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CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

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Annexes

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Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Santander and Las Tapias Renewable Energy Project
Version 04
PDD completed on: 19/07/2012

A.2. Description of the small-scale project activity:

The project activity is the project of Las Tapias 3 and Santander Ceramics, which are both red ceramics industries located in Colombia. Las Tapias 3 Ceramic is located at Bogotá, in the state of Cundinamarca. Santander Ceramic is located at Soacha municipality, also in the state of Cundinamrca. The ceramic industries produce ceramic bricks, destined mainly for the regional market in the metropolitan area of Bogotá. A brief description of the situation on each ceramic before and after the initiation of the project activity follows:

Las Tapias 3 Ceramic

This ceramic factory began operations in 1994. It used to operate two beehive[1] kilns and one Hoffmann[2] kiln using coal as fuel. For the development of the project, the proponent invested in the installation of one tunnel[3] kiln. The ceramic has also acquired new equipments, including a carbojet (an automatic feeder), for the project development.

At *Las Tapias 3* Ceramic, the feeding process in the kilns was done manually. The project involves an increase in fuel volumes, since the renewable biomass has lower energy content than coal, leading to higher volumes for a given amount of energy. Therefore, feeding the kilns demanded investments in the automatic feeders, increasing production costs.

Before being cooked in the kilns, the pieces must be dried. At Las Tapias 3 Ceramic, the ceramic pieces are dried in a coal fired dryer with a capacity of 45,000 pieces. In the baseline, two beehive kilns and one Hoffmann kiln have produced 4,852,608 ceramic pieces in 2008. One tunnel kiln with a capacity of 4,500 pieces per cycle was installed as part of the project. Figures below illustrate the situation before and after the project activity.

Figure 1. Beehive kiln in Las Tapias 3 Ceramic, before the project initiation.

[1] Beehive kilns are circular kilns, with a domed roof and are built of ordinary bricks. The circular wall is totally in contact with the outside air. More information at: <http://www.fao.org/docrep/x5328e/x5328e08.htm#7.2.1. design>. Last access on 12/12/2010.

[2] "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.

[3] A tunnel kiln is a type of continuous kiln that is typically open on both ends and heated centrally. Bricks may be passed through the device in an uninterrupted fashion, allowing large volumes to be processed without shutting off the kiln between batches.

Figure 2. Tunnel kiln installed as the project in Las Tapias 3 Ceramic.

Santander Ceramic

This ceramic factory began operations in 1985. It used to operate two Pampa[4] kilns using coal as fuel. For the development of the project, the proponent invested in the installation of one Hoffmann kiln and one Chamber kiln. The ceramic has also acquired new equipments, including a wood shredder and a carbojet, all involved in the project development. The wood shredder is used in order to cut the bigger pieces of wood and allow their entrance into the kilns. The use and monitoring of this new equipment and new fuels (biomass) called for training of the employees.

At Santander Ceramic, the feeding process in the kilns was done manually. The project involves an increase in fuel volumes, since the renewable biomass has lower energy content than coal, leading to higher volumes for a given amount of energy. Therefore, feeding the kilns demanded investments in the automatic feeders, increasing production costs.

Before being cooked in the kilns, the pieces must be dried. At Santander Ceramic, the ceramic pieces are dried in three coal fired dryers with a capacity of 24,000 pieces. With the new kilns, waste heat is used to help in the drying process by pipes leading heat to the location where ceramic pieces are left to dry. With the project, renewable biomass is also used in the driers as a replacement of coal.

In the baseline, two Pampa kilns have produced 7,550,709 ceramic pieces in 2008. One Hoffmann kiln and one chamber kiln were installed as the project activity. Figures below illustrate the situation before and after the project activity.

Figure 3. Pampa kiln at Santander Ceramic (pre-project situation).

[4] *Pampa kilns are also known as "Arab" kilnsor Open (roofless) Hoffmann kilns. These are intermittent kilns, with rectangular shape, thick walls to retain heat and no chimney or roof. Pampa kilns present very low efficiency due to insufficient air flow and primitive design.*

Figure 4. Chamber kiln at Santander Ceramic (project situation).

In 2010, Santander Ceramic has used an average of around 49 tons of renewable biomass and 307 tonnes of coal per month. This is equivalent to a proportion of nearly 7% of renewable biomass and 93% of fossil fuel, on an energy basis[5]. The proportion of renewable sources shall grow during the crediting period, reaching 100% in the last year of the first crediting period.

The fuel utilized to burn and dry the ceramic pieces in the baseline scenario for both ceramics was coal, which is the common practice in the region. This is a type of fossil fuel, since it has a mineral origin. Mineral coal is formed as the result of millions of years of heat and pressure acting on organic matter present in deep soil layers.

Coal mining is an important activity in the Colombian economy. Energy generation from coal has increased significantly in the last decades in Colombia[6]. According to the *Anuário Estadístico Minero Colombiano*[7] (Colombian Mining Annual Statistics Report) coal mining has shown significant growth rates in recent years, with a rise in production of 10.9% between 2005 and 2006. In 2008, Colombia has produced 73.5 thousand tonnes of coal. According to The Mining Investor's Guide, Colombia is currently the fifth largest mining exporter in the world[8].

This project activity will reduce the greenhouse gases (GHG) emissions through the partial substitution of coal for renewable biomasses to generate thermal energy. As renewable biomasses, the project activity consists in utilizing mostly biomass residues, such as rice husk, sawdust and wood residues to feed the ceramic's kilns, replacing the use of a fossil fuel, coal. The project also results in improvement of energy efficiency, as the ceramics have replaced the kilns that existed before the project initiation by more efficient kilns. In the project kilns, heat is more efficiently used in the burning process, which leads to a reduction in energy demand to burn bricks.

This project pointed out the possibility for kiln replacement and partial switch from fossil fuels to renewable biomasses, which was unattractive due some barriers, including the high investments on the adaptation of machineries to work with the new biomasses. The barriers that prevented the implementation of this project are further described in Section B.5. 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 the use coal, whose consumption leads to GHG emissions that contribute to climate change. Moreover, in

[5] Consumption in tonnes of fuel was converted to Terajoules according to Net Calorific Value of each fuel. More information available on Section B.4.

[6] Data from the National Energy Balance of Colombia from 1975 to 2006 indicates an average annual growth rate of 9.6% in energy production from coal. Document available at: <http://www.upme.gov.co/Upme12/2007/Balances_Energeticos_Nacionales.pdf >. Last visit on 15/12/2010.

[7] Available at: < http://www.simco.gov.co/Portals/0/Otros/DOC_ESP.pdf>. Last visit on 02/12/2010.

[8] Information available at: <http://www.simco.gov.co/simco/Informaci%F3nparaInversionistas/GuiaparalaInversionMinera2008/tabid/113/Default.aspx>. Last visited on 07/12/2010.

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opposition to the identified baseline, the project activity will generate thermal energy 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.

In order to explain that the carbon benefits were seriously considered and necessary in the decision to undertake this project as a proposed emission reductions project activity, it is described below a brief history of the implementation of this project. In May 2007, Sustainable Carbon visited ceramic factories located in and around the metropolitan area of Bogota, Colombia. These visits were intended to promote the benefits of voluntary GHG reduction projects in which owners of small to medium-sized business could participate in order to finance the transition to a cleaner energy matrix that otherwise would be too financially-burdensome to execute without having access to the international carbon market.

Later that year, Sustainable Carbon was invited to participate in the seminar "III Curso Internacional de Ceramica (Third International Course on Ceramics)", organized by the Universidad Francisco de Paula Santander, in Cucuta, Colombia (Sustainable Carbon also participated in the same event in 2008). In both occasions, lectures about carbon projects were held for the owners of ceramic factories and related businesses.

During 2008, Sustainable Carbon made more visits to other ceramic factories in and around Bogota and Medellin, Colombia, when data for the feasibility assessment were collected from some factories, including information from Ladrillera Santander in the city of Soacha. The Camara de Comércio de Bogotá (Commerce Chamber of Bogota) was also contacted regarding the possibility to develop carbon projects within the ceramic industry.

In May 2010, Sustainable Carbon established a partnership with Ecoeficiencia, a Colombian-based company for environmental services and consulting in order to continue the development of projects in Colombia. The first decision made was to develop a project with some ceramic factories in the metropolitan region of Bogotá as some had made investments in energy-efficient technologies with the aim to enter the carbon market. In 2008, two ceramics in that region – Ladrillera Santander D/M S en C and Ladrillera Ruiz y Moreno Compañía Sociedad en Comandita (group where Las Tapias 3 is included) – invested in the replacement of their low efficient kilns. In addition, the entrepreneurs from these factories also plan to replace a large part of their coal consumption with locally-sourced renewable biomasses. Sustainable Carbon and Ecoeficiencia wish to jointly develop a voluntary GHG reduction project under the protocols of the Gold Standard so as to obtain recognition for the voluntary measures undertaken by these factories. The project has not been announced at any moment before the consideration of carbon credit revenues, as the ceramics were aware of such benefits since the site visits made by Sustainable Carbon in 2007 and 2008. However, there wasn't a specific process of documenting the decisions of the ceramic owners with regard to the consideration of possible carbon revenues. This occurred mainly because small and medium-sized ceramic factories lack a culture of documenting investment decisions. Table 1 below provides a brief history of the implementation of this project. More detailed information regarding the prior consideration of this project is also available at Annex 5.

Table 1. Brief history on the project implementation

Date	Event
May, 2007	Sustainable Carbon visits ceramic factories in and around the metropolitan area of Bogota to promote the benefits of voluntary GHG emission reduction credits
November, 2007	Sustainable Carbon participates on the Third International Course on Ceramics, held in Cucuta Colombia, where a presentation was made on voluntary GHG emission reductions project.
20/02/2008 (starting date of the	Santander Ceramic begins the construction of the project kilns, in order to replace the baseline kilns.

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project activity)	
01/08/2008	Las Tapias 3 begins the construction of the project kilns, in order to replace the baseline kilns.
January, 2009	Santander Ceramic begins to use small fractions of renewable biomass, thus reducing GHG emissions.
February, 2009	Santander and Las Tapias 3 begin the operation of the project kilns, improving their energy efficiency and reducing GHG emissions.
May, 2010	Signing of the cooperation agreement between Sustainable Carbon and Ecoeficiencia in order to develop together carbon credits projects in Colombia
August and October, 2010	Las Tapias Ceramic and Santander Ceramic sign contracts with Sustainable Carbon and Ecoeficiencia for the development of a voluntary GHG emission reduction project.
January, 2011	Early consultations with Gold Standard Regional Manager for Latin America regarding the project eligibility
February, 2011	Gold Standard's answer about the project eligibility in Colombia, the prior consideration and fast track procedures
April, 2011	Gold Standard TAC's decision on partial substitution project activities
September, 2011	Acceptance of the validation proposal
September, 2011	Pre Feasibility Assessment of this project activity by the Gold Standard

A.3. Project participants:

Name of the party involved(*) ((host) indicates a host party	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Colombia (host country)	C.I. ECOEFICIENCIA S.A	No
	Ruiz Moreno y Cia S en C	No
	Ladrillera Santander D/M S en C	No
Brazil	Sustainable Carbon Projetos Ambientais Ltda	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required. However, this is a voluntary project, hence no approval from the Host Party is needed.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

The project is located in Colombia, in the State of Cundinamarca. Sections below provide more information on the exact location of each ceramic included in the project activity.

A.4.1.1. Host Party(ies):

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Colombia

A.4.1.2. Region/State/Province etc.:

Cundinamarca

A.4.1.3. City/Town/Community etc:

Bogotá and Soacha

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The ceramics are located in *Colombia*, in the state of Cundinamarca in the central region of the country. The geographic location is illustrated in Figure 5.

Table 2. Location of the ceramics.

Ceramic	City	State
Las Tapias 3	Bogotá	*Cundinamarca*
Santander	Soacha	

The project sites have the postal addresses:

- Las Tapias 3Ceramic

Address: Diagonal 95c S 18I - 71

- Santander Ceramic:

Address: Km 8 Vereda Fusunga

The ceramics are located at the following geographic coordinates:

Table 3. Geographic coordinates of the Ceramics

Ceramic	Latitude	Longitude
Las Tapias 3	4°30'24.73"N	74° 8'58.25"W
Santander	4°31'13.67"N	74°11'54.50"W

Figure 5. Geographic location of the cities of the project activity, which have the following coordinates: Bogotá: 4°35′53″N, 74°4′33″W; Soacha: 4°35′14″N, 74°13′17″W

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

This is a voluntary project activity that fits into the following categories according to UNFCCC and Gold Standard definitions:

- **Project scale**: the project is a small scale project. It generates less than 45MWthermal and results in emission reductions of less than 60,000 tCO_2e per year.
- **Project type**: the project fits both the Renewable Energy Supply category and the End-use Energy Efficiency Improvement category, as it generates energy from non-fossil and non-depletable energy sources (renewable biomasses) while reducing the amount of energy required for producing non-energy physical goods (ceramic pieces). The project also fits in the following category of Annex C[9] of the Gold Standard Toolkit version 2.1[10]: "*Electricity and/or heat, and liquid biofuels from biomass resources*", since the project generates heat from biomass resources.

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

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

  3 - Energy demand;

  4 - Manufacturing industries.

As it is further detailed in Section A.2, the project involves the fuel switching from coal to renewable biomass for the production process of two red ceramic industries located in Colombia. The project also involves the installation of efficient kilns in substitution of the kilns existing prior to project initiation. Although there are barriers associated to these practices (as described in Section B.5), such technologies/measures are considered environmentally safe and sound.

[9] Annex C available at: <http://www.cdmgoldstandard.org/wp-content/uploads/2011/10/Annex_C.pdf>. Last visit on 22/12/2011.

[10] Toolkit available at: <http://www.cdmgoldstandard.org/wp-content/uploads/2011/10/GSv2.1_Toolkit_Clean-11.pdf>. Last visit on 22/12/2011.

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Sustainable Carbon has helped introducing this practice in several ceramic industries in Brazil, which have benefited from the voluntary carbon market to mitigate their environmental impacts. Sustainable Carbon experience with this type of project indicates that the use of renewable biomass is a safe and sustainable practice for red ceramic industries.

Also, the new kilns installed as part of the project activity have long been used in ceramic industries, especially those with higher production levels and that have more investment and human capacity. Thus, even though barriers exist to their implementation without the revenues from carbon credits for the ceramics included in the project, the technology has already been applied with success by other ceramic industries.

The following uncertainty risks are considered to be the most significant for this project activity:

- Availability of renewable biomass:

Thermal energy generation through the combustion of biomass residues is an innovation for the ceramics involved in the project. The future demand of this alternative fuel by other consumers is not easy to foresee. Shortages of biomass supply are not expected at this moment, since studies demonstrate there is abundant biomass in the project region (more information, please see Section B.6.1 – Leakage). However, it is possible that the demand might increase in the future. The ceramic owners will rely on different types of biomass and a variety of suppliers, which may give them more flexibility and resilience to future changes. Even so, the risk of insufficient biomass supply cannot be 100% mitigated.

- Price of renewable biomass:

The cost of energy is an important factor determining the economic feasibility of a ceramic factory. The types of biomass used in the project are currently more costly on an energy basis than the baseline fuel (as detailed in Section B.5). An increase in demand or unforeseen events affecting biomass harvests might push these prices to even higher levels, affecting the competitiveness of this type of renewable fuel. If this scenario occurs, the carbon credit revenues will help to sustain the utilization of renewable biomass feasible, by providing the ceramic owners financial incentives to maintain the project measures operational. Even so, this risk cannot be 100% mitigated.

- Revenues from Voluntary Emission Reductions (carbon credits):

The sale of carbon credits is considered an important source of revenues for the ceramic owners to maintain the project measures and the use of renewable fuels. In case the project fails to deliver revenues from the sale of carbon credits, the ceramic owners might not continue the operation of the project. Project proponents are ensuring the best efforts to successfully generate revenues from VERs, while complying with the best practices in the voluntary carbon market. However, this risk cannot be 100% mitigated, due to possible changes in the carbon market in the future.

- Closing of the ceramic business

If one or more of the ceramic companies included in the project closes, it may substantially affect the project's GHG emission reductions, once other ceramic would probably supply the products consuming fossil fuels, which is the common practice in the region. However, there are currently good perspectives in the ceramic market. In addition, the organized administration verified at the ceramic factories avoids this possibility in the short term.

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A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tonnes of CO2e		
	Las Tapias 3 Ceramic	Santander Ceramic	Total
2010 (from 01/08/2010 to 31/12/2010)	2,038	3,092	5,131
2011	4,863	8,218	13,081
2012	5,572	9,279	14,850
2013	5,856	11,399	17,254
2014	6,281	13,519	19,800
2015	6,423	15,639	22,062
2016	6,565	16,699	23,264
2017 (from 01/01/2017 to 31/07/2017)	3,978	10,007	13,985
Total estimated reductions (tonnes of CO_2e)	**41,576**	**87,853**	**129,428**
Total number of crediting years	07	07	07
Annual average of the estimated reductions over the crediting period (tonnes of CO_2e)	**5,939**	**12,550**	**18,490**

A.4.4. Public funding of the small-scale project activity:

There is no public funding involved in this project activity. The project does not receive Official Development Assistance.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

According to version 03 of the Guidelines on assessment of debundling for SSC project activities[11], a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

(a) With the same project participants;

(b) In the same project category and technology/measure; and

(c) Registered within the previous 2 years; and

(d) Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

There are no projects that fit those conditions, according to a survey made by Sustainable Carbon both in the CDM project database[12] and on the Gold Standard Registry[13]. Therefore, the project is not a debundled component of a large scale project activity.

[11] Document available at: <http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf>. Last visit on 20/01/2011.

[12] Available at: <http://cdm.unfccc.int/Projects/projsearch.html>.

[13] Available at: <http://goldstandard.apx.com/index.asp>.Survey performed on 20/01/2011.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

The project utilizes the following methodology approved under the Gold Standard for voluntary small scale projects: "*Ecologically Sound Fuel Switch to Biomass with Reduced Energy Requirement*", version 1.0[14].

The project is primarily a fuel switch to ecologically sound biomasses with accompanying measures that promote a more efficient use of the generated energy, thus reducing the energy demand per unit of output. More specifically, the project involves fuel switching (from coal to renewable biomass) and energy efficiency measures in red ceramic industries.

B.2 Justification of the choice of the project category:

The applied methodology is based on existing regulation in approved CDM Small Scale methodologies. It extends applicability of AMS-III.B to project activities that are primarily a fuel switch to ecologically sound biomass with accompanying measures that promote a more efficient use of the generated energy, by including into this new methodology guidance that addresses the specific aspects (Leakage and Renewability) which distinguish biomass from the use of fossil fuels, referencing to Gold Standard specific requirements such as Gold Standard Toolkit Annex C, and to the provisions of "Attachment C (information on leakage in biomass project activities)" in the same way AMS-I.C does.

The applied methodology is applicable to fuel switching from fossil fuel to renewable biomass in existing industrial, residential, commercial, institutional or electricity generation applications[15]. As the project involves the partial substitution of coal with renewable biomass and energy efficiency by the installation of more efficient kilns, the project complies with conditions described on this methodology.

The table below provides an assessment of applicability conditions of the applied methodology and how the project complies with such conditions:

[14] Methodology available at: <http://www.cdmgoldstandard.org/wp-content/uploads/2011/10/GS_Methodology_Switch_to_Biomass_Fuel.pdf>. Last visit 22/12/2011.

[15] The partial fuel switch from fossil fuels to renewable biomass is applicable as long as the project ensures a minimum 50% of utilization of renewable fuels for retrofit plants to be achieved within 3 years after registration and a minimum 80% of utilization of renewable fuels for greenfield projects to be achieved from the outset. This is in accordance with the revised Annex C – Guidance on Project Type Eligibility, available at: <http://www.cdmgoldstandard.org/wp-content/uploads/2011/11/Revised-Annex-C-14112011.pdf>. Last visted on 14/12/2011.

Table 4. Assessment of the project compliance to the chosen methodology.

Applicability conditions – Ecologically Sound Fuel Switch to Biomass with Reduced Energy Requirement, version 1.0		Assessment of project compliance to the applicability condition
Section	**Description**	
1.3, bullet 1	This methodology is applicable to fuel switching from fossil fuel to renewable biomass in existing industrial, residential, commercial, institutional or electricity generation applications, in the event where the project activity primarily aims at reducing emissions through fuel switching, but will involve both fuel switching and energy efficiency measures which reduce the energy demand per unit of output.	The main focus of this Project is to allow the substitution of fossil fuel (coal) with renewable biomass. An improvement in energy efficiency does result from the replacement of baseline kilns to the project kilns, however, the major benefit of the project is to avoid the use of coal for thermal applications.
1.3, bullet 2	If fuel switching is part of a project activity focused primarily on energy efficiency, the project activity falls in category II.D or II.E .	The project is primarily focused on fuel switching, since the main goal is to prevent the use of coal as an energy source.
1.3, bullet 3	This methodology is not applicable to project activities that propose a switch from fossil fuel use in the baseline to renewable biomass (…) in the project scenario without energy efficiency initiatives that reduce the energy generation requirement. A relevant type I methodology shall be used for such project activities that generate renewable energy displacing fossil fuel use	The project involves energy efficiency initiatives, as the replacement of kilns reduces the energy demand per unit of output.
1.3, bullet 4	Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually .	As demonstrated in Section B of this PDD, the project is not expected to result in emission reductions higher than 60 kt CO_2e per year.
1.3, bullet 5	The potential of deforestation due to the implementation of the VER project activity must be addressed by considering the following applicability conditions: - Where the project activity involves the use of a type of renewable biomass that is not a biomass residues or waste, project participants shall demonstrate that the area where the biomass is grown is not a forest (as per DNA forest definition) and has not been deforested, according to the forest definition by the national DNA, during the last 10 years prior to the implementation of the project activity. In the absence of forest definition from the DNA, definitions provided by relevant	The project is expected to use predominantly biomass residues as energy source. In case other types of biomass are used, the conditions described in the methodology will be complied with.

Applicability conditions – Ecologically Sound Fuel Switch to Biomass with Reduced Energy Requirement, version 1.0		Assessment of project compliance to the applicability condition
Section	**Description**	
	international organizations (e.g. FAO) shall be used	
1.3, bullet 6	This methodology is applicable following the specific Gold Standard eligibility criteria as set out in the applicable version of The Gold Standard, where this is the GS Version 2, especially Toolkit Annex C. Whenever there is a conflict between the CDM and GS applicability criteria, GS criteria take precedence.	The project is in compliance to criteria set out in the applicable version of the Gold Standard (version 2.1). Applicability conditions described in Toolkit Annex C are described below[16].
Toolkit Annex C, Table C-1.	Projects involving electricity and/or heat, and liquid biofuels from biomass resources:	Please see below
First item	Project activities making use of non-renewable biomass resources shall NOT be eligible for Gold Standard registration. The project applicant shall therefore provide convincing evidence that the project activities make use of renewable biomass resources, and shall include this in the Sustainability Monitoring Plan	The project will use exclusively demonstrably renewable biomasses whose source can be verified. Biomasses shall be considered renewable only if they are in accordance to the CDM EB definitions set out in Annex 18 of EB meeting 23[17].
Second item	Project activities planning to make use of biomass resources already in use (e.g. food, heating, etc.) shall NOT be eligible for Gold Standard registration unless convincing evidence is provided that the current users are in agreement with the new use envisioned. In the absence of such an agreement, the project applicants shall demonstrate that the project activities makes use of surplus biomass, and shall include this in the Sustainability Monitoring Plan.	In case the project utilizes existing biomass, it shall be demonstrated that only surplus biomass is used. Publications shall be used to determine biomass availability in the project region.
Third item	Project activities making use of land currently in use for growing food crops to grow dedicated energy crops shall NOT be eligible for Gold Standard registration unless convincing evidence is provided showing	The project is not expected to use lands to grow dedicated energy crops. If that occurs during the crediting period, compliance with that applicability condition will be assured.

[16] The partial fuel switch from fossil fuels to renewable biomass is applicable as long as the project ensures a minimum 50% of utilization of renewable fuels for retrofit plants to be achieved within 3 years after registration and a minimum 80% of utilization of renewable fuels for greenfield projects to be achieved from the outset. This is in accordance with the revised Annex C – Guidance on Project Type Eligibility, available at: http://www.cdmgoldstandard.org/wp-content/uploads/2011/11/Revised-Annex-C-14112011.pdf. Last visted on 14/12/2011..

[17] Document is available at: <http://cdm.unfccc.int/EB/Meetings/023/eb23_repan18.pdf>. Last visit on 10/12/2010.

Applicability conditions – Ecologically Sound Fuel Switch to Biomass with Reduced Energy Requirement, version 1.0		Assessment of project compliance to the applicability condition
Section	**Description**	
	that the energy crop is part of a traditional rotational cropping. The project applicant shall therefore demonstrate that the project activities make use of otherwise set aside or marginal land, and shall include this in the Sustainability Monitoring Plan.	
Fourth item	Project activities making use of GMOs shall declare so in a transparent way. Local stakeholders opinion on GMOs shall prevail and appropriate mitigation measures shall be put in place to address their concerns, if any, in a satisfactory way.	The project is not expected to use Genetically Modified Organisms.

In addition to the applicability conditions described above, it is worth mentioning that the project does not involve biomass conversion neither will make use of palm oil and/or palm oil mill products or residues for electricity or heat generation.

B.3. Description of the project boundary:

According to the applied methodology, the project boundary for the project is the physical, geographical site where the fuel combustion affected by the fuel-switching measure occurs. For biomass from forests and biomass from croplands or grasslands, the project boundary shall include the area where the biomass is extracted or produced. This means that the ceramic industries are the project boundary. As the project is expected to use predominantly biomass residues, the area where biomass is extracted or produced needs not to be considered in the project boundary. However, in case the project utilizes other types of biomass, the project boundary will be revised appropriately.

The baseline emissions are the current (i.e. before-project) emissions of the facility expressed as emissions per unit of output. This means that baseline emissions are those resulting from the use of coal to burn and dry ceramic pieces. This practice is responsible to discharge in the atmosphere the carbon that was stored in the coal. Project activity emissions include emissions related with the use of fossil fuel (co-firing) after the fuel switch. Table below provides more information on the emission sources included in the project boundary.

Table 5. Gases included in the project boundary and brief explanation

	Gas	Source	Included?	Justification/ Explanation
Baseline	CO_2	Emission from the combustion of fossil fuels	Yes	The major source of emissions in the baseline
	CH_4		No	Excluded for simplification. This is conservative.
	N_20		No	Possibly emissions from coal burning will be excluded for simplification.
Project Activity	CO_2	Emission from the combustion of fossil fuels	Yes	The major source of emissions in the baseline
	CH_4		No	Excluded for simplification. This emission source is assumed to be very small.
	N_20		No	Excluded for simplification. This emission source is assumed to be very small.

B.4. Description of baseline and its development:

The baseline scenario is identified according to general guidance to the small-scale CDM methodologies[18]. The baseline scenario is identified by assessing possible alternatives to the project that could provide similar levels of activity. The baseline assessment is made once for both ceramics included in the project. Since they all operate in similar conditions (in terms of technology availability, market conditions, legal framework, amongst others) this approach is considered appropriate[19]. Furthermore, the scenario existing prior to the project initiation was similar for all ceramics included in the project, namely the use of coal in inefficient kilns to produce bricks. The process follows the steps below:

[18] Available at: < https://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf>. Last access on 10/12/2010.

[19] Although this process is done once for both ceramics, baseline emissions are calculated individually for each ceramic, taking in consideration historical fuel consumption and production. Baseline calculation is detailed in Section B.6.1.

Step 1: identification of alternatives

The possible alternatives to the project consist in brick production by using different types of kilns and/or different types of fuels to obtain thermal energy. The alternatives below are considered relevant baseline candidates:

1. *Continuation of the current (before project) practice, which involves the use of "Pampa", "beehive" and "Hoffmann" kilns using exclusively fossil fuels (coal)*: this alternative is the common practice in Colombian ceramic industries[20] and also the scenario existing prior to the project initiation for all ceramics.
2. *Partial or complete substitution of coal with renewable biomass not undertaken as a GHG emission reduction project*: the substitution of coal with renewable biomass could theoretically provide the same level of activity of the project and would result in GHG emission reductions due to the reduced consumption of coal to produce bricks. However, there are barriers (described in Section B.5) that prevent this scenario from being a common practice in Colombian ceramic industries.
3. *Installation of more efficient kilns and the continuation of the use of coal as an energy source*: this alternative would provide the same level of activity of the project and would result in GHG emission reductions due to the reduced consumption of energy to produce bricks. Nonetheless, there are barriers (described in Section B.5) that prevent this scenario from being a common practice in Colombian ceramic industries.
4. *The proposed project not undertaken as a GHG emission reduction project*: the project involves the installation of new kilns that allow the efficient use of renewable biomass as an energy source. Therefore, the project results mainly in GHG emission reductions due to fuel switching from coal to renewable biomass, but also in energy efficiency due to better use of the energy content of the fuels used. Again, there are barriers (described in Section B.5) that prevent this scenario from being a common practice in Colombian ceramic industries.

Guidance from Chapter 7 of the GHG Protocol for Project Accounting[21] is used to further detail the baseline alternatives. These procedures help identifying baseline candidates via a step-wise approach. The steps are described below:

1.1. Define the product or service provided by the project activity.

The product of the project activity is thermal energy for the production of bricks and construction blocks.

1.2. Identify possible types of baseline candidates.

The possible alternatives to the project (the baseline candidates) consist in brick production by using different types of kilns and/or different types of fuels to obtain thermal energy. The alternatives are described in Step 1 of the demonstration and assessment of additionality. Information on the available types of fuel and kilns are provided to further define the baseline candidates.

The figure below provides information on fuels commonly used in industries of stones, glasses and ceramics in Colombia, from 1975 to 2006.

[20] According to the report La Cadena de Carbón (The Coal Chain) developed by the Ministery of Mines and Energy of Colombia, coal produced in the countryside is used for electricity generation and as a source of primary and secondary energy source in the industry sector. In 2003, the ceramic sector was responsible for consuming approximately 7% of such coal for thermal energy generation. Document is available at:
<http://www1.upme.gov.co/index.php?option=com_phocadownload&view=category&download=20:la-cadena-del-carbon.&id=4:mineria&Itemid=163>. Last visit on: 07/12/2010.

[21] Available at: < http://www.ghgprotocol.org/files/ghg_project_protocol.pdf>. Last access on 15/12/2010.

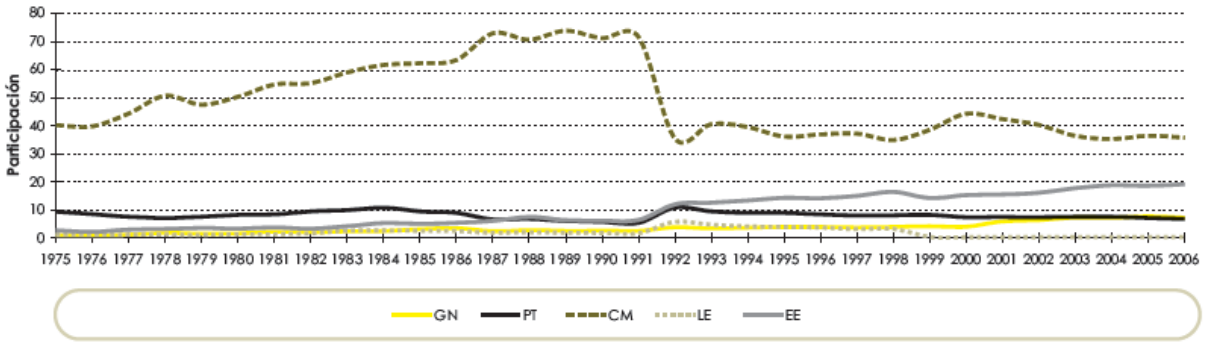

Figure 6. Fuels used in stones, glasses and ceramic industries in Colombia. Source: Colombian Energy Balances 1975 - 2006[22].

Hence, the baseline candidates for fuel are mineral coal, natural gas, petroleum and wood. Regarding the type of kilns, table below provides information on the most common types of kilns in Colombian ceramic industries[23]:

Table 6. Type of kilns used in Colombia.

Kiln Type	*Quantity*	*%*
Fuego dormido	964	39.30%
Arab or Pampa	993	40.48%
Beehive	349	14.23%
Hoffmann	72	2.94%
Tunnel	23	0.94%
Rodillos	16	0.65%
Semi continuous	6	0.24%
Zigzag	6	0.24%
Wagon	11	0.45%
Trunk	13	0.53%
Total	**2,453**	**100%**

Intermittent kilns are considered the baseline candidates for the type of kilns. This includes the following categories of the table above: *fuego dormido*, Pampa, beehive, semi continuous and trunk kilns. Intermittent kilns represent more than 94% of kilns in ceramic industries in Colombia as detailed on the above table.

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. Continuous kilns are only considered baseline candidates if they were the existing technology prior to the project initiation, which is the case for Las Tapias 3 Ceramic.

1.3. Define and justify the geographic area and the temporal range used to identify baseline candidates.

Colombia was identified as the geographic area of the baseline candidates because the Colombian Energy Balances from Mines and Energy Ministry of Colombia is the most representative and reliable source of information about the ceramic sector and its fuel employed. Furthermore, there was no local data regarding the ceramic sector and its energy source in the regions of each ceramic. Information

[22] On the chart, GN stands for Natural Gas, PT stands for petroleum, CM stands for mineral coal, LE stands for wood and EE represents electric energy. Document available at: < http://www.upme.gov.co/Docs/balance_energetico_2006.pdf>. Last access on 24/01/2011.

[23] Information taken from: < http://www.javeriana.edu.co/biblos/tesis/ingenieria/tesis146.pdf >. Last access on 21/12/2010.

on the national level is more widely available. The temporal range includes information from the last decade (2000 to 2010), as different sources of information (regarding fuel consumption, technology level and renewable biomass availability) generally relate to data from this period.

1.4. Define and justify any other criteria used to identify baseline candidates.

The other types of criteria used to identify baseline candidates were the prevailing practices, the costs of fuel, the investment cost of each technology and the local availability of technology and fuel.

The criterion of prevailing practices was used to identify baseline candidates because it takes in consideration what is commonly used in the relevant region (Colombia) and also the situation prior to the project initiation. If a given technology/measure is amongst the most abundant in the region and/or has already been employed with success in the ceramic industries, it is an obvious baseline candidate. The fuel costs and the technology investment cost criteria were considered since it is likely that fuels or technologies with higher costs would hardly be chosen.

Equally important, the local availability of technology and fuel were pieces of criteria because the lack of technology and fuel in the region excludes them as baseline candidates.

1.5. Identify the final list of baseline candidates.

The additional criteria described in the last step allow identifying the most probable of baseline candidates amongst those identified in Section B.4. Regarding the baseline fuel candidates, it is observed that coal is both the fuel mostly used in ceramics industries in Colombia (as available on figure 6) and the most economically attractive (as available on Table 10). Also, coal was the fuel used before the initiation of the project in all ceramics. Therefore, the most probable baseline candidate for fuel is coal.

Regarding the baseline candidates for kilns, the additional criteria allow to conclude that the continuation of the kilns existing prior to the project initiation in each ceramic (as described on Section A.2) is the most probable baseline candidate. These kilns are amongst the most common for ceramic industries in Colombia and demand the lower investment necessity. The Hoffmann kiln built as part of the project activity in Santander ceramic is not considered the baseline situation. Even though this type of kiln is amongst the most commons kiln types in Colombia, it only represents 2.94% of existing kilns in the country (as available in Table 6). Furthermore, this kiln faces the barriers identified in Section B.5. of the PDD.

1.6. Identify baseline candidates that are representative of common practice (for the project-specific baseline procedure).

In Colombia, bricks are produced through an inefficient and traditional process using coal to generate thermal energy[24]. In this industry sector, the use of coal has historically been predominant, due to wide availability and attractive prices. Furthermore, using such fuel is a simple procedure and well known by the kiln operators.

In the ceramic industries of Colombia, the use of inefficient kilns is also predominant. Intermittent kilns such as the Pampa or beehive kilns represent the majority of technologies used to burn bricks and construction blocks. Thus, the prevailing practice is the use of coal and inefficient kilns to provide thermal energy for the brick manufacturing process. The other baseline candidates identified in Step 1 of the baseline identification cannot be considered the prevailing practice, as they face financial and/or technological barriers for their implementation (as further explained in Section B.5). Therefore, the measures proposed by the project are not a common practice.

Step 2: List the alternatives identified per Step 1 in compliance with the local regulations

[24] The Colombian Energy Balances 1975 – 2006 indicates that coal was the primary fuel used for industries of stone, glasses and ceramics throughout this period. Document available at: <http://www.upme.gov.co/Docs/balance_energetico_2006.pdf>. Last access on 15/12/2010.

All the alternatives identified in Step 1 are in accordance with local regulations. Therefore, 4 baseline alternatives remain.

Step 3: Eliminate and rank the alternatives identified in Step 2 taking into account barrier tests

The identified barriers are described in Section B.5. Please refer to this Section to obtain more information on the criteria for the elimination and ranking of the identified alternatives. As a result of the barriers test, only one alternative remains: the continuation of the practice observed prior to the project initiation, which involves the use of Pampa, beehive and Hoffmann kilns using exclusively fossil fuels (coal).

This situation was also the scenario existing prior to the initiation of the project in all ceramics and is the prevailing practice in the project region. Coal has been used to provide thermal energy for the brick manufacturing process. The baseline kilns also presented low efficiency, resulting in high levels of coal consumption per unit produced, leading to a high production specific baseline emission factor (measured in tCO_2/brick produced). The following table provides additional information on the baseline systems:

Table 7. Baseline information for each ceramic industry.

Parameter	Las Tapias 3	Santander
2008 brick production (units)[25]	4,852,608	7,550,709
2008 brick production (thousands of units)	4,852.61	7,550.71
2008 fuel consumption (tonnes)	2,374.55	5,197.15
Emission factor for the baseline situation (tCO_2e/thousands of brick produced) [26]	**1.305**	**1.836**

Therefore, the baseline presents emissions equivalent to 1.30 to 1.84 tCO_2/thousands of bricks produced. During the project, the annual brick production is expected to vary based on market demand. The annual brick production will be monitored during the crediting period to transparently calculate emission reductions. Emission reductions will be claimed due to the reductions in the annual production specific emission factor, which is expected to be lower than the baseline emission factor as a result of partial fuel switch and improved kiln efficiency.

Conservativeness in the determination of the baseline is assured by applying approved methodologies and methodological tools. The most recent versions at the time of first submission are applied. Conservativeness is also achieved by utilizing historical data from each project site for the ex-ante calculation of baseline and project emissions. More information on the set of data used for calculating baseline emissions is available in Section B.6.3.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

The methodology applied is "*Ecologically Sound Fuel Switch to Biomass with Reduced Energy Requirement*", version 1.0, which is applicable to fuel switching from fossil fuel to renewable biomass in existing industrial, residential, commercial, institutional or electricity generation applications in the event

[25] Baseline emissions were determined based in data from 2008 (the last year before the project kilns became operational). A longer period could not be considered due to an insufficient record of consistent historical data.

[26] More information on the calculation of the Emission factor for the baseline situation is available in Sections B.6.1 and B.6.3.

where the project activity primarily aims at reducing emissions through fuel switching, but will involve both fuel switching and energy efficiency measures.

The project involves the partial substitution of coal with renewable biomass and the operation of more efficient kilns in existing red ceramic factories, thus complying with the referred methodology. Furthermore, the project will result in emission reductions lower than 60,000 tCO_2e per year.

The starting date of the project activity (as defined in Section C.1.1) is considered 20/02/2008. The starting date of the project is before the "*Time of first submission*" as per Gold Standard definitions. Hence, the project is applying for retroactive registration according to Gold Standard Toolkit Section 1.2.6.

The baseline scenario is the use of coal to provide thermal energy during the brick production process. This is a common practice in ceramic industries in Colombia[27]. Project additionality is explained according to the Tool for the demonstration and assessment of additionality[28], version 05.2. This tool provides for a step-wise approach to demonstrate and assess additionality. The steps are described below:

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity:

The identified alternatives to the project activity were identified in Section B.4 and are described again below:

1. *Continuation of the current (before project) practice, which involves the use of "Pampa", "beehive" and "Hoffmann" kilns using exclusively fossil fuels (coal)*: this alternative is the common practice in Colombian ceramic industries[29] and also the scenario existing prior to the project initiation for all ceramics.
2. *Partial or complete substitution of coal with renewable biomass not undertaken as a GHG emission reduction project*: the substitution of coal with renewable biomass could theoretically provide the same level of activity of the project and would result in GHG emission reductions due to the reduced consumption of coal to produce bricks.
3. *Installation of more efficient kilns and the continuation of the use of coal as an energy source*: this alternative would provide the same level of activity of the project and would result in GHG emission reductions due to the reduced consumption of energy to produce bricks.
4. *The proposed project not undertaken as a GHG emission reduction project*: the project involves the installation of new kilns that allow the efficient use of renewable biomass as an energy source. Therefore, the project results mainly in GHG emission reductions due to fuel switching from coal to renewable biomass, but also in energy efficiency due to better use of the energy content of the fuels used.

Outcome of Step 1a: All alternatives above are considered realistic and credible and could provide the same levels of activity than the project. As detailed in Step 1 of Section B.4, the most probable baseline

[27] The Colombian Energy Balances 1975 – 2006 indicates that coal was the primary fuel used for industries of stone, glasses and ceramics throughout this period. Document available at: <http://www.upme.gov.co/Docs/balance_energetico_2006.pdf>. Last access on 15/12/2010.

[28] Tool available on UNFCCC's website: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf. Access: 20/12/2010.

[29] According to the report La Cadena de Carbón (The Coal Chain) developed by the Ministery of Mines and Energy of Colombia, coal produced in the countryside is used for electricity generation and as a source of primary and secondary energy source in the industry sector. In 2003, the ceramic sector was responsible for consuming approximately 7% of such coal for thermal energy generation. Document is available at: <http://www1.upme.gov.co/index.php?option=com_phocadownload&view=category&download=20:la-cadena-del-carbon.&id=4:mineria&Itemid=163>. Last visit on: 07/12/2010.

candidates (that are representative of common practice) are the use of coal in inefficient kilns to burn bricks.

Sub-step 1b: Consistency with mandatory laws and regulations:

The project is not mandated by any enforced law, statute or other regulatory framework in Federal, State and Municipal levels in the survey performed. The Environmental Management Plans that defines due obligations and compensations for the ceramics do not impose obligations related to fuel switching or GHG emissions. Although reference is made to atmospheric emissions, this is related to health and pollution concerns and affects parameters such as NOx, SOx and particulate emissions[30]. The Environmental Management Plans do not require the installation of efficient kilns as installed by the project. Therefore, all alternatives identified in Sub-step 1a are consistent with current laws and regulations.

A survey was performed by Darry Torralba, Environmental Engineer of Ecoeficiencia regarding the consistency with mandatory laws and regulations. This survey assessed how the existing and future regulations relate to GHG emission reduction and fuel switch to renewable biomass in the ceramic sector. Amongst others, the following regulations were analyzed:

- Law 99 from 1993: provides definition on environmental licensing[31];
- The agreement for a clean production for the subsector of brick production and clay products signed by the Cundinamarca Regional Corporation[32].
- Resolution 909 from 2008: defines Emissions Standards for stationary sources.
- The Colombian National Policy for Clean Production: defines objectives and principles for a cleaner production in Colombia[33].

The outcome of the survey allows concluding the Project measures are additional, as no specific requirements are set for ceramic factories to reduce GHG emissions or to switch to renewable biomass consumption.

During the stakeholder consultation meeting, a summary of such survey was presented to stakeholders. Stakeholders were also asked if the Project measures comply and are additional to current and future legally binding regulatory instruments. Stakeholders agreed the Project is additional to such instruments.

Outcome of Step 1: At the end of Step 1, credible alternatives to the project activity that are consistent with current laws and regulations have been identified. The most probable alternatives (which are representative of common practice) are also identified. The additionality assessment will now move to Step 3 – Barrier analysis. Investment Analysis (Step 2) will not be performed.

Step 3: Barrier analysis

This step is used to determine whether the proposed project activity faces barriers that:

[30] Emissions Standards for stationary sources are defined by Resolution 909 of the Ministerio de Ambiente, Vivienda y Desarollo Territorial. Limitations include emissions of NOx, SOx, micro particulates and other pollutants. No reference to GHG is made. Resolution is available at: <http://www.carder.gov.co/doc_misionales/calidad%20aire/legislacion%20Fijas/Resolucion_909_del_05_de_junio_de_2008_Fuentes_Fijas.pdf>. Last access on 15/12/2010.

[31] Such Law is available at:< http://www.alcaldiabogota.gov.co/sisjur/normas/Norma1.jsp?i=297>. Last visited on 22/12/2011.

[32] Document is available at: < http://www.corporacionambientalempresarial.org.co/documentos/129_Convenio_Arcillas.pdf>. Last visited on 22/12/2011.

[33] A description of such Policy is available at: <http://www.upme.gov.co/guia_ambiental/carbon/gestion/politica/politica/politica.htm#2.%20POL%C3%8DTICA%20NACIONAL%20DE%20PRODUCCI%C3%93N%20M%C3%81S%20LIMPIA%20-%20PNPL>. Last visited on 22/12/2011.

(a) Prevent the implementation of this type of proposed project activity; and
(b) Do not prevent the implementation of at least one of the alternatives.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

The identified barriers are described below:

- **Technological Barrier**

As mentioned before, the use of coal as an energy source is a traditional and well-known process for Colombian ceramic industries. As a result of the project, two important components were changed in the ceramics, the type of kiln and type of fuel used (that was partially switched from coal to renewable biomass). The main technological barriers were the lack of experience with the new technology/measures proposed by the project, the internal and external logistic modification and the higher risks of technological failure and income loss due to such technology/measures. Both ceramics included in the project had no experience operating with renewable biomass prior to the project initiation.

Before the project activity, the process was noticeably different: coal was received and manually fed into the baseline kilns in order to attend the ceramics needs for thermal energy. This was a well-known process that had occurred for long periods. The project, however, involves the introduction of new type of kilns and the partial use of renewable biomass, which demand a series of adaptations, such as biomass storage, preparation and drying. Moreover, some equipment (such as shredders and feeders) were acquired to allow the efficient use of biomass. This leads both to higher investment costs and uncertainties in the production process.

The replacement of the kilns involves training the employees to allow the proper and efficient use of equipments. The operators did not have knowledge of the ideal amount of fuel that was necessary to achieve the optimum operation conditions, such as temperature and burning period. This point is crucial in order to maintain the quality of production. An adaptation period of 60-90 days was needed for Las Tapias 3 Ceramic for optimum operation condition to be achieved and maintained. The adaptation period for Santander Ceramic was even longer, reaching 180 days.

Also, the use of renewable biomass as a fuel involves significant risks of instability of energy flow rates. Alternative fuels, such as biomass residues, are naturally subject to significant variation on its chemical and energy properties. Such materials might present variations in terms of density, particle size, humidity and other characteristics that affect its efficiency as fuel. These risks are only mitigated if proper handling and storage of biomass is continuously observed, thus demanding increased efforts from the ceramics employees[34].

It is important to clarify that all mentioned adaptations were only needed because of the project. Otherwise, the ceramic industries would not replace the baseline kilns nor use renewable biomass as fuel. All these measures would not be implemented if the ceramic industries were still utilizing coal as fuel.

- **Investment barrier**

With the project implementation, the ceramic companies had to withstand higher investment costs than if they had continued utilizing coal as fuel. The most important additional costs are related to kiln replacement and fuel switching. Furthermore, the project involves increased operation and maintenance costs, as new equipments were introduced. Besides, due to the implementation of the project activity, the ceramic had to purchase shredders and carbojets to allow the proper operation with renewable biomass.

[34] Such barriers are commonly attributed to the use of biomass as fuel. See for instance the following presentation on biomass as fuel: <http://www.unep.org/ClimateChange/LinkClick.aspx?fileticket=JDGR4kratWY%3D&tabid=4845&language=en-US>. Last visit on 09/03/2011.

When the new production techniques have been introduced in the ceramic plant, an adaptation period and a testing period were necessary, leading to considerable waste of biomass and production losses. This has affected the economical balance of the companies involved in the project.

Due to all the above mentioned, the ceramic industries had to deal with higher production costs. Those made the companies think about stopping the fuel switching and energy efficiency project. The following tables summarize additional costs each ceramic would have in each of the baseline alternatives.

Table 8. Main investment costs associated to each baseline alternative for Las Tapias 3 Ceramic

Parameter	Unit[35]	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Cost of new kiln(s)	$	-	-	$1,500,000,000	$1,500,000,000
Cost of auxiliary equipments	$	-	-	$40,125,872	$40,125,872
Additional labor costs[36]	$	-	-	-	-
Additional operation and maintenance costs	$	-	$300,000	-	$300,000
Adaptation period	Days	-	60-90	60-90	60-90
Adaptation period: production losses[37]	$	-	$ 300,000,000	-	$ 300,000,000
Adaptation period: fuel waste	$	-	-	$26,250,000	$26,250,000
Total costs	$	-	$300,300,000	$1,566,375,872	$1,866,675,872

Table 9. Main investment costs associated to each baseline alternative for Santander Ceramic

Parameter	Unit[38]	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Cost of new kiln(s)	$	-	-	$170,573,878	$170,573,878
Cost of auxiliary equipments	$	-	-	$81,000,000	$81,000,000
Additional labor costs	$	-	$51,000,000	$80,000,000	$131,000,000
Additional operation and maintenance costs	$	-	$10,000,000	-	$10,000,000
Adaptation period	Days	-	180	180	180
Adaptation period: production losses	$	-	-	-	-
Adaptation period: fuel waste	$	-	-	$21,000,000	$21,000,000
Total costs	$	-	$61,000,000	$352,573,878	$413,573,878

[35] Monetary values in Colombian pesos.
[36] e.g. Employee(s) hired because of the project
[37] Production loss (bricks discarded), production level decrease, fuel waste or other losses occurring due to adaptation to new kiln and/or due to the use of renewable biomass.
[38] Monetary values in Colombian pesos.

As it is demonstrated above, the alternative that involves lower costs is Alternative 1, the continuation of the current practice, which involves the use of Pampa, beehive and Hoffmann kilns using exclusively fossil fuels (coal).

Besides, the fuel switching also involves additional costs for the ceramics, as the renewable biomass is more costly than coal, on an energy basis. This means that in order to obtain a given amount of energy, coal still is the most attractive fuel amongst those commonly used by ceramic industries in Colombia. Even though the project might result in fuel savings due to energy efficiency in the long term, the initial investment costs were a significant barrier for the ceramic industries included in the project activity. Furthermore, the fuel switching to renewable biomass (a more expensive and more variable fuel) adds uncertainties regarding possible savings due to the energy efficiency gains.

Also, the ceramic industries included in the project are considered medium sized enterprises that, as many ceramic industries in Colombia, face barriers to acquire more efficient kilns and do not consider a priority to improve their operations[39].

Table below provides information on fuel costs, as available on the Report: *Potencialidades de los Cultivos Energéticos y Residuos Agrícolas en Colombia - Resumen Ejecutivo* (Potential of energy crops and agricultural residues in Colombia – Executive Summary), presented to the *Unidad de Planeacion Minero Energetica* (Unit for Mining and Energy Planning)[40]:

Table 10. Energy costs for selected fuels in Colombia.

Fuel	Cost (US$/GJ)[41]
Cotton husks	1.00
Sugarcane bagasse	1.14
Coal	1.38
Residues from native forests	1.88
Residues from planted forests	1.56
Cokes and semi cokes	2.44
Natural Gas	4.65
Rice husk	5.67

As the above table shows, coal is the most economically attractive fuel choice amongst those commonly used by ceramic industries in Colombia (such as coal and natural gas) or those introduced by the project (renewable biomass such as rice husk, wood residues and sawdust). Although sugarcane bagasse and cotton husks are more attractive than coal, these types of biomass will hardly be used during the project, since they are not widely available. The majority of sugarcane bagasse produced in Colombia is used for energy purposes locally by sugar mills. The remaining is used either by the paper industry or as cattle feed, so there is no surplus of this biomass residue. As for cotton husks, these residues are mostly used for soil application. Also, cotton cultivation is not a major activity in Colombia and production varies in terms of quantity and location of cultivated areas, which do not allow this type of residue to become a reliable energy resource[42].

[39] Information taken from: <http://www.javeriana.edu.co/biblos/tesis/ingenieria/tesis146.pdf>. Information available in Section 5.1.2.2, page 48. Last access on 21/12/2010.

[40] Information taken from tables 59 and 60, pages 125 and 127 of the Report. Document available at: <http://www.si3ea.gov.co/si3ea/documentos/documentacion/energias_alternativas/potencialidades/biomasa_CULTIVOS%20ENERGETICOS.pdf>. Last access on 16/09/2011. This is the most recent source of information found for such parameters, since studies on the subject are not easily found.

[41] Values expressed in USD for December 2001.

[42] Information taken from Sections 5.1.3.3 ad 5.1.3.4, Page 105, of the Report Potencialidades de los Cultivos Energéticos y Residuos Agrícolas en Colombia - Resumen Ejecutivo (Potential of energy crops and agricultural residues in Colombia – Executive Summary). Document available at:

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The identified barriers have higher impacts on alternatives 2 to 4 than they do on alternative 1 (continuation of existing practice before project initiation). The continued use of coal at the baseline kilns does not involve technological barriers, since the ceramic industries have operated in such conditions for long periods. This is a common practice in Colombian red ceramic industries as detailed in Step 4. Also, alternative 1 does not involve significant investment costs, since new equipments would not need to be installed nor fuel switching to renewable biomass would take place. Tables 8 and 9 quantify the investment necessity for each scenario.

The impact of the identified technological and financial barriers is demonstrated by the technological level of kilns existing in red ceramic industries in Colombia. As available in Table 6, intermittent kilns represent more than 94% of kilns of this industrial sector. Also, the predominant use of coal as fuel (as demonstrated in figure 2) indicates that these barriers prevent the use of biomass as an energy source.

Therefore, alternatives 2 to 4 are prevented by barriers that have little to no impact on the alternative 1 (continuation of existing practice before project initiation). Hence, the carbon credits income is necessary to cover the expenses and risks related to such changes and make the project an attractive alternative.

The project approval will alleviate the barriers associated to the project measures, by providing financial benefits to the ceramic factories. Furthermore, the revenues from the carbon credits allowed the ceramic factories to benefit from the experience of Sustainable Carbon with fuel switching to renewable biomass and energy efficiency and from the experience of Ecoeficiencia in environmental services. All these benefits will assist the ceramics to acquire more efficient technology and partially switch from fossil fuels to renewable biomass.

Outcome of step 3: At the end of Step 3, barriers are identified and the impacts of the barriers on each baseline alternative are assessed. The demonstration of additionality now follows to Step 4: Common Practice Analysis.

Step 4: Common Practice analysis

This Step is a credibility check to complement the investment analysis (Step 2) or barrier analysis (Step 3).

Sub-step 4a: Analyze other activities similar to the proposed project activity

Activities that are similar to the project are not common in Colombia. As detailed in Section B.4, the prevailing practice in red ceramic industries is the use of coal and low efficiency kilns. Similar activities found in the country are being developed within the carbon market[43] (as voluntary or CDM project activities) and hence cannot be included in this analysis.

Sub-step 4b: Discuss any similar Options that are occurring:

<http://www.si3ea.gov.co/si3ea/documentos/documentacion/energias_alternativas/potencialidades/biomasa_CULTIVOS%20ENERGETICOS.pdf>. Last access on 20/12/2010.

[43] Such as the CDM Project "Energy Efficiency and Fuel Switch at Ladrillera Alcarraza", currently under validation. Information on this Project available at: <http://cdm.unfccc.int/Projects/Validation/DB/IE0ZSY9X4L6QKJSZD1XF6TY57ACXID/view.html>. Last visit on 24/01/2011. Other initiatives in the region aiming to increase energy efficiency or replace coal consumption in ceramic industries in Colombia also aim to develop GHG reduction projects. See information at: <http://camara.ccb.org.co/documentos/6001_proyecto_eela_lanzamiento_def.pdf> and<http://www.portafolio.com.co/archivo/documento/CMS-7735392>. Last visit on 24/01/2011.

As described above, similar activities are not widely observed in the project region. According to the referenced tool for the demonstration and assessment of additionality, if similar activities cannot be observed then the proposed project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Below, a description of the equations and procedures used for the calculation of emission reductions follows:

Baseline emissions:

The emission baseline is the current (before-project) emissions of the facility expressed as emissions per unit of output. Emission coefficients for the fuel used by the generating unit before and after the fuel switch are also needed. IPCC default values for emission coefficients are used. Baseline emissions are calculated as follows:

$$BE_y = EF_{BSL} * Q_y \quad \text{(Equation 1)}$$

Where:

BE_y	Baseline emissions in the project activity in year y (tCO_2e)
EF_{BSL}	Emission factor for the baseline situation (tCO_2e/thousand bricks produced)
Q_y	Net output in the project activity in year y.

The emission factor in the baseline situation (EF_{BSL}) is the coefficient for the fossil fuel used in the baseline expressed as emissions per unit of output. This is calculated as follows:

$$EF_{BSL} = (FC_{BSL} * EF_{CO2} * NCV) / Q_{BLS} \quad \text{(Equation 2)}$$

Where:

FC_{BSL}	Total amount of fossil fuel consumed for captive energy generation in the baseline situation (mass or volume unit)
EF_{CO2}	CO_2 emission factor for the baseline fossil fuel (tCO_2/TJ)
NCV	Net calorific value for the baseline fuel (TJ/mass or volume unit)
Q_{BSL}	Net output generated in the baseline situation during the corresponding period of time for which the total fuel consumption was taken.

Project emissions:

Project emissions (PE_y) include emissions related with the use of fossil fuel co-firing after the fuel switch. IPCC default values for emission coefficients may be used. The following equation is used to calculate emissions from the use of fossil fuels:

$$PE_Y = FC_Y * EF_{CO2} * NCV \quad \text{(Equation 3)}$$

Where:

PE_y	Project emissions in the project activity in year y (tCO_2e)
FC_y	Amount of fossil fuel consumed for captive energy generation in the project activity in year y (mass or volume unit)
EF_{CO2}	CO_2 emission factor for fossil fuel (tCO_2/TJ)
NCV	Net calorific value for the fossil fuel (TJ/mass or volume unit)

Leakage (LE_y)

According to the applied methodology, emission sources related with A. *Shifts of pre-project activities*; B. *Production of Biomass*, and C. *Competing uses of the Biomass*, if the source is not under control of project participants, shall be considered as leakage the detailed guidance provided by "Attachment C (information on leakage in biomass project activities)"and following the Gold Standard specific rules on biomass resources as set out in the applicable version of the Gold Standard, especially ToolKit Annex C.

The Attachement C to Appendix B of the Indicative simplified baseline and monitoring methodologies[44] provides general guidance on leakage in biomass project activities. The document provides different emission sources based on type of biomass being considered. For biomass from forests and biomass from croplands or grasslands, the project boundary shall include the area where the biomass is extracted or produced. Table below summarizes the sources of leakage.

Table 11. 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 of the present project activity are the competing use of biomass for biomass residues or waste and the emissions from biomass generation/cultivation in case of biomass from cropland. The source of leakage of the present project is showed below according to each type of biomass:

Rice husk

In Colombia, approximately 520,000 tons of rice husks are produced annually[45]. Rice cultivation in Colombia is an important agricultural activity. According to data from FEDEARROZ (National Federation of Rice Producers in Colombia), rice cultivation occupied an area of 485,650 hectares in 2009, producing more than 2.1 million metric tons of paddy rice[46]. Rice is the third agricultural product in Colombia in terms of land cultivation, behind coffee and corn.

[44] Document available at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentC.pdf>. Last visit on 24/01/2011.

[45] Ángel, JDM et al. Experimentos de combustión con cascarilla de arroz en lecho fluidizado para la producción de ceniza rica en sílice (Fluidized bed rice husk combustion experimentsfor the production of silica-rich ash). Available at: <http://jaibana.udea.edu.co/grupos/revista/revistas/nro051/51-11.pdf>. Last visit on 08/12/2010.

[46] Information available at: <http://www.fedearroz.com.co/apr_public.php>. Last vist on 08/12/2010.

According to data from the Food and Agriculture Organization, Colombia has produced 45.41 kg of paddy rice per habitant and 30.29 kg of milled rice per habitant in 2007[47]. According to FAO, rice occupies the first place in terms of economic value among short-cycle crops. Colombia is the second largest rice producer in Latin America and the Caribbean[48].

Rice husks are the hard protecting coverings of the grains of rice. Husks are formed predominantly of silica and lignin, and are mostly indigestible to humans. Therefore, rice husks are extracted during the processing of rice for commerce. In Colombia, approximately 520,000 tons of rice husks are produced annually[49].

Despite its possible applications (use as fuel, fertilizer or raw material, amongst others), in Colombia rice husks are generally treated as a residue and the lack of proper destination for such material results in environmental concern. The use of husks for thermal applications in the rice industries is marginal[50]. This is also demonstrated in a study about the use of different types of biomass in Colombia, stating that the rice husk does not have a high usage rate, being scored as 3 of 5 (1 means high usage rate, while 5 means almost unused)[51].

The project is expected to use less than 40,000 tonnes of renewable biomass throughout the crediting period, which represents an average of less than 6,000 tons of renewable biomass per year. Rice husk will only represent a fraction of such consumption. Therefore, rice husk consumption will surely be below 1% of available rice husk in Colombia. Therefore, the amount needed of this type of residue to provide thermal energy in the ceramics' kilns would not be significant, which avoids the possibility of leakage from competing uses.

Sawdust

The production of wood generates a large amount of residues, which can be reused to generate thermal energy. Sawdust is another renewable biomass available in Colombia. Colombian forest production is an important economic activity, although commercial reforestation is not widely developed in the Country. In 2003, it was estimated that commercial forests occupied merely 0.15% of the Colombian territory. Colombian wood industries have historically used predominantly wood from natural forests under the Government administration[52].

The following tables provide an estimate on the production of Colombian forests and on the potential availability of wood residues.

Table 12. Wood production in Colombian native forests.

Forest type/region	***Planted area*** (hectares)	***Wood productivity*** (m^3 of wood per hectare)	***Wood residues*** (%)	***Wood residues*** (m^3)

[47] Information taken from the FAOSTAT. Available at: <http://faostat.fao.org/DesktopDefault.aspx?PageID=609&lang=en#ancor>. Last vist on 08/12/2010.

[48] Information taken from < http://www.fao.org/rice2004/en/p3.htm >. Last visit on 08/12/2010

[49] Ángel, JDM et al. Experimentos de combustión con cascarilla de arroz en lecho fluidizado para la producción de ceniza rica en sílice (Fluidized bed rice husk combustion experimentsfor the production of silica-rich ash). Available at: <http://jaibana.udea.edu.co/grupos/revista/revistas/nro051/51-11.pdf>. Last visit on 08/12/2010.

[50] Information taken from the report: La Cadena del Arroz En Colombia (The Rice Chain in Colombia), published in 2005 by the Ministery of of Agriculture and Rural Development of Colombia.

[51] TORO, A. M. A. Recolección y Sistematización de Información para el Aprovechamiento de Biomasa en Colombia. Universidad Nacional de Colombia. Bogotá, 2010.

[52] Potencialidades de los Cultivos Energéticos y Residuos Agrícolas en Colombia - Resumen Ejecutivo (Potential of energy crops and agricultural residues in Colombia – Executive Summary). Information on Sections 3.2, page 32 and 3.3, page 40. Document available at: <http://www.si3ea.gov.co/si3ea/documentos/documentacion/energias_alternativas/potencialidades/biomasa_CULTIVOS%20ENERGETICOS.pdf>. Last access on 20/12/2010.

Bosque Guandal	140,000	60	45%	3,780,000
Bosque de Terraza Ondulada	160,000	50	50%	4,000,000
Bosque de Colina	170,000	45	50%	3,825,000
Catival	550,000	80	40%	17,600,000
Zona Andina 1	250,000	30	40%	3,000,000
Zona Andina 2	600,000	50	55%	16,500,000
Serranía de San Lucas	170,000	60	45%	4,590,000
Bosque de Galeria	120,000	40	50%	2,400,000
Piedemonte Amazónico	90,000	60	45%	2,430,000
Total	**2,250,000**	**-**	**-**	**58,125,000**

Table 13. Wood production in Colombian commercial forests.

Forest type/region	**Planted area** (hectares)	**Wood productivity** (m³ of wood per hectare)	**Wood residues** (%)	**Wood residues** (m³)
Montajo bajo	65,000	90	40%	2,340,000
Premontajo	40,000	120	30%	1,440,000
Tropical Zona Caribe	30,000	110	40%	1,320,000
Tropical Orinquía	10,000	90	40%	360,000
Total	**145,000**	**-**	**-**	**5,460,000**

The above figures demonstrate that wood residues are largely available in Colombia. Both tables were adapted from the Report *Potencialidades de los Cultivos Energéticos y Residuos Agrícolas en Colombia - Resumen Ejecutivo (Potential of energy crops and agricultural residues in Colombia – Executive Summary).*

The same report provides values for expected density of wood residues. The density of sawdust with 20% humidity is defined as 190 kg/m³. Residues from sawmills usually compose 25% of total wood residues in the wood chain[53]. Moreover, sawmills in Colombia usually store large amounts of sawdust that mount up as a by-product of wood[54], which are often donated as long as the user pays for the transport[55].

Thus, in a conservative estimate, it is assumed that sawdust represents 10% of the total wood residues, which would lead to the figures in table below:

Table 14. Estimated availability of sawdust in Colombia.

Forest type/region	**Wood residues (m³)**	**Sawdust (%)**	**Sawdust density (ton/m³)**	**Sawdust (tons)**

[53] Information taken from the Report "Estado del desarrollo tecnológico de la industria forestal (Technological development status of the forest industry), available at: <http://desarrollo.ut.edu.co/tolima/hermesoft/portal/home_1/rec/arc_19994.pdf>. Last access on 21/12/2010.

[54] BUSTILLO, S. M. L. Plan de negocio para la creación de una nueva línea de negocio para la producción y comercialización de sustratos orgánicos a partir de subproductos de la industria forestal (aserrín, virutas y corteza). Universidad de la Sabana. Chia, 2009. Available at: <http://190.69.3.61:8080/jspui/bitstream/10818/2738/1/122212.pdf>. Last access on 17/07/2012.

[55] GARZóN M. G., MONTENEGRO R. E., LÓPEZ B. F.. Uso de aserrín y acículas como sustrato de germinación y crecimiento de quercus humboldtii (roble). **Colombia Forestal**, Norteamérica, 9, nov. 2004. Available at: <http://revistas.udistrital.edu.co/ojs/index.php/colfor/article/view/3050>. Last access on 17/07/2012.

Planted forests	58,125,000	10%	0.190	1,104,375
Commercial forests	5,460,000	10%	0.190	103,740
Total	**63,585,000**	**-**	**-**	**1,208,115**

For the assessment of biomass surplus, only the fraction of sawdust from commercial forests is considered. This leads to a conservative estimate of 103,740 tons of sawdust per year. It is important to inform that the project might use sawdust from native forests during the crediting period, as long as this is in accordance with applicable laws and regulations in Colombia and also in case it complies with paragraph 1 of EB23 Annex 18 (definition of renewable biomass)[56].

The project is expected to use less than 40,000 tonnes of renewable biomass throughout the crediting period, which represents an average of less than 6,000 tons of renewable biomass per year. Sawdust will only represent a fraction of such consumption. Therefore, sawdust consumption will surely be below 10% of available sawdust in Colombia. Therefore, the amount needed of this type of residue to provide thermal energy in the ceramics' kilns would not be significant, which avoids the possibility of leakage from competing uses.

The project might use different types of renewable biomasses during the crediting period. In that case, leakage shall be assessed according to guidelines on Attachement C and specifc Gold Standard rules set out in Toolkit Annex C. These rules are detailed in table 4 on Section B.2 of this PDD.

Emission reductions:

The emission reduction achieved by the project activity will be calculated as the difference between the baseline emissions and the project emissions, minus leakage. Hence, equation below is used.

$$ER_y = BE_y – PE_y - LE_y \quad \text{(Equation 4)}$$

Where,

ER_y	Emission reductions in year y
BE_y	Baseline emissions in the project activity in year y (tCO_2e)
PE_y	Project emissions in the project activity in year y (tCO_2e)
LE_y	Leakage emissions in year y (tCO_2e)

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**EF_{CO2}**
Data unit:	tCO_2/TJ
Description:	CO_2 emission for the baseline fossil fuel (coal)
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Available at: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf>. Page 2.18. Table 2.3. Last visit on : 08/11/2010.
Value applied:	94.6 tCO_2/TJ
Justification of the choice of data or description of	In the baseline scenario, coal is used as an energy source. This is the common practice for the ceramic sector in Colombia. Default emission factors for coal are applied. Values are taken from 2006 IPCC Guidelines for National Greenhouse

[56] Document is available at: <http://cdm.unfccc.int/EB/Meetings/023/eb23_repan18.pdf>. Last visit on 10/12/2010.

measurement methods and procedures actually applied :	Gas Inventories.
Any comment:	Applicable for stationary combustion in the manufacturing industries and construction. More reliable or updated sources/data may be used if they are available in the future.

Data / Parameter:	NCV_{coal}
Data unit:	TJ/ton
Description:	Net calorific value for the baseline fuel (coal)
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Source: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf. Page 1.18, Table 1.2. Tests on the coal net calorific value are not part of the normal practice for coal purchase, therefore, default values are used.
Value applied:	0.0282
Justification of the choice of data or description of measurement methods and procedures actually applied :	In the baseline scenario, coal is used as an energy source. This is the common practice for the ceramic sector in Colombia. Default values for NCV of coal are applied.
Any comment:	More reliable or updated sources/data may be used if they are available in the future.

Data / Parameter:	$\rho_{biomass}$
Data unit:	Tons/m³
Description:	Specific density of renewable biomass type *j*
Source of data used:	The following sources are used for this parameter: For rice husk: 0.102 ton/m³. TONELI, J.T.C.L. **caracterização e preparo da casca de arroz visando seu aproveitamento energético**. Available at: <http://propes.ufabc.edu.br/simposios/index.php/SIC/III-SIC/paper/view/356>. Last visit on 10/12/2010. For sawdust: 0.190 ton/m³

	Potencialidades de los Cultivos Energéticos y Residuos Agrícolas en Colombia - Resumen Ejecutivo (Potential of energy crops and agricultural residues in Colombia – Executive Summary[57].
Value applied:	Not applied for the calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	In case the quantity of biomass combusted during the crediting period is recorded in units of volume (m^3) instead of units of weight, the Specific Density of the biomass will be used to convert from volume to weight.
Any comment:	Data from published sources are used to determine this parameter. More reliable or updated sources/data may be used if they are available in the future.

B.6.3 Ex-ante calculation of emission reductions:

Emission reductions are calculated with equations described in Section B.6.1. The Emission factor for the baseline situation (EF_{BSL}) is calculated based on historical information on brick production and fuel consumption in each ceramic. Las Tapias 3 and Santander ceramics have been operating since 1994 and 1985 respectively. Both ceramics have started operation of the project kilns in 2009. Data from 2008 (the last year before the project kilns became operational) from both ceramics were used for calculating the baseline. A longer period could not be considered due to an insufficient record of consistent historical data. Table below provides information on brick production and fuel consumption for each ceramic industry. This set of data was chosen based on the prerogative of conservativeness and is considered to be the most reliable data available to determine baseline emissions. Margins of error are not quantified but are expected to be small, (lower than 10%) due to the reliable nature of the data used.

Table 15. Baseline information for each ceramic industry.

Parameter	Las Tapias 3 Ceramic	Santander Ceramic
2008 brick production (units)	4,852,608	7,550,709
2008 brick production (thousands of units)	4,852.61	7,550.71
2008 fuel (coal) consumption (tonnes)	2,374.55	5,197.15
Baseline fuel consumption (tonnes per 1,000 bricks)	0.49	0.69
Baseline energy consumption (TJ per 1,000 bricks)	0.014	0.019
Emission factor for the baseline situation[58] (tCO_2e/Thousands of brick produced)	**1.305**	**1.836**

[57]Document available at: <http://www.si3ea.gov.co/si3ea/documentos/documentacion/energias_alternativas/potencialidades/biomasa_CULTIVOS%20ENERGETICOS.pdf>. Last visit on 20/12/2010. Information on table 39, Page 94. It is considered the density for sawdust with 20% of humidity.

[58]Emission factor calculated with equation 2, described in Section B.6.1.

In 2008, Las Tapias 3 and Santander ceramic industries needed to use respectively 0.49 and 0.69 tonnes of coal per 1,000 bricks produced, which is equivalent to 0.014 and 0.019 TJ of thermal energy per 1,000 bricks respectively[59].

During the project, the energy demand has decreased due to the use of more efficient kilns. Table below provides information on 2010 production, following the project implementation.

Table 16. Information on production during the project for each ceramic industry.

Parameter	Las Tapias 3 Ceramic	Santander Ceramic
2010 brick production (units)	5,898,554	9,383,169
2010 brick production (thousands of units)	5,898.55	9,383.17
2010 coal consumption (tonnes)	1,063.62	3,693.15
2010 renewable biomass consumption (tonnes)	0	590.71
Energy demand per Thousand of bricks (TJ per 1,000 bricks)[60]	0.005	0.012
Estimated equivalent energy capacity (TJ) – Year 2010[61]	29.99	112.06
Estimated equivalent energy capacity (MW) – Year 2010[62]	0.95	3.55

Information above demonstrates that the total energy demand has decreased due to energy efficiency measures (kiln replacement). However, the project will predominantly result in GHG emission reduction due to fuel switching from coal to renewable biomasses. The fuel switching is expected to gradually increase during the crediting period, as the ceramics improve their management of the logistics and renewable biomass supply chain[63]. For the ex-ante calculation of emission reductions, the following fuel switch ratios have been considered.

Table 17. Expected fuel switch ration during the project for each ceramic industry.

Fuel switch ratio[64]	Las Tapias 3 Ceramic	Santander Ceramic
2010	0%	7.1%

[59] Considering the NCV for the baseline fuel (coal), as described in Section B.6.2 above.

[60] Energy demand is calculated by multiplying fuel consumption by its Net Calorific Value. The result is divided per production to obtain the energy demand per thousands of bricks.

[61] Estimated equivalent energy capacity is calculated by multiplying the Energy Demand per Thousand of Bricks by the Brick Production in thousands of units.

[62] Equivalent energy capacity in in MW is calculated by applying the conversion factor from TJ to MWh (277.78), and then, dividing by the number of hours in a year..

[63] The partial fuel switch from fossil fuels to renewable biomass is applicable as long as the project ensures a minimum 50% of utilization of renewable fuels for retrofit plants to be achieved within 3 years after registration and a minimum 80% of utilization of renewable fuels for greenfield projects to be achieved from the outset.

[64] Indicates the percentage of use of renewable biomass on an energy basis. The expected consumption in tonnes of fuel was converted to Terajoules according to Net Calorific Value of each fuel.

2011	0%	15%
2012	25%	25%
2013	35%	45%
2014	50%	65%
2015	55%	85%
2016	60%	95%
2017	70%	100%

It is important to state that the actual use of renewable biomass might be different during the crediting period. The ceramics might manage to use higher amounts of renewable biomass or shortages may occur depending on natural and economic factors. In case of shortages, the ceramics may compensate by buying different kinds of renewable biomass, as long as its origin is verifiable. The ceramics might also use higher levels of coal in case renewable biomass is not easily available. However, all efforts will be made to ensure the minimum fuel switch ratios (as per Gold Standard definitions) will achieved during the crediting period. The consumption of each type of fuel (fossil fuels and renewable biomasses) will be monitored during the crediting period. Emission reductions will be calculated based on monitored fuel switch ratios.

Therefore, baseline emissions are calculated based on historical data on production levels and fuel consumption in each ceramic. Project emissions are calculated based on the calculated energy demand for the project situation and on the expected fuel switch ratios. Tables below provide the calculated baseline emissions and project emissions for each ceramic. More information on baseline and project emissions can be found in Annex 3. Leakage emissions are estimated to be zero, since the project will use primarily abundant biomass residues, thus not causing emissions from any of the leakage sources described in Section B.6.1.

Table 18. Baseline emissions of each ceramic.

Year	Las Tapias 3 Ceramic Baseline emissions (tCO_2e)	Santander Ceramic Baseline emissions (tCO_2e)	Total Baseline emissions (tCO_2e)
2010 (from 01/08/2010 to 31/12/2010)	3,228	7,222	10,450
2011	7,700	17,229	24,929
2012	7,700	17,229	24,929
2013	7,700	17,229	24,929
2014	7,700	17,229	24,929
2015	7,700	17,229	24,929
2016	7,700	17,229	24,929
2017 (from 01/01/2017 to 31/07/2017)	4,472	10,007	14,479
Total baseline emissions (tCO_2e)	**53,900**	**120,605**	**174,505**
Number of years of the crediting period	07	07	07
Annual average of estimated baseline emissions for the 10 years of crediting period (tCO_2e)	**7,700**	**17,229**	**24,929**

Table 19. Project emissions of each ceramic

Year	Las Tapias 3 Ceramic Project emissions (tCO_2e)	Santander Ceramic Project emissions (tCO_2e)	Total Project emissions (tCO_2e)
2010 (from 01/08/2010 to 31/12/2010)	1,189	4,130	5,319
2011	2,837	9,011	11,848
2012	2,128	7,951	10,079
2013	1,844	5,831	7,675
2014	1,419	3,710	5,129
2015	1,277	1,590	2,867
2016	1,135	530	1,665
2017 (from 01/01/2017 to 31/07/2017)	494	0	494
Total project emissions (tCO_2e)	**12,324**	**32,752**	**45,077**
Number of years of the crediting period	07	07	07
Annual average of estimated project emissions for the 10 years of crediting period (tCO_2e)	**1,761**	**4,679**	**6,440**

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Total Baseline emissions (tCO_2e)	Total Project emissions (tCO_2e)	Leakage (tCO_2e)	Total emission reductions (tCO_2e)
2010 (from 01/08/2010 to 31/12/2010)	10,450	5,319	0	5,131
2011	24,929	11,848	0	13,081
2012	24,929	10,079	0	14,850
2013	24,929	7,675	0	17,254
2014	24,929	5,129	0	19,800
2015	24,929	2,867	0	22,062
2016	24,929	1,665	0	23,264
2017 (from 01/01/2017 to 31/07/2017)	14,479	494	0	13,985
Total Emission Reductions (tCO_2e)	**174,505**	**45,077**	**0**	**129,428**
Number of years of the crediting period	07	07	07	7
Annual average of estimated emissions reductions for the 10 years of crediting period (tCO_2e)	**24,929**	**6,440**	**0**	**18,490**

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	Q_y
Data unit:	Thousands of ceramic units
Description:	Net output in the project activity in year y
Source of data to be used:	Measured by the ceramic owners, individually for each ceramic.
Value of data	Values applied are available in Table 15 and in Annex 3.
Description of measurement methods and procedures to be applied:	It is monitored through a sheet that is fed by an operator responsible for quantifying the production in each ceramic industry.
QA/QC procedures to be applied:	The ceramic has an internal control of the quantity of pieces produced. Data will be cross-checked according to the amount of fuel used by each ceramic.
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:	FC_y
Data unit:	Tonnes
Description:	Amount of fossil fuel consumed for captive energy generation in the project activity in year y
Source of data to be used:	Measured by fuel suppliers and controlled by the ceramic owners. Data will be controlled individually for each ceramic and each fuel type.
Value of data	Values applied are available in Table 15 and in Annex 3.
Description of measurement methods and procedures to be applied:	It is monitored through purchase invoice, delivery notes or other documents concerning the acquisition of coal. Information will be cross-checked with production output. For the expected emission reductions, the quantity of renewable biomass combusted per year is estimated based on a fuel switch ratio (measured on an energy basis) that grows during the crediting period, indicating increased consumption of renewable biomass. The expected fuel switch ratios are described in Table 17.
QA/QC procedures to be applied:	The ceramic has an internal control of the quantity of fuel used. Data will be cross-checked according to the receipts of purchase, delivery notes or other documents concerning the acquisition of coal.
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:	$NCV_{biomass}$	
Data unit:	TJ/ton	
Description:	Net calorific value for the renewable biomass	
Source of data to be used:	Monitored by publications or scientific articles.	
Value of data	Biomass	$NCV_{biomass}$ (TJ/ton)
	Rice husk	0.0134

	Sawdust | 0.0147 Sources: Rice husk Available at: <http://www.abepro.org.br/biblioteca/ENEGEP1997_T6505.pdf>. Last visit on 12/07/2012. Sawdust Available at: <http://www.aalborg-industries.com.br/downloads/poder-calorifico-inf.pdf>. Last visit on 20/12/2010.
Description of measurement methods and procedures to be applied:	Data from published sources are used to determine this parameter. More reliable or updated sources/data may be used if they are available in the future. Moreover, this parameter must be revised and updated if new biomasses are utilized in the future. Tests on the different biomass net calorific values are not part of the normal practice for biomass purchase, therefore, default values are used.
QA/QC procedures to be applied:	More reliable or updated sources/data may be used if they are available in the future.
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:	$Q_{renbiomass}$
Data unit:	Tonnes or m³
Description:	Quantity of renewable biomass combusted during the year y
Source of data to be used:	Measured by fuel suppliers and controlled by the ceramic owners. Data will be controlled individually for each ceramic and each biomass type.
Value of data	Not directly used for the calculation of estimated emission reductions.
Description of measurement methods and procedures to be applied:	It is monitored through purchase invoice, delivery notes or other documents concerning the acquisition of biomass. Information will be cross-checked with production output. For the expected biomass usage, the quantity of renewable biomass combusted per year is estimated based on a fuel switch ratio (measured on an energy basis) that grows during the crediting period. The expected fuel switch ratios are described in Table 17.
QA/QC procedures to be applied:	The ceramic has an internal control of the quantity of fuel used. These procedures will be applied both for the amount of use of coal and for the use of renewable biomass during the crediting period. Data will be cross-checked according to the receipts of purchase, delivery notes or other documents concerning the acquisition of renewable biomass.
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:	***Origin of Renewable Biomass***
Data unit:	Not applicable
Description:	Renewable origin of the biomass
Source of data to be used:	Controlled by the ceramic owners
Value of data	Not applied for the calculation. It is assumed that all biomass used during the

	crediting period is renewable and traceable.
Description of measurement methods and procedures to be applied:	This information will be given by the biomasses providers. The guarantee of acquiring renewable biomass will be achieved by invoices from the providers. As stated in section B.6.1, the biomasses (rice husk, sawdust and others) are considered renewable as fulfilling definitions of renewable biomass approved by the CDM Executive Board.
QA/QC procedures to be applied:	Ceramic owners shall store invoices, receipt of sales or other documents to allow the assessment of the origin of the renewable biomass.
Any comment:	The biomasses will be considered as renewable if they are in accordance to the definition by the CDM Executive Board. 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***
Data unit:	tCO_2e
Description:	This source of leakage is relevant for biomass residues. The quantity of renewable biomass used by the project will be assessed annually to determine the occurrence of leakage
Source of data to be used:	Monitored by surveys and publications
Value of data	Not directly applied for the calculation. The amount of biomass available is described in Section B.6.1. It is assumed that there is sufficient biomass surplus in the region to avoid the occurrence of leakage. The following biomass surplus in the project region is considered:

Biomass surplus	Surplus	Year
Rice husk	520,000 tonnes	2005
Sawdust	103,740 tonnes	2003

Description of measurement methods and procedures to be applied:	It will be used to calculate the leakage from renewable biomass. According to the General guidance on leakage in biomass project activities, the project participant shall evaluate ex ante if there is a surplus of the biomass in the region of the project activity, which is not utilized. If it is demonstrated (e.g., using published literature, official reports, surveys etc.) at the beginning of each crediting period that the quantity of available biomass in the region, is at least 25% larger than the quantity of biomass that is utilized including the project activity, then this source of leakage can be neglected otherwise this leakage shall be estimated and deducted from the emission reductions. During the crediting period, the amount of each type of biomass used by the project activity will be compared to the ex ante values of biomass availability, to assess the occurrence of leakage.
QA/QC procedures to be applied:	Data available regarding the ceramic industry fuel consumption will be utilized to monitor the leakage.
Any comment:	For the assessment of biomass surplus, only the fraction of sawdust from commercial forests was considered. The project might use sawdust from native forests during the crediting period as long as this is in accordance with applicable laws and regulations in Colombia. Such biomass will only be considered renewable in case it complies with paragraph 1 of EB23 Annex 18

	(definition of renewable biomass). Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

B.7.2 Description of the monitoring plan:

The party responsible for implementing the monitoring plan will be the owner of each ceramic. The ceramic owners will also be responsible for developing the forms and registration formats for data collection and further classification. Data monitored will be kept during the crediting period and 2 years after. For this purpose, the authority for the registration, monitoring, measurement and reporting will be Mr. Jorge Alberto Ruiz and Mr. Yesid Ruiz for Las Tapias 3 Ceramic and Mr. Jesus Palacios for Santander Ceramic.

The management structure will rely on the local technicians with a periodical operation schedule during the project. The technical team will manage the monitoring, the quality control and quality assessment procedures. The monitored and fixed parameters are described in Sections B.6.2 and B.7.1, respectively. Regarding the monitored parameters, they will be evaluated with the frequency described in Table below.

Table 20. Further information on the monitored and fixed parameters.

Parameters	Description	Units	Origin	Frequency
Q_y	Net output in the project activity in year y	Thousands of ceramic units	It is monitored through a sheet that is fed by an operator responsible for quantifying the production in each ceramic industry.	Monthly
FC_y	Amount of fossil fuel consumed for captive energy generation in the project activity in year y	Tonnes	It is monitored through purchase invoice, delivery notes or other documents concerning the acquisition of coal. Information will be cross-checked with production output.	Monthly
$NCV_{biomass}$	Net calorific value for the renewable biomass	TJ/ton	Data from published sources are used to determine this parameter. More reliable or updated data may be used if they are available in the future.	Annualy
$Q_{renbiomass}$	Quantity of renewable biomass combusted during the year y	Tonnes or m³	Measured by the ceramic owners individually for each ceramic and each biomass type.	Monthly
Origin of Renewable Biomass	Renewable origin of the biomass	Not applicable	Controlled by the ceramic owners	Annualy
Leakage due to competing uses of	This source of leakage is relevant for biomass residues. The	tCO_2e	Monitored by surveys and publications	Annually

Parameters	Description	Units	Origin	Frequency
biomass	quantity of renewable biomass used will be assessed annually to determine the occurrence of leakage			
EF_{CO2}	CO_2 emission for the baseline fossil fuel (coal)	tCO_2/TJ	2006 IPCC Guidelines for National Greenhouse Gas Inventories. More reliable or updated data may be used if they are available in the future.	Not monitored
NCV	Net calorific value for the baseline fuel (coal)	TJ/ton	2006 IPCC Guidelines for National Greenhouse Gas Inventories. More reliable or updated data may be used if they are available in the future.	Not monitored
$\rho_{biomass}$	Specific density of renewable biomass type *j*	ton/m³	Bibliography, described in respective table at section B.6.2. More reliable or updated data may be used if they are available in the future.	Not monitored
EF_{BSL}	Emission factor for the baseline situation	tCO_2e / Thousands of brick produced	Based on historical information on brick production and fuel consumption in each ceramic	Not monitored

In addition, according to the Sustainability Monitoring Plan described in the section G of the Gold Standard Passport, the following indicators will be also monitored:

1) Procedures related to the control and disposal of ashes.
2) Actions of health and security
3) IPE use
4) Total energy produced from renewable sources
5) Energy demand per production output
6) Voluntary Emission Reductions issued
7) Revenues for biomass suppliers
8) Origin of renewable biomass
9) Biomass surplus

More information and details are available at section G of the Gold Standard Passport.

B.8 Date of completion of the application of the baseline and monitoring methodology and the

name of the responsible person(s)/entity(ies)

The application of the baseline and monitoring methodology was finalized on 19/07/2012. The following entities are responsible for applying the baseline and monitoring methodology:

SUSTAINABLE CARBON - PROJETOS AMBIENTAIS LTDA: Project developer
Thiago de Avila Othero, Marcelo Haddad (Technical Coordinators) Mariana dos Santos Silva and Camila Vaccari (Technical Analysts): Project Design Document writers, elaboration of GHGs Emissions' Inventory.

C.I. ECOEFICIENCIA S.A: Data collection and analysis
Darry Torralba: direct contact between the project developers and the ceramics, and responsible for collecting the necessary information.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

20/02/2008. On this date, Santander Ceramic has begun the construction of the project kilns, in order to replace the baseline kilns. Las Tapias 3 Ceramic began construction of the project kilns on 01/08/2008. The starting date of the project is before the "*Time of first submission*" as per Gold Standard definitions[65]. Hence, the project is applying for retroactive registration according to Gold Standard Toolkit Section 1.2.6.

C.1.2. Expected operational lifetime of the project activity:

30 years 0 months.

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

01/08/2010 or two years prior to Gold Standard project registration whichever is later.

C.2.1.2. Length of the first crediting period:

07 years 0 months.

[65] 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.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

In Colombia, Resolution 18-0861 from 2002 provides environmental guidelines for mining activities. Such resolution determines that mining exploitation activities shall be preceded by the Plan of Works and Constructions from the Mining Authority and by the environmental license from the Environmental Authority. Law 99 from 1993 provides definition on environmental licensing. Decree 2,820 from 2010 defines which activities shall be subject to environmental licensing by the Regional Autonomous Corporations (*Corporaciones Autónomas Regionales*) in Colombia. In the mining sector, the following activities are licensed at the regional level:

- Coal mining: when exploitation is lower than 800,000 tons per year;
- Building material: when exploitation is lower than 600,00 tons per year;
- Metals and gemstones: when exploitation is lower than 2,000,000 tons per year;
- Other minerals: when exploitation is lower than 1,000,000 tons per year;

As the ceramics industries exploit clay, they fit into the mining sector, subsector building materials. Since annual production in all of the ceramics included in the project is lower than 600,000 tons per year, they are all licensed at the regional level[66].

Las Tapias 3 Ceramic is part of the Industrial Mining Park of Mochuelo, in the jurisdiction area of the *Corporación Autónoma Regional de Cundinamarca*[67]. Santander Ceramic is located in the region of San Jorge, belonging to the municipality of Soacha, also in the jurisdiction area of the *Corporación Autónoma Regional de Cundinamarca*.

This project is in accordance to the Resolution no. 1197 from the *Ministerio de Ambiente, Vivienda y Desarollo Territorial* (Ministery of Environment, Housing and Terrestrial Development), that establishes zones compatible with mining of building materials and clay[68] in the grassland areas of Bogotá.

According to legal requirement, *Las Tapias 3 Ceramic* integrates the Environmental Management Plan presented by the *Asociación Nacional de Fabricantes de Ladrillos y Materiales de Construción* – ANAFALCO (National Association of Bricks and Building Materials Producers) to the *Corporación Autónoma Regional de Cundinamarca* under number 12527-1. The Environmental Management Plan was presented for technical evaluation as part of the Mining Exploitation License BA3-152. The plan was approved by Resolution 1895 from 30/06/2006 and defines environmental obligations and due compensations. Santander Ceramic had its Environmental Management Plan approved by Resolution 1740 from 15/08/2008, following Mining Exploitation License 19152. Such Environmental Management Plan defines environmental obligations and due compensations for this ceramic. The ceramics included in this project shall ensure all obligations and restrictions defined by the environmental authority are complied with during the crediting period.

[66] Information taken from: <http://www.cornare.gov.co/index.php?option=com_content&view=article&id=30&Itemid=36&lang=es>. Last access on 15/12/2010.

[67] More information on: <http://www.car.gov.co/>. Last access 15/12/2010.

[68] Resolution available at: <http://www.simco.gov.co/simco/Portals/0/Normas/Res_1197_2004.pdf >. Last access on 15/12/2010.

The project is also in accordance to Colombian Laws 141/1994 and 756/2002, which establishes the payment of a Financial Compensation by the Exploitation of non-renewable resources, such as Mineral Resources.

Therefore, the project is in accordance with applicable laws and regulations. The fuel switching and energy efficiency project is not expected to result in significant environmental impacts. The project measures (kiln replacement and use of fuel switching to renewable biomass) do not require any type of license of authorization from the environmental authority.

Following Gold Standards Requirement, the Detailed Impact Assessment was carried out and no environmental impacts were identified (no negative parameters are found). This is better described in the Gold Standard Passport. Mitigation measures identified as part of the Detailed Impact Assessment are described in Section D.2.

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Law 99 from 1993 provides definition on environmental licensing. Decree 2,820 from 2010[69] regulates this law, thus defining which activities shall be subject to environmental licensing before starting operation. Moreover, an environmental impact assessment (EIA) is required on all cases requiring environmental license and shall be presented to the competent environmental authority, which in this case is the Regional Autonomous Corporations (*Corporaciones Autónomas Regionales*) in Colombia. Las Tapias 3 and Santander Ceramics are in the jurisdiction area of the *Corporación Autónoma Regional de Cundinamarca*[70].

The EIA is part of the Environmental Management Plan, and shall contain relevant information and sufficient information about the identification and assessment of impacts, specifying which of them cannot be avoided or mitigated, and the corresponding environmental management measures. The environmental license is only issued if the competent environmental authority approves the required environmental impact assessment.

Therefore, Las Tapias 3 and Santander Ceramics have been granted to operate as they acquired the environmental licenses from the *Corporación Autónoma Regional de Cundinamarca.* Las Tapias 3 Ceramic's Environmental Management Plan was approved by Resolution 1895 from 30/06/2006. Santander Ceramic had its Environmental Management Plan approved by Resolution 1740 from 15/08/2008.

This project activity did not compel the ceramics to require a new environmental license nor to make improvements in the current one. Thus, a new environmental impact assessment was not required as a new environmental license was not needed. However, the ceramics included in this project shall ensure all obligations and restrictions defined by the environmental authority are complied with during the crediting period.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

[69] More information on: http://web.presidencia.gov.co/decretoslinea/2010/agosto/05/dec282005082010.pdf. Last access 22/12/2011.

[70] More information on: <http://www.car.gov.co/>. Last access 15/12/2011.

Environmental impacts are not considered to be significant. The following mitigation measures are established as part of the Detailed Impact Assessment, which is better described in the Gold Standard Passport:

- **Monitoring the procedures related to the control and disposal of ashes**: the project might result in environmental pollution in case appropriate procedures to manage and dispose ashes are not followed. The project proponent will rely in site visits and interviews to determine the level of control over the handling and disposal of ashes. The aim of the project is to assure environmental impacts are avoided and a sustainable use and disposal of ashes is obtained.
- **Monitoring actions of Health and Security and the Use of Individual Protective Equipments (IPEs) on each ceramic**: The project might expose workers to the risk of accidents and other safety related concerns if due caution is not taken. The project proponent will rely in site visits and interviews to assess the project situation regarding health and security measures. The aim of the project is to allow an improvement in the quality of employment for the workers in each ceramic.
- **Monitoring the origin of biomass**: The origin of the renewable biomass will be assessed storing documents (receipts, invoices) from the biomasses providers, thus allowing to determine its origin. The biomasses shall be considered renewable as fulfilling definitions of renewable biomass approved by the CDM Executive Board.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

A letter providing details on the project and its expected contribution on sustainable development was sent to stakeholders. Moreover, they were invited to assist the stakeholders' consultation, which took place on 31/10/2011. As requested during the pre-feasibility assessment, project proponents have developed the Stakeholder Feedback Round in accordance to Gold Standard recommendations for the Local Stakeholder Consultation process. Section E.2 of the Passport provides more information on the Stakeholder Feedback Round. A full report on the consultation process was made available to the validation team. The most recent version of the PDD and Passport were made publicly available at the Sustainable Carbon website[71].

The meeting took place in the municipality of Bogotá, Colombia, close to both ceramics included in the project. The following points were covered in the meeting:

- Opening of the meeting
- Explanation of the project
- Questions for clarification about the project
- Blind SD exercise
- Discussion on monitoring SD
- Closure of the meeting

In this meeting, the actions proposed by project activity were demonstrated, which includes the substitution of fossil fuels to renewable biomasses to generate thermal energy and energy efficiency measures, such as the construction of new kilns and installation of new equipments (like automatic feeders), which reduces the amount of biomass consumed, prevent excessive smoke emissions and reduce the employees contact with the heat from the kilns. A discussion on how the project measures are

[71] Available at: http://www.sustainablecarbon.com/Interaction/.

additional to current regulations in Colombia was performed. Stakeholders were introduced to relevant regulations and were asked to assess if the project is additional to legal requirements.

E.2. Summary of the comments received:

In a general way, the meeting was very useful. In the meeting, the participation from the community was made possible. Stakeholders included people related to the community, as business owners and neighborhood associations.

Most of the comments included aspects related to improvement on air and water quality and the contribution to the climate change.

Improvement in working conditions was also highlighted, especially regarding workers who manage the kilns. With the acquisition of new technology for kilns, the workers` contact with the kilns heat was reduced, also reducing the physical efforts of workers in the production sector of the ceramics.

There was a negative comment in the meeting about lack of interest by the environmental authorities. Some other comments were about the non-attendance of many people in the meeting, and the lack of time between the dispatch of the invitation letter and the meeting. No negative comments were received on the Project activity. Some suggestions of improvements on the design of the consultation meetings were received: attendants mentioned that more information about the management of equipments that feed kilns with biomass could be provided; also, attendants pointed that the choice of time and duration of the meetings could be better selected.

Detailed information on the comments received during the Stakeholder Feedback Round was made available to the validation team (as part of the Local Stakeholder Consultation Report, used to describe the Stakeholder Consultation Process).

E.3. Report on how due account was taken of any comments received:

No negative comments were received on the Project activity. Some suggestion of improvements on the design of the consultation meetings were received, regarding the choice of time and duration of the meetings.

The sustainable development assessment is not going to be revised since the majority of comments from stakeholders were very positive. No negative comments were received and during the blind exercise no indicators were scored negatively. Stakeholders were of the opinion that the project generates significant benefits on water quality. However, project proponents will not consider a positive impact on this indicator, since the current improvement of water quality depends on several factors not controlled by the project.

Stakeholders were of the opinion that the monitoring of sustainability indicators is well designed and no specific suggestions for improvement were received. Given the exposed, project proponents are of the view that no changes to the sustainable development assessment are needed.

Following the meeting, letters were sent to relevant stakeholders (the same stakeholders invited for the physical meetings) describing how the consultation process was developed.

A summary of the stakeholders' comments received and how they were assessed were also described on such letters. Finally, stakeholders were informed on how to make additional comments on the project and on how to obtain the current version of the project PDD and Passport.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Sustainable Carbon Projetos Ambientais Ltda
Street/P.O.Box:	Rua Doutor Bacelar, 368 Conjunto 73
Building:	-
City:	São Paulo
State/Region:	São Paulo
Postfix/ZIP:	CEP: 04026-001
Country:	Brazil
Telephone:	+ 55 11 2649-0036
FAX:	+55 11 2649-0042
E-Mail:	info@sustainablecarbon.com
URL:	www.sustainablecarbon.com
Represented by:	Mr. Stefano Merlin
Title:	CEO
Salutation:	Mr.
Last Name:	Merlin
Middle Name:	-
First Name:	Stefano
Department:	-
Mobile:	Not available
Direct FAX:	+55 11 2649-0042
Direct tel:	+ 55 11 2649-0036
Personal E-Mail:	smerlin@sustainablecarbon.com

Organization:	C.I. ECOEFICIENCIA S.A
Street/P.O.Box:	Km 19-20 Madrid Antigua Troncal de Occidente –Mosquera
Building:	-
City:	Bogotá
State/Region:	Cundinamarca
Postfix/ZIP:	11375
Country:	Colombia
Telephone:	+ 57 8 27 70 30
FAX:	+ 57 8 27 70 30 Ext. 114
E-Mail:	sgi@ecoeficiencia.com.co
URL:	www.ecoeficiencia.com.co
Represented by:	Mr. Juan Carlos Posada
Title:	General Manager
Salutation:	Mr.
Last Name:	Posada
Middle Name:	Carlos
First Name:	Juan
Department:	-

Mobile:	Not available
Direct FAX:	+ 57 8 27 70 30 Ext. 114
Direct tel:	+ 57 8 27 70 30
Personal E-Mail:	juan.posada@ecoeficiencia.com.co

Organization:	Ruiz Moreno y Cia S en C
Street/P.O.Box:	Diagonal 95c S 18I – 71
Building:	-
City:	Bogotá
State/Region:	Cundinamarca
Postfix/ZIP:	-
Country:	Colombia
Telephone:	+57 2009323
FAX:	+57 2009323
E-Mail:	-
URL:	-
Represented by:	Jorge Alberto Ruiz
Title:	General Manager
Salutation:	Mr.
Last Name:	Ruiz
Middle Name:	Alberto
First Name:	Jorge
Department:	-
Mobile:	-
Direct FAX:	+57 2009323
Direct tel:	+57 2009323
Personal E-Mail:	-

Organization:	Ladrillera Santander D/M S en C
Street/P.O.Box:	Km 8 Vereda Fusunga
Building:	-
City:	Bogotá
State/Region:	Cundinamarca
Postfix/ZIP:	-
Country:	Colombia
Telephone:	+57 7810301
FAX:	+57 7810301
E-Mail:	-
URL:	-
Represented by:	Miguel Angel Diaz Lopez
Title:	General Manager
Salutation:	Mr.
Last Name:	Lopez
Middle Name:	Diaz
First Name:	Miguel Angel

Department:	-
Mobile:	-
Direct FAX:	+57 7810301
Direct tel:	+57 7810301
Personal E-Mail:	-

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in this project activity. The project does not receive Official Development Assistance.

Annex 3

INFORMATION ON COAL CONSUMPTION

2008 (baseline period)	
Las Tapias 3	
Period	Quantity (Kg)
January 2008	264,130
February 2008	210,005
March 2008	155,960
April 2008	224,210
May 2008	219,210
June 2008	174,720
July 2008	64,270
August 2008	340,590
September 2008	0
October 2008	504,230
November 2008	94,320
December 2008	122,900
Total	**2,374,545**
Average	**197,879**

2009	
Las Tapias 3	
Period	Quantity (Kg)
January 2009	0
February 2009	92,980
March 2009	131,830
April 2009	259,040
May 2009	279,630
June 2009	516,970
July 2009	93,560
August 2009	202,810
September 2009	308,620
October 2009	75,050
November 2009	225,420
December 2009	92,920
Total	**2,278,830**
Average	**189,903**

2010	
Las Tapias 3	
Period	Quantity (Kg)
January 2010	112,930
February 2010	148,950
March 2010	110,440
April 2010	0
May 2010	76,090
June 2010	0
July 2010	113,670
August 2010	133,000
September 2010	114,550
October 2010	168,530
November 2010	85,460
December 2010	0
Total	**1,063,620**
Average	**88,635**

2008 (baseline period)	
Santander	
Period	Quantity (Kg)
January 2008	359,990
February 2008	537,100
March 2008	345,010
April 2008	478,400
May 2008	571,203
June 2008	401,980
July 2008	472,730
August 2008	544,870
September 2008	466,830
October 2008	311,000
November 2008	359,350
December 2008	348,690
Total	**5,197,153**
Average	**433,096**

2009	
Santander	
Period	Quantity (Kg)
January 2009	390,470
February 2009	341,440
March 2009	343,960
April 2009	348,550
May 2009	339,726
June 2009	317,370
July 2009	334,130
August 2009	275,270
September 2009	265,270
October 2009	160,900
November 2009	376,061
December 2009	309,710
Total	**3,802,857**
Average	**316,905**

2010	
Santander	
Period	Quantity (Kg)
January 2010	308,660
February 2010	222,370
March 2010	260,840
April 2010	302,540
May 2010	174,960
June 2010	306,260
July 2010	276,480
August 2010	330,630
September 2010	485,228
October 2010	356,830
Novembero 2010	331,550
December 2010	336,800
Total	**3,693,148**
Average	**307,762**

BASELINE BRICK PRODUCTION:

2008 (baseline period)	
Las Tapias 3	
Period	Total
January 2008	465,765
February 2008	429,522
March 2008	474,613
April 2008	442,892
May 2008	496,483
June 2008	337,475
July 2008	474,234
August 2008	386,277
September 2008	388,480
October 2008	357,295
November 2008	340,834
December 2008	258,738
Total 2008	**4,852,608**
Average 2008	**404,384**

2009	
Las Tapias 3	
Period	Total
January 2009	108,228
February 2009	114,381
March 2009	119,487
April 2009	453,890
May 2009	438,156
June 2009	627,423
July 2009	603,693
August 2009	561,595
September 2009	509,484
October 2009	518,658
November 2009	500,296
December 2009	451,695
Total 2009	**5,006,986**
Average 2009	**417,249**

2010	
Las Tapias 3	
Period	Total
January 2010	405,134
February 2010	505,700
March 2010	495,028
April 2010	528,972
May 2010	548,502
June 2010	479,892
July 2010	525,999
August 2010	510,214
September 2010	512,930
October 2010	507,460
November 2010	423,183
December 2010	455,540
Total 2010	**5,898,554**
Average 2010	**501,983**

2008 (baseline period)	
Santander	
Period	Total
January 2008	621,420
February 2008	488,630
March 2008	559,078
April 2008	612,153
May 2008	607,565
June 2008	607,612
July 2008	710,515
August 2008	642,870
September 2008	677,571
October 2008	701,270
November 2008	596,858
December 2008	725,167
Total 2008	**7,550,709**
Average 2008	**629,226**

2009	
Santander	
Period	Total
January 2009	770,453
February 2009	736,553
March 2009	629,877
April 2009	510,413
May 2009	700,410
June 2009	565,820
July 2009	808,812
August 2009	778,741
September 2009	839,052
October 2009	754,459
November 2009	719,700
December 2009	621,534
Total 2009	**8,435,824**
Average 2009	**702,985**

2010	
Santander	
Period	Total
January 2010	731,113
February 2010	705,150
March 2010	690,601
April 2010	746,920
May 2010	784,521
June 2010	752,569
July 2010	723,436
August 2010	844,538
September 2010	942,430
October 2010	849,867
nov/10	839,485
dez/10	772,539
Total 2010	**9,383,169**
Average 2010	**781,931**

Annex 4

MONITORING INFORMATION

Monitoring information is available on Section B.7.

Annex 5

DEMONSTRATION OF PRIOR CONSIDERATION

Event	Responsible	Date	Reason	Evidence – Email Subject or Document
First visit from Stefano Merlin to Colombia	Stefano Merlin	20/05/2007	Visit to some ceramics and first contact with Metal Souza	MERLIN/STEFANO MR BSB/MAO
Lecture in Cucutá	Stefano Merlin	10/11/2007	III CURSO INTERNACIONAL DE CERAMICA, in Cucutá	INFORMACION CONGRESO
Application of pre-feasibility questionnaires in some ceramics	Stefano Merlin e Hector Ceballos	21/11/2007	Application of the pre feasibility questionnaires in five ceramics in Colombia	ceramica roja previab 1 colombia
Email from Santander Ceramic requesting some information to determine the feasibility of the project	Email from Mr. Jesus to Sustainable Carbon	22/02/2008	Santander Ceramic Project activity	archivo Ladrillera Santander
Email from Santander Ceramic sending some data regarding the kilns and coal consumption, revised by Hector from Metal Souza	Email from Mr. Jesus to Sustainable Carbon	11/03/2008	Santander Ceramic Project activity	archivo Ladrillera Santander
Email from Santander Ceramic requesting some information about the carbon credits project	Email from Mr. Jesus to Sustainable Carbon	05/08/2008	Santander Ceramic Project activity	ENC: Buenas noches
Lecture in Cucutá	Antonio Cubano Rissone	14/11/2008	IV CURSO INTERNACIONAL DE CERAMICA, em Cucutá	CURSO INTERNACIONAL DE CERÁMICA CÚCUTA
Email from Santander Ceramic requesting some information about the project monitoring	Email from Mr. Jesus to Sustainable Carbon	20/11/2008	Santander Ceramic Project activity	buen dia

Fisrt email establishing contact between Ecoeficiencia and Sustainable Carbon	Alejandro	01/02/2010	Presentation of Sustainable Carbon during a visit from Ecoeficiencia to Brazil	contacto
Cooperation Agreement between Sustainable Carbon and Ecoeficiencia	Stefano/Tomas Uribe	31/05/2010	Cooperation Agreement between Sustainable Carbon and Ecoeficiencia	Cooperation Agreement signature
Contracts for the development of this project activity	Juan Carlos Posada Escobar – C.I. Ecoeficiencia; Stefano Merlin – Sustainable Carbon; José Alberto Ruiz – Ladrillera Las Tapias 3; Miguel Angel Diaz Gomes – Ladrillera Santander;	Las Tapias 3 Ceramic – 07/08/2010 Santander Ceramic – 06/10/2010	Las Tapias and Santander Ceramics sign contracts for the development of a voluntary GHG emission reduction project	-
Email from Sustainable Carbon to Gold Standard Foundation about the development of carbon projects in Colombia	Email from Sustainable Carbon to Gold Standard Foundation	17/01/2011	Early consultations with Gold Standard Regional Manager for Latin America regarding the project eligibility	Guidance on GS project for Sustainable Carbon
Email from Gold Standard Foundation to Sustainable Carbon about the development of carbon projects in Colombia	Email from Gold Standard Foundation to Sustainable Carbon	03/02/2011	Gold Standard's answer about the project eligibility in Colombia, the prior consideration and fast track procedures	Guidance on GS project for Sustainable Carbon
Email from Gold Standard Foundation to Sustainable Carbon about the portion allowed for partial substitution projects	Email from Gold Standard Foundation to Sustainable Carbon	12/04/2011	Gold Standard TAC's decision on partial substitution project activities	Guidance on GS project for Sustainable Carbon
Validation Proposal from the DOE	Email from TÜV Rheinland to Sustainable Carbon	25/05/2011	Receipt of the validation proposal from the DOE	Proposta Comercial Sustainable Carbon

Validation Proposal from the DOE	Email from TÜV Rheinland to Sustainable Carbon	01/09/2011	Acceptance of the validation proposal	Proposta Comercial Sustainable Carbon
Pre Feasibility Assessment	Outlook invitation to event	14/09/2011	Pre Feasibility Assessment of this project activity by Gold Standard	Pre Feasibility Assessment - Santander and Las Tapias Renewable Energy Project