



Monitoring report form
(Version 05.1)

MONITORING REPORT

Title of the project activity	<i>Ceará Renewable Energy Bundled Project</i>	
UNFCCC reference number of the project activity	Not applicable – This project is being developed under the Voluntary Carbon Market, following Gold Standard Rules; Gold Standard ID number GS1042	
Version number of the monitoring report	Version 04	
Completion date of the monitoring report	15/06/2015	
Monitoring period number and duration of this monitoring period	Fourth monitoring period from 01/03/2014 - 30/11/2014 (days included)	
Project participant(s)	Sustainable Carbon - Projetos Ambientais Ltda Antônio Cavalcante de Souza Olaria-ME Ceará Cerâmica Ltda Ceagra – Cerâmica e Agropecuária Assunção Ltda Eliane Cavalcante de Souza EPP Cerâmica Santa Rita Ltda	
Host Party	Brazil	
Sectoral scope(s)	Energy industries (renewable - / non-renewable sources)	
Selected methodology(ies)	AMS-I.E: Switch from Non-Renewable Biomass for Thermal Applications by the User, version 04 ¹ , valid from 29/04/2011 to 02/08/2012	
Selected standardized baseline(s)	Not applicable	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	27,129.75tCO ₂	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0 tCO ₂ e	40,169 tCO ₂ e

¹ Methodology available at: <<http://cdm.unfccc.int/methodologies/DB/I1DGDUD1D5J0KMLSZFWMD3W9Z47OZZ>>. Last visited on 07/01/2015.

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The project activity is the bundled project of five red ceramic factories belonging to Grupo Tavares, a family business that owns several ceramic factories in the State of Ceará, Brazil. The following ceramic factories are included in this project: Antônio Ceramic, Ceará Ceramic, Ceagra Ceramic, Eliane Ceramic and Santa Rita Ceramic. Antônio Ceramic and Eliane Ceramic are located at Itaitinga, in the state of Ceará, northeast region of Brazil. Ceará Ceramic and Ceagra Ceramic are located at Aquiraz, also in the State of Ceará. Santa Rita Ceramic is located at São Gonçalo do Amarante, also in the State of Ceará. The ceramic factories produce ceramic bricks, tiles and construction blocks, destined mainly for the regional market in the metropolitan area of Fortaleza.

All ceramics used to utilize predominantly wood without sustainable forest management as fuel. The use of this type of non-renewable biomass is a common practice in the ceramic industry. Firewood used to be the most employed source of primary energy until 1970's, when the petroleum started to supply the majority of Brazilian's energy needs². Moreover, the Brazilian Energy and Mine Ministry has been monitoring every energy sector of Brazil since 1970, and firewood appears over the years monitored as a significant source of thermal energy for ceramic sector³.

This project activity reduces the greenhouse gases (GHG) emissions through the substitution of non-renewable biomass for renewable biomasses to generate thermal energy. As renewable biomasses, the project activity utilizes mostly biomass residues (such as cashew nut shells, residues from cashew tree, sawdust), wood from sustainable forest management plan areas, among others, to feed the ceramic's kilns. The project also involves energy efficiency measures, such as improved fuel handling and kilns improvement to reduce the necessary energy per production output⁴.

This project points out the possibility for switching from non-renewable biomass to renewable biomasses, which was unattractive due some barriers, including higher fuel costs, uncertainties associated to the fuel switch and the lack of knowledge to operate with renewable biomass. The ceramic owners have considered the income from the commercialization of the carbon credits to make the project activity viable.

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

By the beginning of 2010, Grupo Tavares initiated tests with renewable biomass in the five ceramic factories included in the current project. The start date of the project activity is considered 02/07/2010, when Grupo Tavares and Sustainable Carbon signed contracts for the development of a GHG emission reduction project in the five ceramic factories included in the current project. All ceramics have operated exclusively with demonstrably renewable biomass since the beginning of the crediting period, which is defined as 01/09/2010.

The emission reductions due to the switching of non-renewable fuel (non-renewable wood) to renewable biomasses resulted in **40,169 tCO₂e** during the monitoring period from 01/03/2014 to 30/11/2014. The contribution to sustainability is being monitored applying the **Sustainability Monitoring Plan, described on Section G of the Gold Standard Passport, version 05**.

² BRITO, J.O. "The use of wood as energy". Available at: <http://www.scielo.br/scielo.php?pid=S0103-40142007000100015&script=sci_arttext&tlng=ES>. Last visited on 07/01/2015.

³ Energy Research Company. National Energy Balance - energy consumption per sector. Available at: <https://ben.epe.gov.br/BEN2007_Capitulo3.aspx>. Last visited on 07/01/2015.

⁴ No emission reductions are claimed for energy efficiency measures, since these are applied after the complete fuel switch to renewable biomass.

A brief description of the situation on each ceramic before and after the initiation of the project activity follows:

Antônio Ceramic: The ceramic has two Hoffmann⁵ kilns. In the baseline scenario, the kilns operated predominantly using native firewood (wood without sustainable forest management) as fuel. A fraction of wood from areas with sustainable forest management plan was also used, representing around 6% of total fuel usage⁶. Based on the project activity, the proponent switched its fuel to renewable biomasses such as cashew nut shell, residues from cashew tree, coconut husk and increased amounts of wood from areas with sustainable forest management plan. The ceramic also acquired new equipments, including automatic feeders, to allow an efficient use of renewable biomass as fuel.

Before being cooked in the kilns, the pieces must be dried. At Antônio Ceramic, the ceramic pieces are dried naturally, so no fuel is used for the drying process. During 2009, Antônio Ceramic produced 7,921 thousands of ceramic pieces. The identified baseline for this ceramic was the utilization of a total of approximately 5,407 tonnes of non-renewable woody biomass per year to provide thermal energy to the ceramics' kilns.



Figure 01. Hoffmann kiln being fed with renewable biomass in Antônio Ceramic.

Ceará Ceramic:

This ceramic has two Hoffmann kilns and three round⁷ kilns. In the baseline scenario, the kilns operated using predominantly native firewood as fuel. A fraction of wood from areas with sustainable forest management plan was also used, representing around 16% of total fuel usage⁸. Following the project activity, the proponent switched its fuel to renewable biomasses such as cashew nut shell, residues from cashew tree, coconut, husk and increased amounts of wood from areas with sustainable forest management plan. The ceramic also acquired new equipments, including automatic feeders, to allow an efficient use of renewable biomass as fuel.

⁵ "Hoffman" is a very old type of kiln, which has parallel chambers where the heat from one chamber is used in the next, therefore recycling the generated heat in the previous chambers.

⁶ The amount of wood from sustainable forest management areas utilized in the baseline scenario was updated in the current monitoring period, as its unit of measure is stereo meter (mst). A conversion factor from stereo meter (mst) to cubic meter (m³) was applied.

⁷ Round kilns are intermittent kilns with round shape and lateral furnaces. Intermittent kilns do not allow the continuous operation, as the fuel needs to be added and the kiln cleaned between each burning cycle. Intermittent kilns are not as efficient as continuous kilns (such as tunnel or Hoffmann kilns) because continuous kilns allow the better distribution of heat.

⁸ The amount of wood from sustainable forest management areas utilized in the baseline scenario was updated in the current monitoring period, as its unit of measure is stereo meter (mst). A conversion factor from stereo meter (mst) to cubic meter (m³) was applied.

Before being cooked in the kilns, the pieces must be dried. At Ceará Ceramic, the ceramic pieces are dried naturally, so no fuel is used for the drying process. During 2009, Ceará Ceramic produced 11,453 thousands of ceramic pieces. The identified baseline for this ceramic was the utilization of a total of approximately 7,252 tonnes of non-renewable biomass per year on average to provide thermal energy to the ceramics' kilns.



Figure 02. Round and Hoffman kilns at Ceará Ceramic.

Ceagra Ceramic

This ceramic has four Hoffmann kilns, however only two of them are part of the present project activity. In the baseline scenario, the kilns operated predominantly using native firewood (wood without sustainable forest management) as fuel. A fraction of wood from areas with sustainable forest management plan was also used, representing around 13% of total fuel usage⁹. Based on the project activity, the proponent switched its fuel to renewable biomasses such as cashew nut shells, residues from cashew tree, coconut husk and increased amounts of wood from areas with sustainable forest management plan. The ceramic also acquired new equipments, including automatic feeders, to allow an efficient use of renewable biomass as fuel.

Before being cooked in the kilns, the pieces must be dried. At Ceagra Ceramic, the ceramic pieces are dried naturally, so no fuel is used for the drying process. During 2009, Ceagra Ceramic produced 14,862 thousands of ceramic pieces. The identified baseline for this ceramic was the utilization of a total of approximately 9,424 tonnes of non-renewable woody biomass per year to provide thermal energy to the ceramics' kilns.



Figure 03. Cashew nut shells stored prior to use as fuel in Ceagra Ceramic.

⁹ The amount of wood from sustainable forest management areas utilized in the baseline scenario was updated in the current monitoring period, as its unit of measure is stereo meter (mst). A conversion factor from stereo meter (mst) to cubic meter (m³) was applied.

Eliane Ceramic:

This ceramic has one Hoffmann kiln and one chamber kiln. In the baseline scenario, the kilns operated predominantly using native firewood (wood without sustainable forest management) as fuel. A fraction of wood from areas with sustainable forest management plan was also used, though representing around 11% of total fuel usage¹⁰. Following the project activity, the proponent switched its fuel to renewable biomasses such as cashew nut husk, residues from cashew tree, coconut residues and increased amounts of wood from areas with sustainable forest management plan. The ceramic also acquired new equipments, including automatic feeders, to allow an efficient use of renewable biomass as fuel.

Eliane Ceramic used to process biomass to be used as fuel by several Ceramics from Grupo Tavares, however, during this monitoring period (since July, 2014), Grupo Tavares decided to transfer the technology to another Ceramic which belongs to the group. The five ceramic factories included in the current project haven't been using this processed biomass since then.

Before being cooked in the kilns, the pieces must be dried. At Eliane Ceramic, the ceramic pieces are dried naturally, so no fuel is used for the drying process. During 2009, Eliane Ceramic produced 8,186 thousands of ceramic pieces. The identified baseline for this ceramic was the utilization of a total of approximately 5,117 tonnes of non-renewable woody biomass per year to provide thermal energy to the ceramics' kilns.



Figure 04. Biomass being processed to be used as fuel in Eliane Ceramic.

Santa Rita Ceramic:

This ceramic used to have three Hoffmann kilns. In the baseline scenario, the kilns operated predominantly using native firewood as fuel. This ceramic is divided into two nearby sites (distanced 900 meters from each other). In site 1, one Hoffmann kiln is operated (named Kiln 1), while in site two, two Hoffmann kilns exist (named Kiln 2 and Kiln 3). During the validation of the PDD, the kilns in Site 2 were not operating simultaneously due to the lack of employees and infrastructure. During the third monitoring period, Santa Rita sold the rights of use of its third kiln to a neighbor company who is not a project participant. Since January 01st, 2012, Santa Rita has been operating with 1 kiln.

¹⁰ The amount of wood from sustainable forest management areas utilized in the baseline scenario was updated in the current monitoring period, as its unit of measure is stereo meter (mst). A conversion factor from stereo meter (mst) to cubic meter (m³) was applied.

In the baseline scenario, a fraction of wood from areas with sustainable forest management plan was also used, though representing around 4% of total fuel usage¹¹. Based on the project activity, the proponent switched its fuel to renewable biomasses such as cashew nut shells, residues from cashew tree, coconut husk and increased amounts of wood from areas with sustainable forest management plan. The ceramic also acquired new equipments, including automatic feeders, to allow an efficient use of renewable biomass as fuel.

Before being cooked in the kilns, the pieces must be dried. At Santa Rita Ceramic, the ceramic pieces are dried naturally, so no fuel is used for the drying process. During 2009, Santa Rita Ceramic produced 8,423 thousands of ceramic pieces. The identified baseline for this ceramic was the utilization of a total of approximately 5,307 tonnes of non-renewable biomass per year on average to provide thermal energy to the ceramics' kilns.



Figure 05. Hoffmann kiln being fed with renewable biomass in Santa Rita Ceramic.

This project activity reduces the greenhouse gases (GHG) emissions through the substitution of non-renewable biomass for renewable biomasses to generate thermal energy. As renewable biomasses, the project activity utilizes mostly biomass residues (such as cashew nut shells, residues from cashew tree, coconut residues) and wood from areas with sustainable forest management plan to feed the ceramic's kilns.

This project does not involve significant construction, as only auxiliary equipments are installed to allow the efficient use of biomass. Hence, the start date of construction is actually interpreted as the date when the ceramics have signed contracts with Sustainable Carbon for the development of an emission reduction project. This has occurred on 02/07/2010. Hence, the project is following the retroactive project cycle according to Gold Standard Toolkit version 2.1.

A.2. Location of project activity

The ceramics are located in Brazil, in the state of Ceará in the northeast region of the country. The geographic location is illustrated in Figure 01.

¹¹ The amount of wood from sustainable forest management areas utilized in the baseline scenario was updated in the current monitoring period, as its unit of measure is stereo meter (mst). A conversion factor from stereo meter (mst) to cubic meter (m³) was applied.

Table 01. Location of the ceramics

Ceramic	Latitude	Longitude	Postal Address
Antônio Ceramic	4° 0'42.01"S	38°31'15.00"W	Rodovia BR 116, Km 28, s/n°, Riachão CEP 61.880-000 – City of Itaitinga, State of Ceará
	4° 0'35.76"S	38°31'9.81"W	
	4° 0'38.71"S	38°31'5.94"W	
	4° 0'45.04"S	38°31'10.28"W	
Ceará Ceramic	4° 1'26.94"S	38°29'42.65"W	Rodovia BR 116, Km 32, s/n°, Sítio Terra do Sol CEP 61.700-000 – City of Aquiraz, State of Ceará
	4° 1'19.36"S	38°29'50.76"W	
	4° 1'14.27"S	38°29'46.78"W	
	4° 1'21.63"S	38°29'36.64"W	
Ceagra Ceramic	3°59'38.63"S	38°30'57.44"W	Rodovia BR 116, Km 28, s/n°, Riachão CEP 61.880-000 – City of Aquiraz, State of Ceará
	3°59'27.09"S	38°30'56.27"W	
	3°59'32.55"S	38°30'49.93"W	
	3°59'39.20"S	38°30'53.34"W	
Eliane Ceramic	3°58'36.08"S	38°30'52.04"W	Rodovia BR 116, Km 26, s/n° CEP 61.880-000 - City of Itaitinga, State of Ceará
	3°58'38.07"S	38°31'0.01"W	
	3°58'32.51"S	38°31'0.85"W	
	3°58'31.87"S	38°30'52.57"W	
Santa Rita Ceramic Site 1	3°40'31.53"S	38°58'53.80"W	Rodovia BR 222, Km 47, s/n° - Railway station unit CEP 62.670-000 – City of São Gonçalo do Amarante, State of Ceará
Santa Rita Ceramic Site 2	3°40'3.78"S	38°58'43.83"W	Rodovia BR 222, Km 47, s/n° -Gas station unit CEP 62.670-000 – City of São Gonçalo do Amarante, State of Ceará



Figure 06. Geographic location of the cities of the project activity.

A.3. Parties and project participant(s)

Table 02. Project participants

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
Brazil (host)	Sustainable Carbon - Projetos Ambientais Ltda	No
	Antônio Cavalcante de Souza Olaria-ME	
	Ceará Cerâmica Ltda	
	Ceagra – Cerâmica e Agropecuária Assunção Ltda	
	Eliane Cavalcante de Souza EPP	
	Cerâmica Santa Rita Ltda	

A.4. Reference of applied methodology and standardized baseline

The project utilizes the following methodology approved under the Clean Development Mechanism for small scale projects: **“AMS-I.E: Switch from Non-Renewable Biomass for Thermal Applications by the User”**, version 04¹², valid from 29/04/2011 to 02/08/2012.

This category comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies. The technology in case of this project activity was determined as the ceramic facilities, which utilized thermal energy generated by the new renewable energy technology. The project involves the substitution of non-renewable biomass with renewable biomass in existing red ceramic factories, thus complying with the referred methodology.

¹² Methodology available at: <<http://cdm.unfccc.int/methodologies/DB/I1DGDUD1D5J0KMLSZFWMD3W9Z47OZZ>>. Last visited on 07/01/2015.

A.5. Crediting period of project activity

The starting date of the project activity was considered 02/07/2010. On this date, the ceramics included in the project have signed contracts with Sustainable Carbon to develop an emission reduction project. The starting date of the project is before the “*Time of first submission*” as per Gold Standard definitions¹³. Hence, the project is following the retroactive project cycle according to Gold Standard Toolkit version 2.1.

Start date of the crediting period: 01/09/2010.

End of the crediting period: 31/08/2020

Length of the crediting period: 10 years

A.6. Contact information of responsible persons/entities

The following entity is responsible for applying the monitoring methodology:

SUSTAINABLE CARBON - PROJETOS AMBIENTAIS LTDA

Project developers: Beatriz Rovere - Technical Analyst and Thiago de Avila Othero - Technical Coordinator

SECTION B. Implementation of project activity**B.1. Description of implemented registered project activity**

This voluntary project was validated by the Designated Operational Entity TÜV Rheinland (China) Ltd and this present monitoring report is being verified by the Designated Operational Entity RINA Services S.p.A.

In October, 2008 Grupo Tavares and Sustainable Carbon begun the validation of their first GHG emission reduction project, entitled *Assunção Ceramic Fuel Switching Project*. The project involved fuel switching to renewable biomass in another Ceramic belonging to Grupo Tavares. The *Assunção Ceramic Fuel Switching Project* was validated under the VCS (Verified Carbon Standard) in September, 2009.

By the beginning of 2010, Grupo Tavares begun tests with renewable biomass in the five ceramic factories included in the current project. The start date of the project activity was 02/07/2010, when Grupo Tavares and Sustainable Carbon signed contracts for the development of a GHG emission reduction project in the five ceramic factories included in the current project. All ceramics have operated exclusively with demonstrably renewable biomass since the beginning of the crediting period, which is defined as 01/09/2010.

During the current monitoring period, the ceramics had no significant changes on its physical structure; therefore there was no need to make any restoring in the kilns. During April, 2014 Santa Rita Ceramic factory had problems with the water public supply, due to the dry period in the region. The factory has stopped its activities during this period, thus reducing its production. Even so, no impacts on the emissions reductions were observed for this period on Santa Rita Ceramic or Antônio Ceramic, Ceará Ceramic, Ceagra Ceramic and Eliane Ceramic.

During validation, the ceramics belonging to Grupo Tavares utilized residues from cashew trees, sawdust, coconut residues, cashew nut shells and wood from sustainable management plan areas

¹³ According to Gold Standard Requirements version 2.1, the time of first submission means submission of the Local Stakeholder Consultation Report for projects proceeding under the regular project cycle, and submission of the required Gold Standard project activity documentation for a Pre-Feasibility Assessment and payment of the applicable fee under the retroactive project cycle.

as renewable biomass instead of native wood. In the first monitored period, the companies started to use Mamona (*Ricinus communis*) husk and Babaçu (*Orbignya phalerata*) residues as renewable biomasses. At this current monitored period the ceramics continued using the previously used types of biomass.

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

Not applicable, as no temporary deviations from registered monitoring plan have taken place on the current monitoring period.

B.2.2. Corrections

No corrections or revisions on the monitoring plan were made for the current monitoring period. The monitoring data was kept according to the monitoring plan described in the Project Design Document, version 05. Monitoring of the sustainability indicators was based on best available sources of information. During this monitoring period it was used the CDM template version 05, which was the most recent template at the verification time.

Regarding the Sustainability Monitoring Plan, in this current period, the factories did not offer any lectures to employees regarding safety issues. The companies have been restructuring its internal operations, thus reducing its investments in the development of new activities.

Regarding parameter "Use of safety equipments" of the Sustainability Monitoring Plan, the ceramics performed the control on the use of Individual Personal Equipments (IPE) and provided awards to employees as an attempt to encourage its use.

B.2.3 Changes to start date of crediting period

Not applicable, as no changes to start date of crediting period were applied on the current monitoring period.

B.2.4 Inclusion of a monitoring plan to the registered PDD that was not included at registration

Not applicable, as no monitoring plan was included during the current monitoring period

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

As described in the Project Design Document version 05, $Q_{\text{renbiomass}}$ parameter is measured by the biomass providers and controlled by the ceramic owners, through purchase invoices, delivery notes or other documents concerning the acquisition of renewable biomasses. However, the amount of wood from sustainable forest management areas and residues from cashew trees have been updated in the last monitoring periods, as its unit of measure is stereo meter (mst). Hence, a conversion factor from stereo meter (mst) to cubic meter (m^3) was used for both biomass, more information regarding conversion factor can be seen in section D.2 below.

Furthermore, in the registered PDD it was not considered the same conversion factor for the fraction of firewood from management areas used in the baseline scenario. Therefore, the conversion factor was applied in the amount of sustainable firewood used in baseline scenario, which means minor changes in the BF_y (Quantity of woody biomass per thousand of ceramic units fired in year y) and the $f_{\text{NRB},y}$ (Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass) parameters. Both changes

in the parameters BF_y and $f_{NRB,y}$ do not affect the amount of emission reductions since the conversion factor will be applied only for renewable firewood. More detailed information can be verified in section D below.

B.2.6. Changes to project design of registered project activity

Not applicable, as no changes to the project design have taken place on the current monitoring period.

B.2.7. Types of changes specific to afforestation or reforestation project activity

Not applicable, as no changes specific to afforestation or reforestation project activities have taken place on the current monitoring period.

SECTION C. Description of monitoring system

The project utilizes the following methodology approved under the Clean Development Mechanism for small scale projects: “**AMS-I.E: Switch from Non-Renewable Biomass for Thermal Applications by the User**”, version 04¹⁴, valid from 29/04/2011 to 02/08/2012.

The owner of each ceramic was responsible for implementing the monitoring plan. In addition, the ceramic employees were responsible for developing the forms and registration formats for data collection and further classification. The authority for the registration, monitoring, measurement and reporting was *Mr. Francisco Evanildo de Souza* for all five ceramic factories.

Monitored data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity.

The management structure was relying on the local technicians with a periodical operation schedule during the monitoring period. The technical team managed the monitoring, the quality control and quality assessment procedures. Monitored parameters are described in Section D and were monitored with the frequency described in Table below.

Table 03. Monitored parameters

Parameters	Description	Units	Origin	Frequency
PR_y	Amount of products produced in year y	Thousands of ceramic pieces	This parameter was monitored by employees on each ceramic, counting the total production. Measurements were done by an internal control sheet monitored by the project proponent. Values used during the project monitoring were taken either from sales reports or from production control documents.	Measured on a daily or weekly basis. Data was aggregated on a monthly and yearly basis.
$Q_{renbiomass}$	Amount of renewable biomass used during year y of the crediting period	Tonnes	Measured by the biomass providers and controlled by the ceramic owners. Data was calculated from receipts, invoices and other documents regarding the acquisition of biomass	Monthly
$f_{NRB,y}$	Fraction of woody biomass used in the	Fraction	Survey methods, as described in Section E.1	Annually

¹⁴ Methodology available at: <<http://cdm.unfccc.int/methodologies/DB/I1DGDUD1D5J0KMLSZFWMD3W9Z47OZZ>>. Last visited on 09/01/2015.

Parameters	Description	Units	Origin	Frequency
	absence of the project activity in year y that can be established as non-renewable			
Origin of Renewable Biomass	Renewable origin of the biomass	Not applicable	Controlled by the ceramic owners	Annually
Leakage due to competing uses of biomass	This source of leakage is relevant for biomass residues and biomass from existing forests. The quantity of renewable biomass available will be assessed annually to determine the occurrence of leakage	tCO ₂ e	Monitored by surveys and publications ¹⁵	Annually
Leakage of non-renewable woody biomass	This source of leakage assesses the use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources.	tCO ₂ e	Monitored by surveys and publications	Annually
Checking of all appliances (kiln)	According to the applied methodology, monitoring shall include checking of all appliances or a representative sample thereof, to ensure that they are still operating or are replaced by an equivalent in service appliance.	Not applicable	Sustainable Carbon performed visual inspections and interviews with the employees on each ceramic factory to confirm the kilns were still operating or were replaced by an equivalent in service kiln.	Once every two years

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data / Parameter:	EF_{projected fossilfuel}
Unit:	tCO ₂ /TJ
Description:	Emission factor for substitution of non-renewable woody biomass by similar consumers.
Source of data:	Approved small scale methodology AMS-I.E "Switch from Non-

¹⁵ In response to FAR 1 raised by the Gold Standard Secretariat during project registration, Sustainable Carbon has developed a detailed Study on the surplus of all types of biomass used by the project activity. This FAR has been closed in the first monitoring period.

	Renewable Biomass for Thermal Applications by the User", version 04.
Value(s) applied:	81.6 tCO ₂ /TJ
Choice of data or measurement methods and procedures	In the baseline scenario, non-renewable biomass was used as an energy source. This is the common practice for the red ceramic sector in the project region. As described in Section B.5 of the PDD, Version 05, the use of fossil fuels is the most likely scenario in the absence of non-renewable biomass.
Purpose of 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.
Additional comment:	According to the applied methodology, a value of 81.6 tCO ₂ /TJ shall be used for this emission factor, representing the mix of fossil fuels to be used for the present and future.

Data / Parameter:	NCV_{biomass}
Unit:	TJ/ton
Description:	Net calorific value of the non-renewable woody biomass that is substituted
Source of data:	Approved small scale methodology AMS-I.E "Switch from Non-Renewable Biomass for Thermal Applications by the User", version 04.
Value(s) applied:	0.015
Choice of data or measurement methods and procedures:	This parameter was used to calculate baseline emissions from the use of the fossil fuel that would be used in the baseline scenario. It provides the energy generated by the amount of non-renewable biomass that would be used in the absence of the project.
Purpose of 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. It differs from the IPCC value because represents the net calorific value of the local biome.
Additional comment:	In the baseline scenario, non-renewable biomass was used as an energy source. This is the common practice for the red ceramic sector in the project region. Applied value is recommended by the approved methodology.

Data / Parameter:	$\rho_{biomass}$
Unit:	Tonnes/m ³
Description:	Specific gravity of non-renewable biomass type <i>j</i>
Source of data:	-IPCC: Intergovernmental Panel on Climate Change. Orientación del IPCC sobre las buenas prácticas para UTCUTS - Chapter 3 – Table 3A.1.9-2 - LORENZI, H. <i>Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil</i> , vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002.

	- <i>Estrutura anatômica da madeira e qualidade do carvão de Mimosa tenuiflora (Willd.)</i>. Available at: <http://www.scielo.br/pdf/rarv/v30n2/a18v30n2.pdf>. Visited on: 09/01/2015. - <i>Poder Calorífico da Madeira e de Resíduos Lignocelulósicos</i>. Available at: < http://www.renabio.org.br/06-B&E-v1-n2-2004-173-182.pdf >. Visited on: 09/01/2015.
Value(s) applied :	0.88
Choice of data or measurement methods and procedures:	The species used to calculate the average value of this parameter are typical trees of <i>Caatinga</i> Biome that are usually utilized as fuel in the ceramic industries of the region.
Purpose of 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.
Additional comment:	Not applicable

Data / Parameter:	BF_y
Unit:	Tonnes of wood per thousand of ceramic pieces
Description:	Quantity of woody biomass per thousand of ceramic units fired in year y
Source of data:	Historical data from project proponent
Value(s) applied:	0.7231 for Antônio Ceramic 0.7510 for Ceará Ceramic 0.7327 for Ceagra Ceramic 0.7023 for Eliane Ceramic 0.6551 for Santa Rita Ceramic
Choice of data or measurement methods and procedures:	The value was acquired using historical data on woody biomass consumption and production of ceramic pieces when the ceramic used to consume non-renewable wood. Data from year 2009 was used. The value was employed to calculate the real amount of wood displaced to maintain the ceramic production in the baseline scenario.
Purpose of 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.
Additional comment:	The amount of wood from areas with sustainable forest management utilized in the baseline scenario, used to determine BF_y parameter was updated in the current monitoring period, as its unit of measure is stereo meter (mst). A conversion factor from stereo meter (mst) to cubic meter (m³) was applied. The conversion factor for native wood of Caatinga biome is determinate by Brazilian Environmental Ministry¹⁶. The corrected calculation can be seen in the VER calculation spreadsheet. Please, see BF_y sheet.

¹⁶ Brasil. Ministério do Meio Ambiente Subsídios para a elaboração do plano de ação para a prevenção e controle do desmatamento na Caatinga / Ministério do Meio Ambiente. - Brasília, 2011. Available at: <http://www.mma.gov.br/estruturas/168/_arquivos/diagnostico_do_desmatamento_na_caatinga_168.pdf> Last visited on: 15/01/2015. Value applied: 0.3.

D.2. Data and parameters monitored

Data / Parameter:	PR _y																					
Unit:	Thousands of ceramic pieces																					
Description:	Amount of products produced in year y																					
Measured /Calculated /Default:	Values used for the calculations were taken from manual control of devices burned in the kiln. Measurements were done by an internal control sheet monitored by employees.																					
Source of data:	Controlled by the ceramic owners																					
Value(s) of monitored parameter:	<table><tr><th colspan="7">PR_y (thousands of ceramic units)</th></tr><tr><th>Period</th><th>Antônio Ceramic</th><th>Ceagra Ceramic</th><th>Ceará Ceramic</th><th>Eliane Ceramic</th><th>Santa Rita Ceramic</th><th>Total</th></tr><tr><td>Total Monitoring Período (March to November 2014)</td><td>13,264.71</td><td>9,683.56</td><td>13,459.71</td><td>13,963.29</td><td>8,439.36</td><td>58,810.63</td></tr></table>	PR _y (thousands of ceramic units)							Period	Antônio Ceramic	Ceagra Ceramic	Ceará Ceramic	Eliane Ceramic	Santa Rita Ceramic	Total	Total Monitoring Período (March to November 2014)	13,264.71	9,683.56	13,459.71	13,963.29	8,439.36	58,810.63
PR _y (thousands of ceramic units)																						
Period	Antônio Ceramic	Ceagra Ceramic	Ceará Ceramic	Eliane Ceramic	Santa Rita Ceramic	Total																
Total Monitoring Período (March to November 2014)	13,264.71	9,683.56	13,459.71	13,963.29	8,439.36	58,810.63																
Monitoring equipment :	No monitoring equipment was used to determine this parameter. Production was counted by trained personnel on each ceramic.																					
Measuring/ Reading/ Recording frequency:	This parameter was monitored by employees on each ceramic, counting the total production during the kiln unloading step, on a daily or weekly basis. Data was aggregated on a monthly and yearly basis.																					
Calculation method (if applicable):	Data regarding production was monitored through the number of devices burned in the kiln, measured manually on a daily or weekly basis and compiled into spreadsheets¹⁷. The ceramic industries composing the present project activity have an established internal procedure to convert the existing data (number of unloaded pieces) into the number of pieces that were loaded inside the kiln. They estimate that the average loss during the kiln's loading/burning/unloading is around 1%. This conversion is necessary due to the fact that the correct PR_y data should measure the number of pieces that were actually burned in the kiln. This procedure enables the correct comparison between the number of pieces burned by the biomass consumption.																					
QA/QC procedures applied:	The ceramics have internal controls to assure proper monitoring of this parameter. Data will be compared to the amount of renewable biomass employed.																					
Purpose of 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).																					
Additional comments:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.																					

¹⁷ Spreadsheets with production control were made available to the verification team.

Data / Parameter:	Q_{renbiomass}																						
Data unit:	Tonnes																						
Description:	Amount of renewable biomass used during year y of the crediting period																						
Measured /Calculated /Default:	Measured by the biomass providers and controlled by the ceramic owners																						
Source of data:	It was monitored through purchase invoice, delivery notes or other documents concerning the acquisition of renewable biomasses.																						
Value(s) of monitored parameter:	<table border="1" data-bbox="630 504 1289 1294"> <tr> <th colspan="2">Q_{renbiomass} - Amount of renewable biomass</th></tr> <tr> <th>Period</th><th>March to November 2014</th></tr> <tr> <th>Renewable Biomass</th><th>Q_{renbiomass} (tonnes)</th></tr> <tr> <td>Babaçu</td><td>596.89</td></tr> <tr> <td>Cashew nut shells</td><td>3,541.05</td></tr> <tr> <td>Coconut residues</td><td>0.00</td></tr> <tr> <td>Mamona husk</td><td>682.37</td></tr> <tr> <td>Wood from sustainable management plan areas</td><td>4,086.42</td></tr> <tr> <td>Residues from cashew trees</td><td>6,273.39</td></tr> <tr> <td>Sawdust</td><td>11,322.81</td></tr> <tr> <td>Total</td><td>26,502.93</td></tr> </table> These values represent the sum for all ceramics included in the project. The amount of renewable biomass used by each ceramic is available in the Voluntary Emission Reduction calculation spreadsheet for this monitoring period.	Q _{renbiomass} - Amount of renewable biomass		Period	March to November 2014	Renewable Biomass	Q _{renbiomass} (tonnes)	Babaçu	596.89	Cashew nut shells	3,541.05	Coconut residues	0.00	Mamona husk	682.37	Wood from sustainable management plan areas	4,086.42	Residues from cashew trees	6,273.39	Sawdust	11,322.81	Total	26,502.93
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Total	26,502.93																						
Monitoring equipment:	No monitoring equipment was used to determine this parameter.																						
Measuring/ Reading/ Recording frequency:	This parameter was monitored by documents concerning the acquisition of renewable biomasses, counting the biomass purchase on a daily or weekly basis. Data was aggregated on a monthly and yearly basis. Measurement was done by a spreadsheet monitored by the project proponent. The amount of renewable biomass described represents both the biomass fired and biomass stocked in the ceramics. These figures are different than the actual biomass fired on each ceramic. However, in the long term, biomass fired and biomasses purchased are likely to be similar.																						
Calculation method (if applicable):	Biomass providers measure the amount of products delivered to the ceramics to determine due financial compensation. In case any renewable biomass was measured in volume, default values of specific gravity were used to convert it to tonnes. Values below were applied for the given biomass types:																						

Biomass type	Specific gravity (tonnes/m ³)
Coconut residues	0.50
Residues from cashew trees	0.42
Sawdust	0.25
Wood from sustainable forest management areas	0.88
Cashew nut shells	0.34

These values were taken from the sources below:

- Coconut residue and residues from cashew trees: 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.
- Sawdust: PINHEIRO, G.F., RENDEIRO, G., PINHO, J.T. *Densidade Energética de resíduos vegetais*. Available at: <<http://www.renabio.org.br/03-B&E-014-GiorgianaFP-DensEn-2005-p113-123.pdf>> Last visited on 09/01/2015.
- Wood from sustainable management plan areas: considered to be the same as for native firewood. Please check parameter ρ_{biomass} on section D.1 for more information.
- Cashew nut shells: OGUNDIRAN, M.B., BABAYEMI, J.O., NZERIBE, C.G. Determination of metal content and an assessment of the potential use of waste cashew nut ash (CNSA) as a source for potash production. Available at: <http://www.ncsu.edu/bioresources/BioRes_06/BioRes_06_1_0529_Ogundrian_BC_Determ_Metal_Cashew_Nut_Ash_Potash_1329.pdf> Last visited on 09/01/2015.

In this Monitoring Report, the values presented in the table $Q_{\text{renbiomass}}$ for cashew wood and native wood from management areas were corrected, according to the conversion factors presented in table below.

Conversion factor from "st" to "m ³ "	
Native Wood from forest management areas	0.3388
Cashew tree wood	0.3745

Native Wood from forest management areas:

Table 13, section 5.3.3.7, of the Boqueirão Forest Management Plan. The conversion factor was calculated according to the average of the plots described in this table.¹⁸

Residues from cashew trees:

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, 2008.¹⁹

¹⁸ This document was made available to the verification team.

¹⁹ This document was made available to the verification team.

QA/QC procedures applied:	The amount of renewable biomass purchased was controlled with digital spreadsheets and filled by the ceramic manager and by a third party consultant. Sustainable Carbon has double checked these spreadsheets against biomass invoices to detect inconsistencies. The ceramics are responsible for storing all documents related to the purchase or acquisition of renewable biomass. Data was compared to production output.
Purpose of the data	This parameter was used to : a. 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); b. Demonstrate that the Project fits in small scale category (<45MWth/year); Calculation of leakage emissions due to competing use of biomass.
Additional comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	$f_{NRB,y}$
Unit:	Fraction or percentage
Description:	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable using survey methods
Measured/calculated/default:	The monitoring of this parameter was based on national and international articles, databases and data monitored by the project developer such as project activities at the same region. The sources provided information about the availability of woody biomass in the Caatinga biome, as described on section B.6.3. of the <i>Project Design Document Form</i> , version 05.
Source of data:	Survey methods.
Value(s) of monitored parameter:	0.8208 for Antônio Ceramic 0.7330 for Ceará Ceramic 0.7525 for Ceagra Ceramic 0.7739 for Eliane Ceramic 0.8362 for Santa Rita Ceramic
Monitoring equipment	No monitoring equipment was used to determine this parameter.
Measuring/reading/recording frequency:	Each monitoring period
Calculation method (if applicable):	The values from wood residues should be determined <i>ex ante</i> ²⁰ .
QA/QC procedures applied:	Data from published sources were used to determine this 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.
Additional comments:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity,

²⁰ 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: 13/03/2015.

	whichever occurs later. The monitored value for this parameter is equal to the figures described in version 05 of the PDD.
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Data / Parameter:	<i>Origin of Renewable Biomass</i>
Data unit:	Not applicable
Description:	Renewable origin of the biomass
Measured/Calculated/Default:	The guarantee of acquiring renewable wood was achieved by invoices from the providers. Biomasses were considered renewable as fulfilling the options described in the methodology applied.
Source of data:	Controlled by the ceramic owners
Value(s) of monitored parameter:	Not applied for the calculation. All biomass used during the crediting period are demonstrably renewable, since they comply with CDM definitions of renewable biomass.
Monitoring equipment:	No monitoring equipment was used to determine this parameter.
Measuring/ Reading/ Recording frequency:	Each monitoring period
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Ceramic owners will store invoices, receipt of sales or other documents to allow the traceability of the renewable biomass.
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.
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 / Parameter:	Leakage due to competing uses of biomass
Unit:	tCO ₂ e
Description:	This source of leakage was relevant for biomass residues and biomass from existing forests, according to the general guidance on leakage in biomass project activities. The quantity of renewable biomass available was assessed annually to determine the occurrence of leakage.
Measured /Calculated /Default:	Calculated
Source of data:	In the first monitored period (from 01/09/2010 to 31/12/2011), Sustainable Carbon developed a detailed study on surplus of all biomass types used by the project activity. Information on this biomass availability and consumption was assessed by Sustainable Carbon following a methodological plan based on the application of questionnaires to relevant biomass experts, producers and suppliers. Such study allowed concluding there was sufficient surplus of the all but one types of biomass used by the project (the exception being wood from sustainable forest

	management areas). An independent third party expert opinion on the results and findings of such study was obtained, to ensure the results are appropriate and conservative. This study was later assessed by the Designated Operational Entity responsible for the project verification (TÜV Rheinland (China) Ltd.) and by the Gold Standard Secretariat. During the second monitoring period (from 01/01/2012 to 30/04/2013), the surplus of wood from sustainable forest management areas was analyzed through a different methodology developed by another independent expert. This second study allowed concluding there was a surplus of this type of biomass in the project region. Similarly, such study was assessed by the Designated Operational Entity responsible for the project verification (IBOPE Instituto Brasileiro de Opinião Pública e Estatística Ltda) and by the Gold Standard Secretariat.																										
Value(s) of monitored parameter:	Leakage emissions are calculated as 0 (zero) tCO₂e in this monitoring period. The following surplus of each biomass is considered, as based on a study developed by Sustainable Carbon. <table border="1"> <thead> <tr> <th>Biomassa Type</th><th>Surplus (%)</th><th>Year of assessment</th></tr> </thead> <tbody> <tr> <td>Cashew nut shells</td><td>45%</td><td>2011/2012</td></tr> <tr> <td>Residues from cashew trees</td><td>25%</td><td>2011/2012</td></tr> <tr> <td rowspan="2">Coconut residues</td><td>1.444% for dry coconut</td><td>2011/2012</td></tr> <tr> <td>3.491% for green coconut</td><td>2011/2012</td></tr> <tr> <td>Babaçu residues</td><td>83%</td><td>2011/2012</td></tr> <tr> <td>Mamona Husk</td><td>458%</td><td>2011/2012</td></tr> <tr> <td>Sawdust</td><td>65%</td><td>2011/2012</td></tr> <tr> <td>Wood from sustainable forest management areas</td><td>444%</td><td>2012/2013</td></tr> </tbody> </table>	Biomassa Type	Surplus (%)	Year of assessment	Cashew nut shells	45%	2011/2012	Residues from cashew trees	25%	2011/2012	Coconut residues	1.444% for dry coconut	2011/2012	3.491% for green coconut	2011/2012	Babaçu residues	83%	2011/2012	Mamona Husk	458%	2011/2012	Sawdust	65%	2011/2012	Wood from sustainable forest management areas	444%	2012/2013
Biomassa Type	Surplus (%)	Year of assessment																									
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Mamona Husk	458%	2011/2012																									
Sawdust	65%	2011/2012																									
Wood from sustainable forest management areas	444%	2012/2013																									
Monitoring equipment:	No monitoring equipment was used to determine this parameter.																										
Measuring/ Reading/ Recording frequency:	Annually																										
Calculation method (if applicable):	The values described on table above were calculated by the equation: $\text{Biomass surplus (\%)} = (\text{Biomass Availability/Biomass consumption}) - 1.$ Leakage emissions due to the competing use of biomass are considered not to occur for all biomass types currently used by																										

	the project activity. The reasons for this approach are described on Section E.3. The biomass surplus was determined ex ante and Sustainable Carbon performs an annual assessment of the occurrence of leakage from this source. Leakage may occur if the ceramic factories begin to use new types of biomass (for which the surplus is unknown) or if the amount of biomass consumed increases in a manner to affect the calculated surplus. None of these situations have occurred in this monitoring period.
QA/QC procedures applied:	In the first monitored period Sustainable Carbon developed a detailed study on surplus of biomass used by the project activity, which was verified by the Designated Operational Entity TÜV Rheinland. Also, in the second monitoring period, the surplus of Caatinga firewood from forest management plans was analyzed through a methodology developed by a biomass expert and verified by the Designated Operational Entity IBOPE Instituto Brasileiro de Opinião Pública e Estatística Ltda.
Purpose of the data:	Calculation of leakage emissions. This parameter is used to evaluate if there is any source of indirect emission related to renewable biomass. If applicable, leakage emissions are used to adjust emission reductions resulting from the project
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	<i>Leakage of non-renewable woody biomass</i>
Unit:	tCO ₂ e
Description:	Leakage relating to non-renewable woody biomass
Measured /Calculated /Default:	The source of leakage from non-renewable biomass was monitored according to the applied methodology.
Source of data:	Monitored
Value(s) of monitored parameter:	0 (zero). It was assumed that no emissions occur due to this source, as explained in Section B.6.1. of the <i>Project Design Document</i> , version 05.
Monitoring equipment:	No monitoring equipment was used to determine this parameter.
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Data available regarding the ceramic industry fuel consumption was employed 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.
Any comment:	Not applicable

Data / Parameter:	Checking of all appliances (kiln)
Unit:	Not applicable
Description:	Checking of all appliances (kiln)
Measured /Calculated /Default:	This parameter is determined by interviews and visual inspections.
Source of data:	Ceramic owners and employees
Value(s) of monitored parameter:	Not applicable. All kilns on each ceramic factory were in operation during all months of the monitoring period.
Monitoring equipment:	No monitoring equipment was used to determine this parameter.
Measuring/ Reading/ Recording frequency:	Once every two years
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Visual inspections and interviews with employees on each ceramic are made to ensure that kilns are still operating or are replaced by an equivalent in service appliance.
Purpose of data	Ensure that all kilns are operating or, if they aren't, verify if they are replaced by an equivalent in service appliance.
Any comment	Not applicable

D.3. Implementation of sampling plan

Not applicable as no sampling mechanism is performed.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

Baseline emissions were estimated following procedures of the applied methodology: “**AMS-I.E:Switch from Non-Renewable Biomass for Thermal Applications by the User**”, version 04²¹, valid from 29/04/2011 to 02/08/2012. The project activity in this monitoring period (9 months) generated 385.96 TJ, or 514.62 TJ per year. Converting this number to MWh, it was generated 142,949 MWh per year, which corresponds to the use of 16.32 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 Emission

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

Where:

ER_y:	Emission reductions during the year y in tCO ₂ e
B_y:	Quantity of woody biomass that was substituted or displaced in tonnes
f_{NRB,y}:	Fraction of woody biomass used in the absence of the project activity in year y that was established as non-renewable biomass using survey methods
NCV_{biomass}:	Net calorific value of non-renewable woody biomass that was substituted, in TJ/ton

²¹ Methodology available at: <<http://cdm.unfccc.int/methodologies/DB/I1DGDUD1D5J0KMLSZFWMD3W9Z47OZZ>>. Last visited on 13/01/2015.

EF_{projected fossil fuel}: Emission factor for substitution of non-renewable woody biomass by similar consumers, in tCO₂e/TJ²².

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

B_y was calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year);

The consumption of woody biomass in the kilns was calculated as the amount of products (ceramic pieces) produced and the consumption of woody biomass per thousand of ceramic pieces fired in year y, as follows:

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

Where:

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

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

The value of BF_y was determined with the use of the historical records from the ceramics included in the project, by dividing monthly average consumption in the baseline by monthly average baseline production. According to procedures on the applied methodology, the project participants determined the shares of renewable and non-renewable woody biomass in B_y using nationally approved methods. Also, the following principles were taken into account:

Demonstrably Renewable woody biomass²³ (DRB)

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

1. The woody biomass is originating from land areas that are forests²⁴ where:
 - (a) The land area remains a forest;
 - (b) Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and
 - (c) Any national or regional forestry and nature conservation regulations are complied with.
2. The biomass is woody biomass and originates from non-forest areas (e.g. croplands, grasslands) where:
 - (a) The land area remains cropland and/or grasslands or is reverted to forest;
 - (b) Sustainable management practices are undertaken on these land areas to ensure in particular that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and
 - (c) Any national or regional forestry, agriculture and nature conservation regulations are complied with.

Non-renewable biomass

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

²² According to the applied methodology, a value of 81.6 tCO₂/TJ shall be used for this emission factor, representing the mix of fossil fuels to be used for the present and future.

²³ This definition uses elements of Annex 18, EB 23. Document available at: <http://cdm.unfccc.int/EB/Meetings/023/eb23_repan18.pdf>. Last visit on 13/01/2015.

²⁴ The forest definitions as established by the country in accordance with the Decisions 11/CP.7 and 19/CP.9 should apply.

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

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

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

Before the project activity, wood from areas without forest management was offered with low prices and high viability to the ceramic owner. Thus, the majority of the fuel employed in the baseline scenario was from non-renewable origin. A fraction of baseline fuel was from sustainable origin, namely woody biomass for which a DOF (*Documento de Origem Florestal*, Forest Origin Document) was available. According to the IBAMA Normative Instruction Nº 112 from 21/08/2006²⁵, the entrepreneur who uses raw material from native forests is obliged to use the DOF to control the origin, transportation, and storage of forest products and by-products. This document ensures that the related forest products were obtained from legalized areas where conservation measures are applied. Therefore, firewood with DOF was considered renewable, since it complies with item 1 of the definition of renewable biomass.

The $f_{NRB,y}$ parameter was determined in two steps: the first step was based on project specific information regarding the amount of native firewood from areas without forest management and the amount of firewood with DOF. This provides a fraction of non-renewable biomass used in the baseline scenario based on the origin of the firewood. The second step was an assessment on the fraction of woody biomass used that could be established as non-renewable biomass using survey methods applied to the Caatinga biome, where the project is located. Such assessment was based on Annex 20 of the 35th meeting of the Small Scale Working Group of the Clean Development Mechanism, which provides a methodology for the calculation of $f_{NRB,y}$ ²⁶. A description of such methodology follows:

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

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

$$NRB = R - DRB \quad (\text{Equation 4})$$

Where:

R Total annual biomass removals (tonnes/year)

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

$$R = MAI + \Delta F \quad (\text{Equation 5})$$

²⁵ BRASIL. INSTRUÇÃO NORMATIVA IBAMA Nº 112, DE 21 DE AGOSTO DE 2006. Available at: <http://www.cetesb.sp.gov.br/licenciamentoo/legislacao/federal/inst_normativa/2006_Instr_Norm_IBAMA_112.pdf>. Visited on 13/01/2015.

²⁶ Document is available at: <http://cdm.unfccc.int/Panels/ssc_wg/meetings/035/ssc_035_an20.pdf>. Last visited on 13/01/2015.

Where:

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

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

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

$$MAI = F \times GR \quad (\text{Equation 6})$$

Where:

F Extent of forest (ha)

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

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

$$DRB = PA \times GR \quad (\text{Equation 7})$$

Where:

PA Protected Area Extent of Forest (ha)

This approach was considered appropriate since it took in consideration historical practices of the ceramics involved in the project in regard to fuel usage, meaning only native firewood from areas without forest management were considered as non-renewable. Also, choosing the biome where the project is located as the geographical boundary for the second step is a more accurate approach than performing a national assessment, given the dimensions and peculiarities of each biome in Brazil and considering that sub-regional information is neither available nor feasible to obtain. Also, there is evidence to support that carbon stocks are depleting in the project area²⁷ and that there is a trend showing an increase in time spent or distance travelled for gathering fuel-wood by users²⁸.

E.2. Calculation of project emissions or actual net GHG removals by sinks

The applied methodology does not include any source of project emissions

E.3. Calculation of leakage

Leakage is estimated as 0 (zero) tCO₂e during the current 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.

Leakage from the use of renewable biomass was considered using the general guidance on leakage in biomass project activities (attachment C of Appendix B)²⁹. Also, the specific rules on

²⁷ The Second Brazilian Inventory of Anthropogenic Emissions and Removals of Greenhouse Gases provides data on net carbon emissions from Land Use Change for each Brazilian biome on Table 3.111, page 249. Net carbon emissions for the Caatinga biome indicate carbon pools have constantly decreased between 1990 and 2005. Document available at: <http://www.mct.gov.br/upd_blob/0214/214077.pdf>. Last visit on 13/01/2015.

²⁸ DA SILVA, E.R. *A exploração da lenha da caatinga como fonte de energia para as lavanderias de jeans em Toritama – Pernambuco*. Information on Page 2 shows increasing distances to obtain firewood in the Caatinga biome. Document available at: <<http://www.eventosufupe.com.br/jepex2009/cd/resumos/R1451-2.pdf>>. Last visited on 13/01/2015.

²⁹ Document available at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentC.pdf>. Last visit on 13/01/2015.

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

For this project activity, the following sources of leakage were included: A. *Shifts of pre-project activities*; B. *Emissions related to the production of Biomass*, and C. *Competing uses for the biomass*.

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

Table 04. Sources of leakage according to the type of the biomass.

Biomass Type	Activity/Source	Shift of pre project activities	Emissions from biomass generation/ cultivation	Competing use of biomass
Biomass from forests	Existing forests	-	-	X
	New forests	X	X	-
Biomass from croplands or grasslands (woody or non-woody)	In the absence of the project the land would be used as a cropland/wetland	X	X	-
	In the absence of the project the land will be abandoned	-	X	-
Biomass residues or waste	Biomass residues or wastes are collected and use.	-	-	X

Observing the table above, the sources of leakage relevant to the present project activity are the competing use of biomass from existing forests and for biomass residues or waste.

In response to FAR 1 raised by the Gold Standard Secretariat during project registration, Sustainable Carbon developed a detailed study on the surplus of all types of biomass used by the project activity. Such study was developed during the first monitoring period, and included various phases. Information on this biomass availability and consumption was assessed by Sustainable Carbon following a methodological plan based on the application of questionnaires to relevant biomass experts, producers and suppliers.

Also, during the second monitoring period, the surplus of wood from sustainable forest management areas was analyzed through a different methodology developed by another independent expert. These studies allowed concluding there was a surplus of all types of biomass in the project region, avoiding possibility of competing uses of biomass due to the project implementation.

The results of the studies can be found in the monitored parameter *Leakage due to competing use of biomass*, where it shows each biomass type utilized by the ceramic factories and the correspondent surplus expressed in percentage.

E.4. Summary of calculation of emission reductions or net GHG removals by sinks

Table 05. Summary of calculation of emission reductions

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	40,169	0	0	0	40,169	40,169

Table 06. Emission reductions by each ceramic for the monitoring period.

Emission reductions by each ceramic (tCO ₂ e)							
	Period	Antônio Ceramic	Ceagra Ceramic	Ceará Ceramic	Eliane Ceramic	Santa Rita Ceramic	Total
2014	March	988	698	1,179	827	658	4,350
	April	592	670	697	886	439	3,284
	May	592	573	665	894	640	3,364
	June	1,020	632	919	880	688	4,139
	July	1,327	757	1,345	1,204	840	5,473
	August	1,304	790	1,248	1,146	797	5,285
	September	1,283	815	933	1,175	772	4,978
	October	1,319	840	909	1,203	705	4,976
	November	1,208	757	1,169	1,070	116	4,320
Total Monitoring Period		9,633	6,532	9,064	9,285	5,655	40,169

E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

This section includes a comparison of actual values of the emission reductions achieved during the monitoring period with the estimations in the registered PDD.

Table 07. Comparison of values described on the PDD and the monitoring period.

Ceará Renewable Energy Bundled Project			
	PDD	Current Monitoring Period	Monitoring Period - Annual average
Energy Generated(TJ)	687	385	514
Energy generated (MWh)	190,732	107,212	142,949
Equivalent energy capacity (MW)	21.77	12.24	16
PR_y (thousands of ceramic units)	50,847	58,811	78,414
Emission reductions - ER_y (tCO₂e)	36,173	40,169	53,559

E.6. Remarks on difference from estimated value in registered PDD

As detailed on the table below, most of the values of production (parameter PR_y) presented in this monitoring period increased compared to the estimated in the PDD, but it has decreased in comparison with the previous monitoring period. The production at the ceramic factories has been decreasing, as a result of a decrease in demand in the civil construction sector.^{30, 31}

According to the National Industry Confederation (CNI), the civil construction sector economy decreased for the first time since 2009, when Government Housing Program had lead to an excellent growth in the sector.³²

During the current monitoring period, variations were also observed on the thermal energy per production output (TEPO), which is measured in TJ per 1,000 of ceramic pieces produced. When compared with the previous monitoring period, Antonio ceramic had a decrease of 7% of its TEPO. Although the TEPO for this ceramic is 44% lower than the baseline period, it is consistent with the past monitoring periods, when fuel and operating conditions were similar to current conditions.

Ceagra ceramic had a decrease of 40% of its TEPO when compared to the previous monitoring period. Such difference was observed because the monitoring of biomass in previous monitoring periods was inaccurate and probably included biomass that was feeding two kilns located inside the ceramic factory but that are not part of the Project Activity. During this monitoring period, however, the amount of biomass was conservatively corrected to account only for the amount that was used to feed both Hoffman kilns that are included in the Project.

Nevertheless, even with this decrease in its TEPO, Ceagra had the same average thermal energy when compared with the factories from this bundle, thus the generated thermal energy was consistent with the amount of pieces produced.

Moreover, for the next monitoring periods, the factory will take the necessary actions to ensure that the biomass will be specifically monitored for the site included in the project activity.

Ceará ceramic factory presented a 14% increase of its TEPO, when compared to the previous monitoring, which had a previously negative variation. When compared to the baseline, this monitoring period had a negative variation of 45%. Such difference is partly caused by the predominant use of round kilns (which are less efficient) in the baseline, compared to the Project scenario.

Eliane ceramic factory had a negative variation of 20% of its TEPO when compared to the previous monitoring period, however the ceramic has increased the TEPO in 23% when compared to the baseline period.

Santa Rita also had decreased the TEPO in 14% when compared to the previous monitoring period and a remarkable increase of 52% when compared to the baseline period.

Finally, please notice that the comparison between the current monitoring period and the baseline shows the combined TEPO for all ceramic factories included in the project represented 72% of the baseline period. The difference of 28% can be partly attributed to energy efficiency, given the

³⁰ *Diário do Comércio.* Available at http://diariodocomercio.com.br/noticia.php?tit=ceramistas_estao_em_crise_em_minas&id=145678 Last visited on 23/01/2015

³¹ JusBrasil. Available at < <http://al-pe.jusbrasil.com.br/noticias/130886874/silvio-costa-filho-alerta-para-crise-no-setor-ceramista-do-estado> > Last visited on 23/01/2015

³² Internet Group/ Economia < <http://economia.ig.com.br/empresas/2014-08-23/apos-boom-perspectiva-de-baixa-na-construcao-civil-preocupa-cni.html> > Last visited on 23/01/2015

improvements in fuel usage resulting from the project. However, a high variation on this parameter is observed over time and from one ceramic factory to the other, which indicates other factors affect the energy requirements of the factories included in the project. Even so, the analysis of TEPO provides a reasonable assessment of how the ceramic factories are meeting their energy needs from renewable biomass sources.

Production levels are mainly influenced by the market demand, as there is no logic in producing more than the ceramic is expected to sell. Besides, as can be verified by the Financial Barrier (on Section B.1), the use of renewable biomass involves additional costs to the ceramics. Although the income from the commercialization of the carbon credits is essential to encourage and maintain the fuel switching process, they do not act as an incentive to increase production beyond market demand levels.

Table 8. Comparison of values for each ceramic company

Double check of production and thermal energy use												Variation - 3rd MR to Current Monitoring Period	Variation - Baseline to Current Monitoring Period
Ceramic	Parameter (monthly average)	Baseline scenario - 2009	1st MR		2nd MR			3rd MR			4th MR - Current Monitoring Period		
			2010	2011	2012	2013 (jan to apr)	Weighted Average - Years 2012 and 2013	2013	2014 (jan to feb)	Weighted Average - Years 2013 and 2014	2014 (mar to nov)		
Antônio	PRy (1,000 pieces)	660.17	478.25	549.33	1,740.02	1,419.53	1,659.90	1,561.94	1,445.00	1,538.55	1,473.86	-4%	123%
	Thermal Energy (TJ)	7.16	3.48	8.79	10.32	7.34	9.57	11.21	5.30	10.03	8.92	-11%	25%
	TJ per 1,000 pieces	0.0108	0.0073	0.0160	0.0059	0.0052	0.0057	0.0072	0.0037	0.0065	0.0061	-7%	-44%
Ceagra	PRy (1,000 pieces)	1,238.57	2,372.17	2,085.92	1,484.03	1,476.15	1,482.06	1,177.13	1,110.78	1,163.86	1,075.95	-8%	-13%
	Thermal Energy (TJ)	13.61	6.35	21.51	11.75	11.29	11.64	15.05	10.06	14.06	7.71	-45%	-43%
	TJ per 1,000 pieces	0.0110	0.0027	0.0103	0.0079	0.0076	0.0079	0.0128	0.0091	0.0120	0.0072	-40%	-35%
Ceará	PRy (1,000 pieces)	954.42	952.00	864.67	1,655.04	1,481.75	1,611.72	1,798.54	1,816.28	1,802.09	1,495.52	-17%	57%
	Thermal Energy (TJ)	10.75	7.54	14.75	11.46	5.72	10.03	10.80	5.36	9.71	9.21	-5%	-14%
	TJ per 1,000 pieces	0.0113	0.0079	0.0171	0.0069	0.0039	0.0062	0.0060	0.0030	0.0054	0.0062	14%	-45%

Eliane	PRy (1,000 pieces)	682.17	721.50	664.50	1,428.70	1,150.03	1,359.03	1,410.01	1,485.71	1,425.15	1,551.48	9%	127%
	Thermal Energy (TJ)	3.59	5.42	9.34	9.96	8.37	9.56	12.14	9.17	11.54	10.04	-13%	179%
	TJ per million pieces	0.0053	0.0075	0.0141	0.0070	0.0073	0.0070	0.0086	0.0062	0.0081	0.0065	-20%	23%
Santa Rita	PRy (1,000 pieces)	701.92	1,011.25	1,642.25	1,004.52	463.58	869.29	1,136.21	1,002.85	1,109.54	937.71	-15%	34%
	Thermal Energy (TJ)	3.45	3.29	12.18	10.62	6.28	9.53	10.61	5.84	9.66	7.00	-27%	103%
	TJ per 1,000 pieces	0.0049	0.0033	0.0074	0.0106	0.0136	0.0113	0.0093	0.0058	0.0086	0.0075	-14%	52%
Ceará Renewable Energy Bundled Project	TJ per 1,000 pieces	0.0091	0.0047	0.0115	0.0074	0.0065	0.0072	0.0084	0.0052	0.0078	0.0066	84%	72%

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	☒ Project participant ☒ Person/entity responsible for completing the CDM-MR-FORM
Organization name	Sustainable Carbon Projetos Ambientais Ltda
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Salutation	Mr.
Last name	Merlin
Middle name	-
First name	Stefano
Department	-
Mobile	Not Available
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Personal e-mail	smerlin@sustainablecarbon.com

Project participant and/or responsible person/ entity	☒ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
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Fax	Not available
E-mail	Not available
Website	Not available
Contact person	Lorival Assunção Tavares

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Last name	Tavares
Middle name	Assunção
First name	Lorival
Department	General Management
Mobile	Not available
Direct fax	Not available
Direct tel.	Not available
Personal e-mail	Not available

Project participant and/or responsible person/ entity	☒ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
Organization name	Ceará Cerâmica Ltda
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Project participant and/or responsible person/ entity	☒ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
Organization name	Ceagra – Cerâmica e Agropecuária Assunção Ltda
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Project participant and/or responsible person/ entity	☒ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
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Personal e-mail	Not available

Project participant and/or responsible person/ entity	☒ Project participant ☐ Person/entity responsible for completing the CDM-MR-FORM
Organization name	Cerâmica Santa Rita Ltda
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Contact person	Lorival Assunção Tavares
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Mobile	Not available
Direct fax	Not available
Direct tel.	Not available
Personal e-mail	Not available

Annex 1 – Sustainability Monitoring Plan

This Annex describes the monitoring of the sustainability indicators, as defined by the Sustainability Monitoring Plan described in the Gold Standard Passport, version 05. Monitoring of the sustainability indicators was based on best available sources of information.

No		01
Indicator		Air quality
Chosen parameter		Emissions to the atmosphere
Implications on monitoring requirements and justification		The project is expected to generate positive impacts on air quality, by improving operational procedures related to fuel usage and by increasing monitoring procedures on atmospheric emissions. In the baseline scenario, the ceramic factories used native firewood as fuel and little control existed on the kilns feeding, leaving the possibility of high atmospheric pollution due to irregular burning (i.e. excessive feeding of the kilns and burning of wet firewood). Air quality is expected to improve due to the more efficient burning of fuels, as automatic feeders tend to maximize the use of fuels and avoid excess of smoke due to irregular burning.
Way of monitoring	How	Evaluations by applying Ringelmann smoke charts as recommended by SEMACE (Environmental Superintendence of the State of Ceará), the environmental authority. Results were stored to assess the intensity of atmospheric emissions.
	When	On an bi-weekly basis
	By who	Ceramics employees.
QA/QC procedures to be applied		Ringelmann smoke charts shall be used in accordance with SEMACE guidelines. Besides the control based on such charts, the project also applied the following indicator from SOCIALCARBON Standard® ³³ : SOCIALCARBON indicators for Ceramic Industry, Version 8.2 ³⁴ : Emissions to the atmosphere - Evaluates the control over the atmospheric emissions involving the gases emitted during the productive process, except the greenhouse gases. According to the SOCIALCARBON indicators for Ceramic Industry, emissions to the atmosphere was analyzed on a periodical basis and is scored from 1 to 6, where 1 represents a critical situation and 6 represents a sustainable scenario. More detail can be verified on Section F.2. <i>Sustainable Development matrix</i> on the Gold Standard Passport, version 05.
Monitoring Value and Frequency		During this monitoring period, all of the five ceramic factories have applied the monitoring of smoke emissions using the Ringelmann smoke chart every week. The Ringelmann smoke chart results were compiled in files. The indicator “ <i>Emissions to the atmosphere</i> ” from SOCIALCARBON Standard® allows classifying the project

³³ The SOCIALCARBON Standard is a certification adept at bringing demonstrable social, environmental and economic benefits to the stakeholders of carbon offset projects. More information at: <<http://www.socialcarbon.org/>>. Last visit on 13/01/2015.

³⁴ Available at: <http://www.socialcarbon.org/wp-content/themes/socialcarbon/docs/Industries_Ceramic_Sector_v8.2_09_06_2011.pdf>. Last visit on 13/01/2015.

	activity into scenario 4, defined as: “Scenario 4: <i>There is monitoring but the entrepreneur can’t guarantee that it is in conformity with the legislations, norms and applied requisites. There are actions to control and reduce the emissions with evident results and/or measurable.”</i> The operation license issued in 2014 has an environmental requirement that demands a new method of monitoring the atmospheric emissions. According to this requirement, the ceramic factories will need to perform a detailed monitoring of their atmospheric emissions, ensuring that it is in compliance with the legislation. Although this detailed monitoring is now a legal requirement, the factories have been monitoring the emissions since the beginning of the project, and have controlled them more often than required by applying the monitoring plan defined by the project. For the next monitoring periods, Project Participants will also take into account the results, considerations and determination from this new method of monitoring the emissions, whenever such information is available.
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No		02
Indicator		Soil condition
Chosen parameter		Procedures related to the control and disposal of ashes.
Implications on monitoring requirements and justification		During the kilns operation, ashes result from the burning of biomass. In the baseline scenario, the ceramics try to minimize the environmental impact of the ashes by recycling it or selling it to third parties and raw material. With the project activity, new kinds of fuels will be used (renewable biomasses such as biomass residues) and the generation of ashes might increase.
Way of monitoring	How	Ashes are to be quantified by using standard storage bags with a known weight. Employees on the ceramic used spreadsheets to control the amount of storage bags leaving the ceramic each time ashes were collected for final destination. Such spreadsheet shall also include information on the destination of ashes, such as the person/entity responsible for collecting the ashes and the place of destination. Photographs are to be used as evidence of the final destination whenever feasible. Interviews and meetings with stakeholders and ceramic personnel on each ceramic should also be applied to identify the relevant score under the SOCIALCARBON indicator.
	When	Ashes should be quantified and have their destination monitored whenever they were collected for final destination. The assessment on the relevant score of the SOCIALCARBON indicator was performed on the current monitoring period.
	By who	Project participants ³⁵

³⁵ Ceramic owners shall assign personnel to quantify and monitor the final destination of ashes. Sustainable Carbon will help the ceramic owners identify the corresponding scoring of the Project scenario, following the requirements of SOCIALCARBON Standard.

QA/QC procedures to be applied	Besides the procedures to control and dispose ashes on each ceramic, the project proponents applied the indicator from SOCIALCARBON Standard: SOCIALCARBON indicators for Ceramic Industry, Version 8.2: Ashes - Evaluates the procedures adopted by the entrepreneur in order to control the ashes and its destination. The project situation was analyzed on a periodical basis and is scored from 1 to 6, where 1 represents a critical situation and 6 represents a sustainable scenario. More detail can be verified on Section F.2. <i>Sustainable Development matrix</i> on the Gold Standard Passport, version 05.
Monitoring Value and Frequency	Since the first monitoring period, ceramic owners have provided a proper destination to ashes resulted from biomass combustion. Ashes quantification and destination are documented on proper files for all the ceramic factories. The indicator “Ashes” from SOCIALCARBON Standard allows classifying the project activity into scenario four, defined as: <i>“Scenario 4:</i> - <i>Ashes are totally reused or donated, with control of the quantity and destination of the material.”</i>

No		03
Indicator		Quality of employment
Chosen parameter		Actions of health and security
Implications on monitoring requirements and justification		Following the project measures, a certain level of automation in the logistics and feeding of fuels in the kilns were installed, improving the working conditions of employees responsible for feeding the kilns with bricks and fuels.
Way of monitoring	How	Site visits and interviews with employees and Managers of each ceramic.
	When	Each monitoring period
	By who	Project participants ³⁶
QA/QC procedures to be applied		To monitor the project impact on the quality of employment, the project applied the following indicator from SOCIALCARBON Standard: SOCIALCARBON indicators for Ceramic Industry, Version 8.2: Actions of Health and Security – evaluates the existence and performance of campaigns, leisure and goal and plans regarding to health and security. The project situation was analyzed on a periodical basis and is scored from 1 to 6, where 1 represents a critical situation and 6 represents a sustainable scenario.
Monitoring Value and Frequency		According to the indicator from SOCIALCARBON Standard: SOCIALCARBON indicators for Ceramic Industry, Version 8.2: Actions of Health and Security , the project activity can be classified into scenario two, defined as: “Scenario 2: There were no serious accidents, but no campaign, lecture or training was done in the last 12 months. In this current period, the factories did not offer any lectures to employees regarding safety issues, since the companies have been restructuring its internal operations, thus reducing its investments in the development of news activities.

³⁶ Sustainable Carbon will help the ceramic owners identify the corresponding scoring of the Project scenario, following the requirements of SOCIALCARBON Standard.

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No		04
Indicator		Quality of employment
Chosen parameter		Use of safety equipments
Implications on monitoring requirements and justification		In the baseline scenario, employees were resistant to use safety equipments, since they feel these equipments are uncomfortable to use due to high local temperatures. During the second monitoring period, the project developers conducted trainings regarding the importance of using safety equipments to employees. The aim of the project is to reduce resistance and obtain higher usage rates of safety equipments by employees working with biomass and around the kilns.
Way of monitoring	How	Ceramic managers are to use spreadsheets to control the use of safety equipments by employees. Employees should provide their signatures on such spreadsheet each time they receive safety equipment.
	When	On a weekly basis. Data were consolidated for each monitoring period.
	By who	Project participants ³⁷
QA/QC procedures to be applied		No QA/QC procedures are defined for this parameter
Monitoring Value and Frequency		All five ceramic factories have control over the delivery of IPEs to employees through a spreadsheet with the signature of each worker. Also, to encourage the use of IPEs, the ceramic distributed awards to workers that have used the equipments properly, such as bicycles, microwave oven, stereos, among others. The factories are aware that a more efficient incentive mechanism shall be employed in the future, although during this monitoring period the companies have been restructuring its internal operations, thus reducing its investments in the development of news activities. The factories expect to develop another mechanism as soon as possible.

No		05
Indicator		Access to affordable and clean energy services
Chosen parameter		Total energy produced from renewable sources
Implications on monitoring requirements and justification		The project is expected to positively impact the access to affordable and clean energy services. The measures applied by the project activity resulted in renewable energy generation by utilizing renewable biomasses, thus providing alternative and clean energy sources that were not utilized in the baseline scenario.
Way of monitoring	How	The amount of renewable biomass used by each ceramic was monitored during the crediting period (through purchase invoice, delivery notes or other documents concerning the acquisition of biomass). By using default values of energy content, the project proponents were able to determine the amount of renewable energy produced during each year of

³⁷ Ceramic owners shall assign managers to monitor the use of safety equipments. Sustainable Carbon will help the ceramic owners quantifying the usage rate of such equipments.

		the crediting period.
	When	On a monthly basis. Data was consolidated on an annual basis
	By who	Project Participants. Staff from each ceramic should store information on biomass purchase and acquisition. Sustainable Carbon should determine the amount of renewable energy generated during the crediting period.
QA/QC procedures to be applied		The amount of renewable biomass purchased was controlled with digital spreadsheets filled by staff members from Grupo Tavares. Sustainable Carbon has double checked these spreadsheets against biomass invoices to detect inconsistencies.
Monitoring Value and Frequency		Biomass acquisition was monitored for each purchase, by storing documents such as invoices or receipts. These allowed Sustainable Carbon to determine the amount of energy produced from renewable sources. Values are available in Table A1.

No		06														
Indicator		Quantitative employment and income generation														
Chosen parameter		Voluntary Emission Reductions issued.														
Implications on monitoring requirements and justification		The project is expected to reduce 395,520 tCO ₂ e during the crediting period. However, the actual emission reductions will depend on the production and the related amount of renewable biomass used. The issuance of carbon credits will also be subject to the capacity of the project to comply with Gold Standard requirements for voluntary offset projects.														
Way of monitoring	How	The issuance of Voluntary Emission Reductions (or similar assets from the carbon market) will be monitored.														
	When	Once every monitoring period														
	By who	Project Participants. Staff from each ceramic should store information regarding the project operation, including fuel usage and production output. Sustainable Carbon should determine the emission reductions resulting from the project.														
QA/QC procedures to be applied		This parameter will be monitored based on the amount of VERs issued. VER issuance is subject to third party verification following Gold Standard requirements. Hence, additional QA/QC procedures are not necessary														
Monitoring Value and Frequency		(a) This parameter is monitored every monitoring period based on the amount of VERs issued at each monitoring period. The project has issued the following amount of VERs to date: <table><tr><th>Year</th><th>VERs</th></tr><tr><td>2010</td><td>11,314</td></tr><tr><td>2011</td><td>29,263</td></tr><tr><td>2012</td><td>65,566</td></tr><tr><td>2013</td><td>57,619</td></tr><tr><td>2014</td><td>9,791</td></tr><tr><td>Total</td><td>173,553</td></tr></table> It is important to clarify that a fee of 2% of the total amount of	Year	VERs	2010	11,314	2011	29,263	2012	65,566	2013	57,619	2014	9,791	Total	173,553
Year	VERs															
2010	11,314															
2011	29,263															
2012	65,566															
2013	57,619															
2014	9,791															
Total	173,553															

	credits verified were discounted to the Gold Standard Share of Proceeds. Values on the table above do not include such "discount", meaning they represent the full amount of credits verified and issued. The monitoring of biomass carried out in Ceagra ceramic factory in previous monitoring periods was inaccurate and probably included biomass that was feeding two kilns located inside the ceramic factory, however that are not part of the Project Activity. During this monitoring period, nevertheless, the amount of biomass was conservatively corrected to account only for the amount that was used to feed two Hoffman kilns that are included in the Project. Therefore, kilns that are part of the project were responsible for 58% of the total amount of Ceagra production, during this monitoring period. This percentage was then discounted from the total revenues of biomass purchased by Ceagra ceramic industry.
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No		07
Indicator		Quantitative employment and income generation
Chosen parameter		Additional revenues for biomass suppliers
Implications on monitoring requirements and justification		The project is allowing the ceramics to use exclusively renewable biomass as fuel. Since these types of fuels are more expensive than native firewood, it is likely that total revenues to biomass suppliers will increase. Furthermore, these revenues are now being destined to suppliers of renewable biomass, which do not cause deforestation.
Way of monitoring	How	Total revenues will be monitored by storing purchase invoices, receipts of sale and other documents concerning biomass acquisition. Total revenues shall be compared to the baseline fuel cost for the ceramics which were destined to native firewood suppliers. This parameter is defined ex-ante using data from 2009 (the most recent year prior to the project start date) ³⁸ . A conservative correction factor of 15% will be applied annually, to account for general price increase due to inflation ³⁹ .
	When	Once every monitoring period
	By who	Project Participants. Staff from each ceramic shall store information biomass acquisition and costs. Sustainable Carbon shall determine the additional revenues by comparing monitored values with figures estimated for the baseline situation.
QA/QC procedures to be applied		The amount of renewable biomass purchased was controlled with digital spreadsheets filled by the ceramic factories employees and a third party consultant. Sustainable Carbon has double checked these spreadsheets against biomass invoices to detect inconsistencies.
Monitoring Value and Frequency		Biomass acquisition was monitored for each purchase, by storing documents such as invoices or receipts. These allowed Sustainable Carbon to determine the payments for

³⁸ The same data was used for the assessment of additionality. Hence, this approach provides consistency. Furthermore, it is not feasible to monitor the cost of non-renewable biomass ex-post, since this biomass is no longer used by the project.

³⁹ No methodology was found to correct the price of non-renewable biomass in Brazil, since this is mostly an informal market. A 15% correction factor is considered conservative since it is above current inflation levels in Brazil.

	biomass suppliers. Values are available in Table A2.
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No		08
Indicator		Origin of renewable biomass
Chosen parameter		Origin of renewable biomass
Implications on monitoring requirements and justification		Following the project measures, the ceramics have begun utilizing renewable biomass as fuel. Currently, the ceramics use exclusively renewable biomasses as fuels since the beginning of the crediting period, which is defined as 01/09/2010.
Way of monitoring	How	The origin of the renewable biomass will be assessed storing documents (receipts, invoices) from the biomasses providers, thus allowing determining its origin. The biomasses shall be considered renewable as fulfilling definitions of renewable biomass approved by the CDM Executive Board ⁴⁰ .
	When	Once every monitoring period
	By who	Project Participants. Staff from each ceramic shall store information regarding the biomass purchase and acquisition. Sustainable Carbon shall assess the source of biomass and confirm they comply with CDM EB definitions of renewable biomass.
QA/QC procedures to be applied		Ceramic owners will store invoices, receipt of sales or other documents to allow the traceability of the renewable biomass.
Monitoring Value and Frequency		The guarantee of acquiring renewable wood was achieved by invoices from the providers. Biomasses were considered renewable as fulfilling the options described in the methodology applied.

No		09
Indicator		Competing uses of biomass
Chosen parameter		Biomass surplus
Implications on monitoring requirements and justification		In the baseline situation, all ceramics used predominantly non-renewable woody biomass for thermal energy generation. The project activity aims to allow the complete switch from non-renewable biomass to renewable biomasses. The target is to generate all the energy demand of the ceramics from renewable sources.
Way of monitoring	How	According to the Gold Standard Passport (version 05, dated 08/03/2012), national and international articles and databases should be assessed to determine the availability of each type of biomass used during the project operation. However, in response to FAR 1 raised by the Gold Standard Secretariat during project registration, Sustainable Carbon has developed a detailed Study on the surplus of all types of biomass used by the project activity, during the first monitoring period. In addition to the first study, which could not determine the surplus of firewood with certainty, during the second monitoring period a new evaluation was requested and a methodology was developed in response to confirm the existence of availability and surplus of firewood at Caatinga forest management plans.

⁴⁰ EB 23, Annex 18 – Definition of renewable biomass. Available at: http://cdm.unfccc.int/EB/Meetings/023/eb23_repan18.pdf. Last visited on 13/01/2015

	When	Once every monitoring period
	By who	Project Participants. Staff from each ceramic shall store information regarding the project operation, including biomass usage. Sustainable Carbon shall assess the availability of biomass and determine the occurrence of leakage.
QA/QC procedures to be applied		During the second monitoring period, an independent third party expert opinion on the results and findings of the assessment of biomass surplus was obtained, to ensure the results are appropriate and conservative. This study was verified by the Designated Operational Entity IBOPE Instituto Brasileiro de Opinião Pública e Estatística Ltda., as well by the Gold Standard Secretariat.
Monitoring Value and Frequency		Monitoring values and frequency are available on Section D.2 (pages 20 and 21).

Table A 1. Total energy produced from renewable sources.

Ceramic	Total energy produced from renewable sources (TJ)
	Monitoring Period
Antônio Ceramic	80.27
Ceagra Ceramic	69.41
Ceará Ceramic	82.93
Eliane Ceramic	90.34
Santa Rita Ceramic	63.03
Ceará Renewable Energy Bundled Project	385.96

Table A 2. Additional revenues for biomass suppliers

Ceramic	Estimated revenues for biomass suppliers in the baseline scenario	Additional revenues for biomass suppliers
	2014	Monitoring report 2014
Antônio Ceramic	R\$ 320,413.15	R\$ 352,739.85
Ceagra Ceramic	R\$ 231,564.53	R\$ 723,572.82
Ceará Ceramic	R\$ 330,836.79	R\$ 148,866.21
Eliane Ceramic	R\$ 313,061.84	R\$ 319,885.66
Santa Rita Ceramic	R\$ 180,693.05	R\$ 246,469.95
Ceará Renewable Energy Bundled Project	R\$ 1,376,569.35	R\$ 1,791,534.50