON® Standard, which is based in six main pointers: Technology; Natural; Financial; Human; Social and Carbon Resources.

1.2 Sectoral Scope and Project Type

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

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

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

1.3 Project Proponent

Project Proponents

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

***Kitambar* Ceramic:**

Industrial Establishment: Cerâmica *Kitambar* Artefatos de Cerâmica Ltda

Mr. Antônio Marcos Tavares Barbosa, 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.

Mr. Severino Francisco Torres, Quality Controller, monitoring data responsible: 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.

Other information on the project's proponent:

Ceramic phone number: +55 (81) 3722-7777

Website: <http://www.kitambar.com.br>

Project Developer

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

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

The monitoring report was completed on 15/01/2013 by *Marcelo Hector Sabbagh Haddad, Camila Vaccari, Felipe Sanchez A. Silva, Mariana dos Santos Silva, Mariana Fieri, Larissa Tega da Fonseca and Thiago de Avila Othero*, from *Sustainable Carbon – Projetos Ambientais LTDA*.

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

Address:

R. Doutor Bacelar, 368 – Conj. 54 – Vila Clementino

Postal Code: 04.026-001

São Paulo – SP, Brazil

Phone number: +55 11 2649 0036

Web site: <http://www.sustainablecarbon.com>

E-mails: marcelo@sustainablecarbon.com; camila@sustainablecarbon.com;

felipe@sustainablecarbon.com; marianas@sustainablecarbon.com;

thiago.othero@sustainablecarbon.com.

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 01/12/2006. On this date, the project began reducing or removing GHG emissions, i.e. the ceramic started using renewable biomass as fuel.

¹ Document available at: < http://mer.markit.com/br-reg/public/project.jsp?project_id=100000000000032>. Last on: 14/01/2013.

1.6 Project Crediting Period

The crediting period for this project started on 01/01/2007 and ends on 31/12/2016.

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



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.

² This version of the methodology is available at:

<http://cdm.unfccc.int/UserManagement/FileStorage/CDM_AMSP4VBBO5G54RXDE9KQ6FJWMGHZLHFA5>. Last visit on: 01/05/2012.

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 Bureau Veritas Certification Brazil.

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 their baseline emissions.

As described on the VCS PD version 02, the production process at *Kitambar Ceramic* encompasses eight “Round kilns”³ 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 42,000 ceramic units approximately per burning cycle, depending on the kind of the products that are fired, and approximately 22 burning cycles are done per month. As renewable biomasses, *Kitambar Ceramic* employs *Algaroba* wood, cashew tree residues⁴, forest residues (sawdust and MDF) and coconut husk.

The drying process occurs in a semi-continuous dryer which reuse the heat provided by the kilns to dry the ceramic units. In case of no heat is being provided by the kilns, there is a separated furnace supplied only with renewable biomass.

The table 1 below demonstrates the emission reductions verified in the last monitored periods:

Table 1. Emission reductions verified in the last monitored periods

Emission Reduction (tCO2e)		
1° Monitoring Period	January to December of 2007	40.627
	January to September of 2008	33.122
Total in the period		73.749
2° Monitoring Period	October to December of 2008	10,203
	January to November of 2009	36,988
Total in the monitoring period		47,191

The following modifications occurred in *Kitambar Ceramic* since the last monitoring period: the entrepreneur bought a new mixer and a new molding machine combined with a high-performance motor, which were responsible for an increase of 10-15% in the ceramic productivity. This gain in efficiency is due to the molding stage, and it does not influence the kilns' efficiency and its consumption of renewable biomass

None of the changes described above have significant effects on the project monitoring or on its capacity to mitigate emission reductions. The monitoring data was kept according to the monitoring plan described in the project description document. This Monitoring Report refers to the third monitoring period of this project, and includes data from 01/12/2009 to 29/02/2012.

³ The “Round Kilns” are intermittent kilns with round shape and lateral furnaces. Its internal diameter is about 9 meters. It is usually employed to burn roofs and bricks.

⁴ The cashew tree's pruning occurs due to its fructification, which happens more intensely in new branches.

2.2 Deviations from the Monitoring Plan

The registered VCS PD version 02 establishes that the project developer (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 industry. This means the amount of renewable biomass is measured by each 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.

2.3 Grouped Project

Not applicable. This is not a grouped project.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	EF_{projected fossil fuel}
Data unit:	tCO ₂ /TJ
Description:	CO ₂ Emission factor of residual fuel oil
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Available at: < http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf >. Page 2.18. Table 2.3. IPCC. Last visit on: 01/05/2012.
Value applied:	77.4 tCO ₂ /TJ
Purpose of the data:	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. The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel.
Any comment:	Applicable for stationary combustion in the manufacturing industries and construction.

Data Unit /	NCVnon-renewable wood
-------------	------------------------------

Parameter:	
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/arquivos/p_poder_lignocelulosicos_11107.pdf>. Last visit on: 01/05/2012. 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: 01/05/2012.
Value applied:	0.019
Purpose of the data:	This value provided the energy generated by the amount of wood that would be used in the absence of the project. Some sources of data used provide the Gross Calorific Values (GCV) of the <i>Caatinga</i> species. In order to transform the GCV to NCV, it was utilized the equation which is available at the MR Calculation spreadsheet. 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.
Any comment:	IPCC default values shall be used only when country or project specific data are not available or difficult to obtain, according to "Guidance on IPCC default values" (Extract of the report of the twenty-fifth meeting of the Executive Board, paragraph 59).

Data 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/arquivos/p_poder_lignocelulosicos_11107.pdf>. Last visit on: 01/05/2012. - 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: 01/05/2012. -IBAMA – Madeiras Brasileiras. <http://www.ibama.gov.br/lpf/madeira/caracteristicas.php?ID=195&caracteristica=139>. Last visit on: 01/05/2012.
Value applied:	0.88
Purpose of the data:	The amount of wood used in the baseline was measured by volume units, so this data was used to the unity conversion.
Any comment:	The species used to calculate the average value are typical trees of <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
Purpose of the data:	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 Unit / Parameter:	$Q_{renbiomass}$														
Data unit:	Tonnes														
Description:	Amount of renewable biomasses														
Source of data:	Measured by the biomass providers and controlled by the ceramic owner. The registered VCS PD v.02 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 industry.														
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 cashew wood and Algaroba, the values in the receipts are described in m³. However, a conversion factor from mst (m³ stereo) to m³ had to be applied, since the ceramic owners confirmed measurements were actually made in m³ stereo. The conversion factor is presented in the table below: <table border="1"> <thead> <tr> <th colspan="2">Conversion factor from "m³ stereo" to "m³"</th></tr> </thead> <tbody> <tr> <td>Algaroba and Cashew tree wood</td><td>0.3745</td></tr> </tbody> </table> Aftwards, 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. The specific gravity values of the renewable biomasses utilized in this project is: <table border="1"> <thead> <tr> <th>Biomass</th><th>Specific gravity (tonne/m³)</th></tr> </thead> <tbody> <tr> <td>Algaroba Wood</td><td>0.836</td></tr> <tr> <td>Cashew tree residues</td><td>0.42</td></tr> <tr> <td>Forest Residues</td><td>0.35</td></tr> <tr> <td>Coconut Husk</td><td>0.5</td></tr> </tbody> </table> 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:	Conversion factor from "m ³ stereo" to "m ³ "		Algaroba and Cashew tree wood	0.3745	Biomass	Specific gravity (tonne/m ³)	Algaroba Wood	0.836	Cashew tree residues	0.42	Forest Residues	0.35	Coconut Husk	0.5
Conversion factor from "m ³ stereo" to "m ³ "															
Algaroba and Cashew tree wood	0.3745														
Biomass	Specific gravity (tonne/m ³)														
Algaroba Wood	0.836														
Cashew tree residues	0.42														
Forest Residues	0.35														
Coconut Husk	0.5														

	<http://www.cnpf.embrapa.br/publica/boletim/boletarqv/bolet45/pag-99_106.pdf>. Last visit on: 01/05/2012. - Cashew tree residues: 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. - Forest residues : PINHEIRO, G. F.; RENDEIRO, G.; PINHO J. T. Densidade Energética de Resíduos Vegetais. 2006. Available at: <www.ufpa.br/gedae/BIOMASSAEENERGIA2006.pdf>. Last visit on: 01/05/2012. - Coconut Husk: PINHEIRO, G. F.; RENDEIRO, G.; PINHO J. T. Densidade Energética de Resíduos Vegetais. 2006. Available at: <www.ufpa.br/gedae/BIOMASSAEENERGIA2006.pdf>. Last visit on: 30/11/2012. Algaroba and Cashew tree wood (conversion factor): 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: <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=ADGEESiMIDtbGvrwKnl888t-ddbzBkGnc2hYaTXhq3GtXUOg1wbAbYIk1f2UWdhIIHsWCyfjYtfFgNbOU_qeG8hcJf5fAzliJlJP3Z451eltDC6xOwmnW_X7D6HN69DDfUPbjq60wes&sig=AHIEtbTwzpj3zy7n6nlZFDM3-djyemLmDg>. Last visit on: September 28th, 2011.						
Frequency of monitoring/recording:	Monthly						
Value monitored:	Total amount of biomasses consumed during all months of the monitoring period (in tonnes): <table> <tr> <th>Biomass</th><th>Amount of biomass consumed</th></tr> <tr> <td>Algaroba Wood</td><td>9,842.44</td></tr> <tr> <td>Cashew Tree Residues</td><td>1,616.82</td></tr> </table>	Biomass	Amount of biomass consumed	Algaroba Wood	9,842.44	Cashew Tree Residues	1,616.82
Biomass	Amount of biomass consumed						
Algaroba Wood	9,842.44						
Cashew Tree Residues	1,616.82						

	<table> <tr> <td>Forest Residues</td><td>2,018.06</td></tr> <tr> <td>Coconut Husk</td><td>1,328.50</td></tr> </table> More detailed information is available in Section 5.	Forest Residues	2,018.06	Coconut Husk	1,328.50
Forest Residues	2,018.06				
Coconut Husk	1,328.50				
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, cashew tree residues, forest residues (sawdust and MDF) and coconut husk per thousands of ceramic devices produced during the current monitoring period was compared to the VCS PD. The thermal energy generated per thousand of ceramic units produced at <i>Kitambar Ceramic</i> on the monitored period was lower than the estimated in the VCS PD. Differences are likely caused by energy efficiency gains.				
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.				
Any comment:	As stated in the VCS PD, the providers listed in the PDD 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 pices
Description:	Production of ceramic devices
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 monitoring/recording:	Monthly

Value monitored:	Period		Production of ceramic units (PR_y)
	2009	December	1,140,750
		Total 2009	1,140,750
	2010	January	1,171,660
		February	1,013,120
		March	1,126,640
		April	1,173,560
		May	1,189,900
		June	1,196,000
		July	1,179,270
		August	1,350,670
		September	1,188,050
		October	1,157,204
		November	1,079,133
		December	1,290,490
		Total 2010	14,115,697
	2011	January	1,152,680
		February	1,199,930
		March	1,159,950
		April	1,056,940
		May	1,186,040
		June	1,128,360
		July	1,155,500
		August	1,474,400
		September	1,292,300
		October	1,032,150
		November	1,193,450
		December	1,079,560
		Total 2011	14,111,260
	2012	January	1,162,920
		February	1,243,770
		Total 2012	2,406,690
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 PR_y 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.
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 biomasses (<i>Algaroba</i> wood, coconut husk, forest residues and cashew tree residues) are considered renewable as fulfilling the options described in the methodology applied.
Frequency of monitoring/recording:	Annually
Value monitored:	Not applicable.
Monitoring equipment:	No monitoring equipment was used to determine this parameter.
QA/QC procedures to be applied:	The biomasses were considered renewable as they were in accordance with the definition given by the Annex 18, EB 23 of UNFCCC definition ⁵ .
Calculation method:	Not applicable
Any comment:	All the renewable biomasses utilized in the monitoring period were already described in the VCS PD and 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.

⁵ CDM – Executive Board. Annex 18 definition of renewable biomass. EB 23. Available at: < http://cdm.unfccc.int/EB/023/eb23_repan18.pdf>. Last visited on January 17th, 2012.

Data Unit / Parameter:	Renewable biomass surplus												
Data unit:	tonnes or m³												
Description:	Amount of renewable biomass available												
Source of data:	Monitored												
Description of measurement methods and procedures to be applied:	It was 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 surplus</th><th>Surplus</th></tr><tr><td>Algaroba wood in m³</td><td>2,500,000</td></tr><tr><td>Cashew tree residues in m³</td><td>51,359</td></tr><tr><td>Coconut husk in tonnes</td><td>6,700,000</td></tr><tr><td>Forest Residues in m³</td><td>319,891.88</td></tr></table> Detailed information in Section 4.3.: “Leakage”.			Biomass surplus	Surplus	Algaroba wood in m³	2,500,000	Cashew tree residues in m³	51,359	Coconut husk in tonnes	6,700,000	Forest Residues in m³	319,891.88
Biomass surplus	Surplus												
Algaroba wood in m³	2,500,000												
Cashew tree residues in m³	51,359												
Coconut husk in tonnes	6,700,000												
Forest Residues in m³	319,891.88												
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												
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.
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 International Tropical Timber Organization (ITTO, 2011), article "Brazil Profile". Available at: http://www.itto.int/sfm/. Last visited on 10/05/2012, the area of <i>Caatinga</i> with sustainable use corresponds to 295,000 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 % 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>Kitambar</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>Kitambar</i> project, respectively⁶. Afterwards, summing each value with the sustainable use areas defined by ITTO (2011), 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 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 <i>Caatinga</i> biome. Wood saved from projects developed by <i>Sustainable Carbon</i> in the same biome and that have applied the same methodology was considered in this fraction⁷. 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.
Calculation method:	Not applicable.
Any comment:	It was employed in order to estimate the amount of non-renewable biomass. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

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

⁷ Document available at: <<http://mc.markit.com/br-reg/public/index.jsp?s=cp>> Last visit on: 05/06/2012.

3.3 Description of the 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.

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 $Q_{\text{renbiomass}}$ and PR_y). Ceramic personnel are also responsible to store invoices, receipts of sales and other documents related to purchase or acquisition of biomass.

Based on this information, Sustainable Carbon is responsible to assess if the biomasses are from renewable origin, to evaluate if there is a surplus of renewable biomass and to calculate emission reductions, including an assessment of leakage emissions and the determination of parameter $f_{\text{NRB},y}$. Sustainable Carbon also assists the Ceramic personnel to double check the monitored data on biomass consumption and ceramic devices production. No internal auditing was performed on data related to this monitoring period. Non-conformities identified in the double check procedures are 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 08/04/2010⁸. The project activity in this monitoring period (27 months) generated 119.49 TJ per year. Converting this number to MWh, it was generated 33,191.73 MWh per year, which corresponds to the use of 3.79 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

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

Where:

ER_y : Emission reductions during the year y in tCO₂e

⁸ Available at:

<http://cdm.unfccc.int/filestorage/C/D/M/CDM_AMSP4VBBO5G54RXDE9KQ6FJWMGHZLHFA5/AMS_I.E_ver01.pdf?t=YjJ8bHRtdXdtFDDOUFuwm9x424otUA_-niR2>. Last visit on: 01/05/2012.

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 tCO_2/TJ ⁹.

B_y is determined using the option:

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

$$B_y = \frac{HG_{p,y}}{\eta_{old} \times NCV_{biomass}}$$

(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

$$HG_{p,y} = SGE \times PR_y$$

(Equation 03)

Where:

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

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

$$\eta_{old} = \frac{SGE}{SFE}$$

(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

$$SFE = BF_y \times NCV_{biomass}$$

(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:

$$B_y = PR_y \times BF_y$$

(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.

⁹ The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel.

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)
2009	December	3,801
	Total 2009	3,801
2010	January	3,904
	February	3,376
	March	3,754
	April	3,911
	May	3,965
	June	3,986
	July	3,930
	August	4,501
	September	3,959
	October	3,856
	November	3,596
	December	4,301
	Total 2010	47,039
2011	January	3,841
	February	3,999
	March	3,865
	April	3,522
	May	3,952
	June	3,760
	July	3,851
	August	4,913
	September	4,307
	October	3,440
	November	3,977
	December	3,598
	Total 2011	47,025
2012	January	3,875
	February	4,145
	Total 2012	8,020
Total in the monitoring period		105,885

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 Category AMS-I.E 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, cashew tree residues, forest residues (sawdust and MDF) and coconut husk. All of these biomasses have enough availability as showed below demonstrating the lack of leakage for each biomass.

Algaroba wood

According to Silva (2007)¹⁰, *Algaroba*¹¹ (*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 areas¹².

A research made by EMBRAPA¹³, 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 impacts¹⁴. 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 dispersal¹⁵, 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 stake¹⁶, 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 IBAMA¹⁷.

¹⁰ 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.

¹¹ *Algaroba* may also be known as mesquite

¹² 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/>>. Visited in: 14th December, 2008.

¹³ 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.

¹⁴ Araújo, J. L. P., Correia, R. C., Araújo, E. P., Lima, P. C. F. Cadeia Produtiva da *Algaroba* no Pólo de Produção da Bacia do Submédio São Francisco. EMBRAPA. Petrolina -PE – Brazil.

¹⁵ 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/>>. Visited in: 14th December, 2008.

¹⁶ Heavy pole to which cattle is tied.

¹⁷ 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,

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. The production of *Algaroba* wood in the project's region is about 2,500 thousands of m³ per year, in this monitoring period *Kitambar* Ceramic consumed approximately 5,167.31 m³ of *Algaroba* wood per year, which represents less than 1% of the total *Algaroba* used by the ceramic.

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.

Cashew tree wood residues

Since *Kitambar* 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 hectares¹⁹.

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 nuts²⁰. 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 trees²¹. Moreover, dry branches on the ground compound a considerable amount of residues from cashew trees cultivation.

Environmental Licensing, Environmental Quality and Sustainable Use of Forest Management and Animal Resources. More information about IBAMA is available at: <www.ibama.gov.br>.

¹⁸ EMBRAPA, Comunicado Técnico N°, Nov/92, p.1-2. Available at: <http://www.cpatia.embrapa.br/public_eletronica/downloads/COT51.pdf>. Last visit on: 01/05/2012.

¹⁹ According with EMBRAPA (Brazilian Agricultural Research Corporation's). Available at: <<http://sistemasdeproducao.cnptia.embrapa.br/FontesHTML/Caju/CultivodoCajueiro/index.htm>>. Last visit on: 01/05/2012.

²⁰ Available at: <<http://www.nordesteural.com.br/nordesteural/matLerdest.asp?newsId=2219>>. Last visit on: 01/05/2012.

²¹ According with EMBRAPA (Brazilian Agricultural Research Corporation's). Available at: <<http://sistemasdeproducao.cnptia.embrapa.br/FontesHTML/Caju/CultivodoCajueiro/tratosculturaais.htm>>. Last visit on: 01/05/2012.

Sustainable Carbon has assessed the availability of residues from cashew tree as part of a voluntary carbon project located in Ceará. Such assessment included interviews with biomass experts and producers, and was independently assessed by a third party consultant, by the DOE responsible for the project verification and finally by the Gold Standard Secretariat.

An expert interviewed as part of such study informed cashew trees yield either 7m³ or 25m³ of wood residues per hectare of cultivated area per year²². The difference is related to the type of cashew tree cultivated. The *Cajueiro Anão Precoce*, a subtype of cashew tree developed by Embrapa (Brazilian Agricultural Research Corporation) yields better production of both cashew nuts and cashew fruit and requires significantly less pruning. According to the expert, this subtype yields only 7m³ of residues per hectare per year, while regular cashew trees cultivated in Brazil yield 25m³ per hectare per year, on average.

Hence, data on cultivated area of cashew tree were utilized to estimate the availability of this type of biomass, as available on table below. On this table, the low availability scenario considers *Cajueiro Anão Precoce* represents 100% of cultivated area, the High availability scenario considers only regular cashew trees are cultivated and the conservative scenario considers 50% of each type are cultivated. Such scenario is considered conservative since the cultivation of *Cajueiro Anão precoce* is still not a common practice in the Brazilian Northeast.

Table 4. Availability assessment of residues from cashew tree

Availability assessment from residues of cashew tree					
State	Year	Cultivated area (hectares)	Availability of residues from cashew tree		
			Low availability scenario	High availability scenario	Conservative scenario
			m ³	m ³	m ³
Pernambuco	2010	7337	51,359	183,425	117,392
	2011	8,531	59,717	213,275	136,496
Total	2010	7,337	51,359	183,425	117,392
	2011	8,531	59,717	213,275	136,496
Project use (% of availability)	2010		5.9%	1.7%	2.6%
	2011		1.3%	0.4%	0.6%

Since the Project used around 3,036.56 m³ of residues from cashew tree in 2010 and 756.30 in 2011, the project use of this type of biomass was around 0.4% to 5.9% of total biomass available in Pernambuco State during the crediting period, depending on the availability scenario considered.

Forest Residues

Forest Residues are 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,

²² Evidences to such statement were made available to the verification team.

considering that around 22% of the wood produced will generate sawdust²³. The production of wood in the state of *Pernambuco* was of 1,454,054 m³ ²⁴ in 2007. Thus, the production of sawdust is around 319,891.88 m³ per year.

In this monitoring period *Kitambar* ceramic utilized 2,562.62 m³ per year of sawdust and MDF which represents around 0.80 % 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.

Coconut Husk

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 cities²⁵. In this monitoring period, *Kitambar* ceramic utilized 590.44 tonnes of Coconut Husk per year which represents around 0,009% of coconut husk availability.

Therefore, this biomass is widely available in the region, once its use for generate thermal energy may be a solution for the solid waste disposal in these cities.

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

²³ 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.

²⁴ According to IBGE (Geographic and Statistic Brazilian Institute). Available at: <<http://www.ibge.gov.br/estadosat/temas.php?sigla=pe&tema=extracaovegetal2007>>. Last visit on: 01/05/2012.

²⁵ Available at: <www.sbpnet.org.br/livro/60ra/textos/SI-GoreteMacedo.pdf>. Last visit on: 01/05/2012.

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 equipments had to be acquired.

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

Table 5. Production – Qrenbiomass - QA/QC Procedure

	VCS PD	Monitoring Period
<i>PR_y- Production (thousands of units)</i>	28,350.00	31,774.40
<i>Algaroba Wood Consumption (tonnes)</i>	25,147.47	26,076.56
<i>Cashew Tree Residues Consumption (tonnes)</i>	4,859.19	4,317.26
<i>Forest Residues (tonnes)</i>	0.00	2,018.06
<i>Coconut Husk Consumption (tonnes)</i>	2,313.90	1,328.50
<i>Thermal Energy (TJ)</i>	607.05	631.34
<i>Thermal energy per thousand of pieces produced (TJ/thousand of pieces)</i>	0.021	0.020

As can be verified on Table 5, the thermal energy generated with the use of *Algaroba*, cashew tree residues, forest residues and coconut husk per thousands of ceramic devices produced during the current monitoring period was similar to 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 February 01st, 2008 to April 08th, 2010) this project activity contributes to sustainable development, once the ceramic company is using renewable biomass and applying the SOCIALCARBON methodology.

4.4 Summary of GHG Emission Reductions and Removals

Table below summarizes the emission reductions for this monitoring period²⁶.

Table 6. Emission reductions for the monitoring period.

Year	Period	PR _y (ceramic units)	By (tonnes)	ER _y (tCO ₂ e)
2009	December	1,140,750	2,601	3,801
	Total 2010	1,140,750	2,601	3,801
2010	January	1,171,660	2,671	3,904
	February	1,013,120	2,310	3,376
	March	1,126,640	2,569	3,754
	April	1,173,560	2,676	3,911
	May	1,189,900	2,713	3,965
	June	1,196,000	2,727	3,986
	July	1,179,270	2,689	3,930
	August	1,350,670	3,080	4,501
	September	1,188,050	2,709	3,959
	October	1,157,204	2,638	3,856
	November	1,079,133	2,460	3,596
	December	1,290,490	2,942	4,301
	Total 2010	14,115,697	32,184	47,039
2011	January	1,152,680	2,628	3,841
	February	1,199,930	2,736	3,999
	March	1,159,950	2,645	3,865
	April	1,056,940	2,410	3,522
	May	1,186,040	2,704	3,952
	June	1,128,360	2,573	3,760
	July	1,155,500	2,635	3,851
	August	1,474,400	3,362	4,913
	September	1,292,300	2,946	4,307
	October	1,032,150	2,353	3,440
	November	1,193,450	2,721	3,977
	December	1,079,560	2,461	3,598
	Total 2011	14,111,260	32,174	47,025
2012	January	1,162,920	2,651	3,875
	February	1,243,770	2,836	4,145
Total 2012		2,406,690	5,487	8,020
Total Monitoring Period		31,774,397	72,445.63	105,885

²⁶ Emission reductions are equal to the baseline emissions, since there are no project emissions according to the applied methodology and since leakage emissions are estimated at zero tCO₂e.

5 ADDITIONAL INFORMATION

5.1 Amount of renewable biomass consumed per month on Kitambar ceramic

Table 7. Amount of renewable biomass used by Kitambar Ceramic.

Period		Algaroba Wood (tonnes)	Cashew tree residues (tonnes)	Coconut Husk (tonnes)	Forest Residues (tonnes)
2009	December	537.28	23.81	80.50	0.00
	Total 2009	537.28	23.81	80.50	0.00
2010	January	486.88	81.33	126.50	0.00
	February	395.39	105.34	34.50	0.00
	March	325.89	100.60	103.50	0.00
	April	433.81	105.73	57.50	0.00
	May	457.48	95.81	103.50	0.00
	June	327.98	102.63	80.50	0.00
	July	475.38	123.50	103.50	0.00
	August	382.77	105.09	36.00	0.00
	September	279.74	105.16	24.50	0.00
	October	378.74	118.06	92.00	48.00
	November	350.09	103.40	37.50	48.00
	December	432.65	128.69	80.50	85.00
Total 2010		4,726.79	1,275.35	880.00	181.00
2011	January	349.81	101.11	80.50	0.00
	February	225.95	44.31	34.50	108.00
	March	279.68	38.19	69.00	171.60
	April	347.90	38.02	69.00	111.00
	May	294.33	44.17	69.00	141.60
	June	292.73	25.37	46.00	77.00
	July	403.52	26.49	0.00	149.00
	August	441.20	0.00	0.00	171.00
	September	415.90	0.00	0.00	224.00
	October	311.99	0.00	0.00	118.00
	November	330.21	0.00	0.00	124.00
	December	398.90	0.00	0.00	196.94
Total 2011		4,092.09	317.65	368.00	1,592.14
2012	January	278.02	0.00	0.00	65.40
	February	208.26	0.00	0.00	179.52
Total 2012		486.28	0.00	0.00	244.92
Total of monitored period		9,842.44	1,616.82	1,328.50	2,018.06