Gold standard for the global goals
Monitoring report

June 2017, version 1

Gold Standard

Title of the project	Santander and Las Tapias Renewable Energy Project
Gold Standard project id	GS1074
Version number of the monitoring report	Version 04
Completion date of the monitoring report	18/06/2019
Date of project design certification	16/11/2013
Start date of crediting period	01/04/2013
Duration of this monitoring period	01/01/2017 to 31/12/2018
Duration of previous monitoring period	01/04/2013 to 31/12/2016
Project representative(s)	Sustainable Carbon - Projetos Ambientais Ltda. Ladrillera Santander Diaz Muñoz S en C Ruiz Moreno y Cia S en C
Host Country	Colombia
Certification pathway (activity certification/impact certification)	
SDG Contributions targeted (as per approved PDD)	SDG 7 (Affordable and Clean Energy) SDG 8 (Decent Work and Economic Growth) SDG 13 (Climate Action)
Gold Standard statement/product certification sought (GSVER/ADALYs/RECs etc.)	GSVER
Selected methodology(ies)	Methodology approved under the Gold Standard for Voluntary small scale projects: "Ecologically Sound Fuel Switch to Biomass with Reduced Energy Requirement", Version 1.0
Estimated amount of annual average certified SDG impact (as per approved PDD)	Santander Ceramic Factory[1]: SDG 7: 85% usage of renewable energy SDG 8: Higher than Score 3 of SOCIALCARBON indicator SDG 13: Estimated annual average VERs (according to approved PDD): 12,342 tCO_2e per year; Estimated total VERs for the current monitoring period (according to approved PDD): 28,985 tCO_2e.

[1] Las Tapias Ceramic Industry could not provide the necessary monitoring information and other supporting documents. Thus, emission reductions generated by Las Tapias Ceramic Industry during this monitoring period were considered as 0 (zero). Therefore, emission reductions generated during this monitoring period were only calculated for Santander Ceramic Industry.

Total amount of certified SDG impact (as per approved methodology) achieved in this monitoring period	Santander Ceramic Factory[2]: SDG 7: 59% usage of renewable energy SDG 8: Improvement of 1 score of SOCIALCARBON Indicator in comparison to the score from previous monitoring SDG 13: 41,242 VERs generated during current monitoring period.

[2] Las Tapias Ceramic Industry could not provide the necessary monitoring information and other supporting documents. Thus, emission reductions generated by Las Tapias Ceramic Industry during this monitoring period were considered as 0 (zero). Therefore, emission reductions generated during this monitoring period were only calculated for Santander Ceramic Industry.

SECTION A. Description of project

A.1. Purpose and general description of project

This project activity consists of two red ceramic companies located in Colombia: Las Tapias 3 and Santander Ceramic Industries. Las Tapias 3 is located at Bogota, in the state of Cundinamarca. Santander is located at Soacha municipality, also in the state of Cundinamarca. Both ceramic industries produce ceramic bricks, which are mainly destined for the regional market in the Bogotá metropolitan area.

The fuel utilized to burn and dry ceramic pieces in the baseline scenario for both ceramic industries was coal, which is the common practice in the region. This is a fossil fuel because 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.

This project activity reduces greenhouse gases (GHG) emissions through the partial substitution of coal for renewable biomasses to generate thermal energy. As renewable biomasses, the project utilizes biomass residues, such as sawdust, wood residues, and pulp and paper sludge, which are used to feed the ceramics' kilns, replacing the use of fossil fuel, i.e. coal. In addition, the project activity also results in improvements of energy efficiency, as the ceramic industries have replaced the kilns that existed before the project initiation by kilns that are more efficient: one Hoffman and one Camara. These new kilns utilize the heat in a more efficient way during the burning process, which leads to a reduction in energy demand (i.e. coal consumption) 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 new biomasses.

Carbon benefits were seriously considered and necessary in the decision to undertake this project as a proposed emission reductions project activity. Since May 2007, Sustainable Carbon has been promoting GHG emission reduction projects in ceramic industries within Colombia through the investment in more efficient kilns and fuel switching from coal to locally-sourced renewable biomasses. The ceramic owners participating of this project activity have considered the income from the commercialization of the carbon credits to make the project activity feasible.

In 2008, Las Tapias 3 and Santander Ceramic Industries invested in the replacement of their low efficient kilns. In addition, the entrepreneurs from these factories also planned to replace a large part of their coal consumption with renewable biomasses. On 20/02/2008, Santander Ceramic began the construction of new and more efficient kilns in order to replace baseline kilns. This date established the project start date. Las Tapias 3 began the construction of new kilns on 01/08/2008. In 2009, Santander Ceramic Industry began to use small fractions of renewable biomass.

During the current monitoring period, Las Tapias 3 Ceramic Industry could not provide monitoring information and supporting documents. Thus, according to what has been agreed between Sustainable Carbon and Las Tapias 3, the emission reductions generated by Las Tapias 3 Ceramic Industry during this monitoring period were considered as 0 (zero). However, this does not affect the possibility of this ceramic factory participating in the next monitoring periods. Therefore, emission reductions generated during this monitoring period were only claimed for Santander Ceramic Industry.

The main goal of this project activity is to minimize the negative impacts from the use coal, which consumption leads to GHG emissions that contribute to climate change. Moreover, in opposition to the identified baseline, the project activity generates 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 workers.

GHG emission reductions generated by this project activity due to fossil fuel switching to renewable biomasses and energy efficiency measures resulted in **41,242** tCO_2e during the monitoring period from 01/01/2017 to 31/12/2018.

A.2. Location of project

Both ceramic industries composing this project activity are located in Colombia, in the state of Cundinamarca, which is located in the central region of the country. Table 1 contains the location of each industry and their geographic coordinates. In addition, Figure 1 below shows the map of each municipality where the project activity is located.

Figure 1. Location of project activity

Ceramic Industry	Municipality	State	Country	Latitude	Longitude
Las Tapias 3	Bogota	Cundinamarca	Colombia	4°30'24.73"N	74°08'58.25"W
Santander	Soacha	Cundinamarca	Colombia	4°31'13.67"N	74°11'54.50"W

Postal addresses of each site are detailed below:

- Las Tapias 3 Ceramic Industry
  Address: Diagonal 95c S 18I – 71, Bogota – Colombia.

- Santander Ceramic Industry
  Address: Km 8 Vereda Fusunga, Soacha – Colombia.

Figure 2. Geographic location of the municipalities of the project activity: Bogotá: 4°35'53"N, 74°4'33"W; Soacha: 4°35'14"N, 74°13'17"W

A.3. Reference of applied methodology

The project activity utilizes the following methodology approved under the Gold Standard for VER small scale projects: "Ecologically Sound Fuel Switch to Biomass with Reduced Energy Requirement", version 1.0[3].

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

In addition, the project activity also utilizes the following guidance and tools:

- Attachment C to Appendix B: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. General guidance on leakage in biomass project activities, Version 03.[4]
- Annex 18 of the 23rd meeting report of the CDM Executive Board. Definition of renewable biomass.[5]
- CDM Methodological Tool: "Tool for the demonstration and assessment of additionality". Version 05.2, valid from 26/08/2008 until 24/11/2011.[6]

A.4. Crediting period of project

- Start date of the crediting period: 01/04/2013.
- End of the crediting period: 31/03/2020
- Length of the crediting period: 7 years, renewable twice.

SECTION B. Implementation of project

B.1. Description of implemented project

This Gold Standard Voluntary Project was validated by the Designated Operational Entity TÜV Rheinland (China) Ltd and this present monitoring report is being verified by the Earthood Services Private Limited.

The project activity involves the fuel switching from coal to renewable biomass for the production process of two red ceramic industries located in Colombia. It also involves the installation of efficient kilns, one Hoffman and one Camara, in replacement of old kilns existing prior to project initiation. Although there are barriers associated to these practices, such technologies/measures are considered environmentally safe and sound.

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. Furthermore, the new kiln type installed as part of the project activity is

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[3] Available at: <http://www.goldstandard.org/sites/default/files/gs_methodology_switch_to_biomass_fuel.pdf>. Last visit on: December 11, 2018.

[4] Available at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentC.pdf>. Last visit on: December 11, 2018.

[5] Available at: < https://cdm.unfccc.int/EB/023/eb23_repan18.pdf>. Last visit on: December 11, 2018.

[6] Available at: <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf>. Last visit on: December 11, 2018.

a consolidated technology within the ceramic sector, especially in those with higher production levels and more investment capacity.

Coal mining is an important activity within the Colombian economy. Energy generation from coal has significantly increased in the last decades in Colombia[7]. According to the *Sistema de Información Minero Colombiano*[8] (Colombian Mining Information System) coal mining has shown significant growth rates in recent years, with a rise in production of 123% between 2000 and 2015. Colombia hosts the biggest coal reserves in South America, and holds the ninth largest coal reserves in the world. In addition, the country exports more than 90% of its coal output and it is the fifth biggest coal exporter in the world.[9]

This present project activity created the opportunity for carrying out a partial fossil fuel switch to renewable biomass together with kilns replacement, which was unattractive due to some barriers, including high investments on the purchase and adaptation of machineries to work with new biomasses. Thus, carbon benefits were seriously considered in the decision to undertake this project as a proposed emission reductions activity.

A brief history of the project implementation is described below.

Table 1. Brief description of 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 project activity)	Santander Ceramic begins the construction of the project kilns, in order to replace the baseline kilns.
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
September, 2011	Acceptance of the validation proposal
September, 2011	Pre Feasibility Assessment of this project activity by the Gold Standard
September, 2011	DOE validation site visit

[7] 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://www1.upme.gov.co/InformacionCifras/Paginas/BECOENERGTICO.aspx>. Last visit on December 11, 2018.

[8] Available at: <http://www.simco.gov.co/simco/Estad%EDsticas/Producci%F3n/tabid/121/Default.aspx>. Last visit on December 11, 2018.

[9] Information available at: <http://www.mining-technology.com/features/feature-the-worlds-biggest-coal-reserves-by-country/>. Last visited on December 11, 2018.

February, 2012	Project validation and start of the GS 8 weeks review
April, 2014	Project Registration under Gold Standard
February, 2015	Voluntary withdrawal of Ecoeficiencia as project participant
May, 2017	Completion date of the 1st Monitoring Report
June, 2017	Final Verification Report of the 1st Monitoring Period

On February 02th, 2015, the private entity C.I. Ecoeficiencia S.A. voluntary conducted the withdrawal of its participation in this project activity. All rights and obligations under the contract for the present project activity were transferred and assigned to Sustainable Carbon.

During the last and the current monitoring periods, Las Tapias 3 Ceramic Industry could not provide the necessary monitoring information and supporting documents. Thus, according to what has been agreed between Sustainable Carbon and Las Tapias 3, the GHG emission reductions generated by Las Tapias 3 Ceramic Industry during this monitoring period was considered as 0 (zero), which will not be claimed in the future. However, this does not affect the possibility of this ceramic factory participating in next monitoring periods. Therefore, emission reductions generated in this monitoring period were only claimed for Santander Ceramic Industry.

On the other hand, Santander Ceramic Industry had no significant changes on its physical structure. It is still operating one Hoffmann kiln and one Chamber kiln. In addition, Ladrillera Santander has been utilizing the same biomass types described in the first monitoring period: wood residues, sawdust, and pulp and paper sludge.

Production of sludge as waste in pulp and paper plants can be considered as one of the serious environmental problems that have to be solved. The production of pulp and paper is associated with the generation of large quantities of wastewater that shall be purified to avoid severe pollution of the environment. Nevertheless, wastewater treatment generates large volumes of solid residues, i.e., sludge. While landfilling is not a suitable solution from the environmental point of view, thermal treatment may be the most appropriate one. After dewatering, sludge can be incinerated and thus used for bio-energy production[10].

Furthermore, Santander Ceramic Industry is also mixing this biomass with the clay, which resulted in important benefits to the whole production process. The reduction of clay within the ceramic block reduces its weight, and moreover, reduces the necessary burning time because the sludge is also burned inside the block, thus making the burning process faster. In addition, there was a reduction of coal consumption, because coal was previously mixed with clay. Around 30% of the total sludge that arrives at the ceramic factory is mixed with the clay.

[10] According to:

ORAL, J. et al. Processing of waste from pulp and paper plant. **Journal of Cleaner Production.** Brno, Czech Republic, p. 509-515. April 2005. Available at: <http://www.sciencedirect.com/science/article/pii/S0959652603001483>. Last visit on December 11, 2018.

HAGELQVIST, Alina. **Sludge from pulp and paper mills for biogas production:** Strategies to improve energy performance in wastewater treatment and sludge management. 2013. 58 f. Dissertation (Master) - Environmental and Energy Systems, Faculty of Health, Science and Technology, Karlstad University, Karlstad, Sweden, 2013. Available at: <https://www.diva-portal.org/smash/get/diva2:603009/FULLTEXT01.pdf>. Last visited on: December 11, 2018.

Figure 3. Employee loading pulp and paper sludge inside the molding machine

Figure 4. Pulp and paper sludge mixed with the clay for the brick production

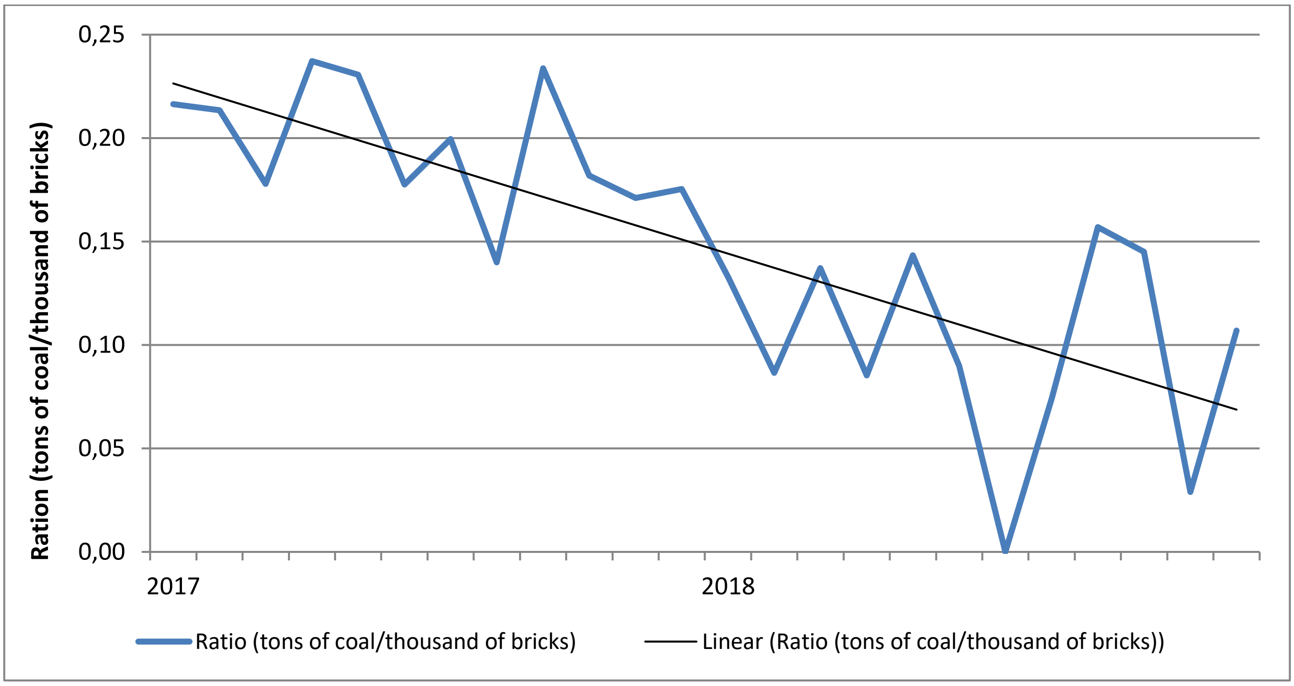
In addition, new equipment and technologies have been installed in the industry, which allowed an increase in the biomass consumption and a more homogeneous fuel. At the same time, this resulted in less physical effort for the workers responsible for the loading/unloading of the kiln.

Santander Ceramic Industry has been decreasing its coal consumption compared to the baseline scenario. In 2008, when using inefficient Pampa kilns purely on coal, around 0.7 tonne of coal was necessary to produce 1,000 bricks. This ratio decreased around 62% during the 2013-2016 period (first monitoring period), reaching 0.26 tonne of coal to produce 1,000 bricks in 2016. The main reason for this reduction was the use of renewable biomasses together with coal in a more efficient kiln, which requires less energy to burn bricks.

During the second monitoring period, correspondent to 2017 and 2018, the ratio decreased 86% compared to the baseline scenario, consuming an average of around 0.099 tonne of coal to produce 1,000 ceramic pieces in 2018. There is a continuous improvement in the efficiency of the production process due to the increase of biomass use throughout the years.

Figure 5 below shows the decrease in the ratio between coal consumption and production of bricks in Santander Ceramic Industry during the 2017-2018 period. This decrease shows that the ceramic company has been increasing the use of renewable biomass in its production process.

Figure 5. Ratio between coal consumption and production of bricks during the monitoring period - Santander Ceramic Industry



Thus, the partial fuel switch to renewable biomass in conjunction with the use of more efficient kilns has significantly reduced the use of coal in Santander Ceramic Industry. During the current monitored period, the amount of coal saved by the project activity was around 15,460 tonnes, which is equivalent to a reduction of around 644 tonnes per month. Table 2 below details the amount of coal saved per year by the project activity, which during the current monitored period, included data only from Santander Ceramic Industry.

Table 2. Quantity of fossil fuel (coal) saved by the project activity, in tonnes

Year	Las Tapias 3 Ceramic Industry	Santander Ceramic Industry	Total
2017	0	8,073	8,073
2018	0	7,388	7,388
Total	0	15,460	15,460

As described in the registered PDD, the fuel switching is expected to gradually increase during the crediting period, as long as the ceramic industries improve their management of the logistics and renewable biomass supply chain. The table below shows the annual fuel switch ratios from coal to renewable biomass that have been achieved during the current monitored period for Santander Ceramic Industry.

Table 3. Average fuel switch ratio per year achieved by Santander Ceramic Industry during the current monitoring period

Year	Average fuel switch ratio on a mass basis (%)	Average fuel switch ratio on an energy basis (%)
2017	78%	55%
2018	83%	67%
Average in the period	79%	59%

During the current monitoring period, the project activity maintained an increased renewable energy use while reducing coal consumption, as can be seen in the table above. Figures below show the comparison between the coal and biomass usage rate during the current monitoring period for Santander Ceramic Industry, in a mass basis and energy basis, respectively.

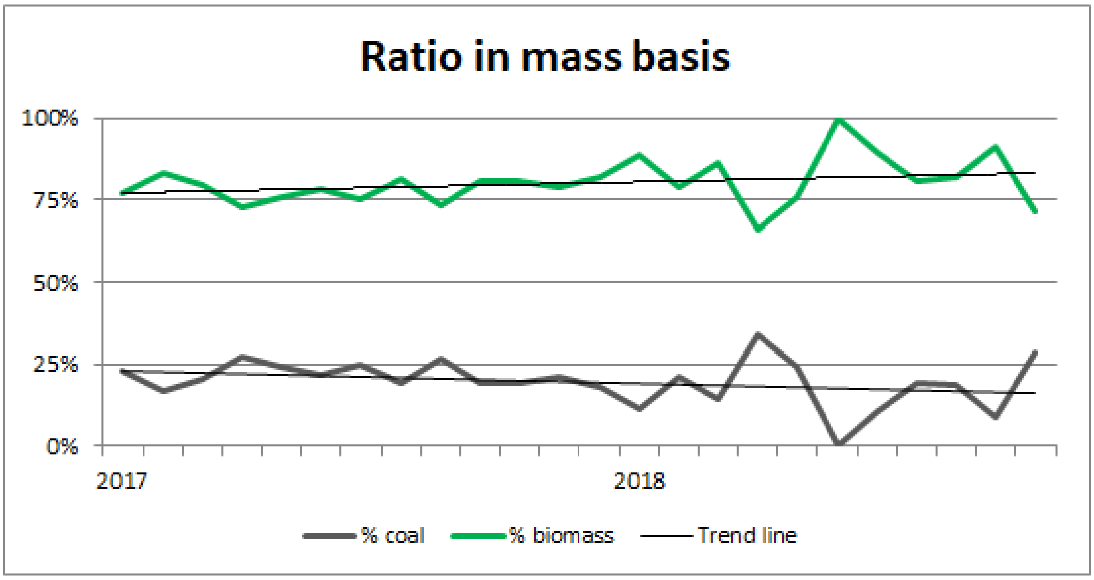


Figure 6. Ratio between coal and biomass use in Santander Ceramic Industry during the current monitoring period, mass basis

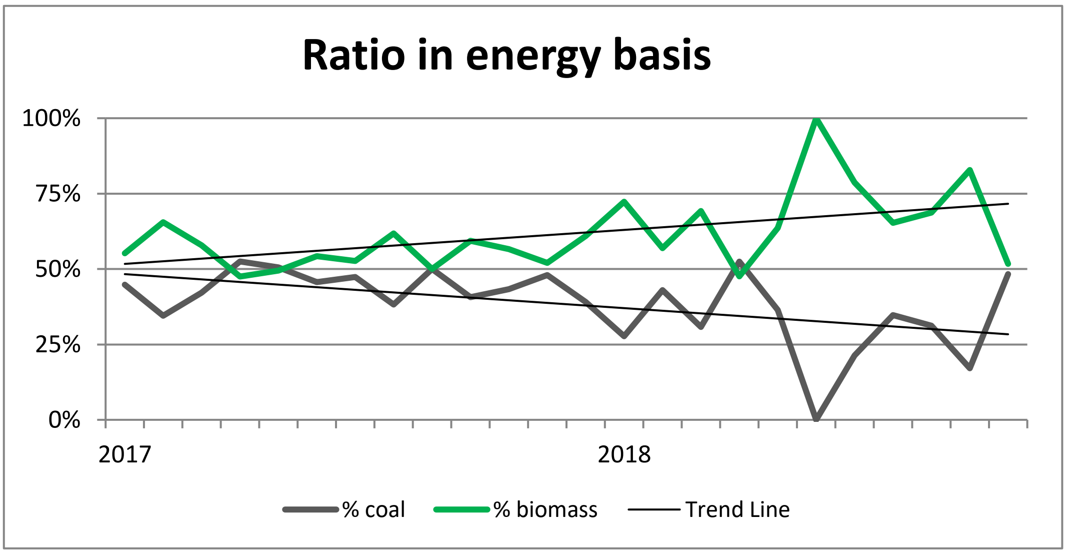


Figure 7. Ratio between coal and biomass use in Santander Ceramic Industry during the current monitoring period, energy basis

Both Figures above show that Santander Ceramic Industry has been increasing the biomass participation rate in its productive process.

Furthermore, Santander Ceramic Industry plans to acquire new equipment to use a higher amount of renewable biomass, and it is also planning to construct a new and more efficient kiln, which will use only renewable biomass and thereby will almost eliminate the use of coal in the industry. Therefore, carbon credits revenues will be an important component to make this low carbon initiative feasible.

B.2. Post-registration changes

B.2.1. Temporary deviations from Certified Key Project Information, Project Design Document, Monitoring & Reporting Plan, applied methodology or applied standardized baseline

During the current monitoring period, Las Tapias 3 Ceramic Industry could not provide the necessary monitoring information and supporting documents. Thus, according to what has been agreed between Sustainable Carbon and Las Tapias 3, the GHG emission reductions generated by Las Tapias 3 Ceramic Industry during this monitoring period was considered as 0 (zero), which will not be claimed in the future. However, this does not affect the possibility of this ceramic factory participating of next monitoring periods. Therefore, emission reductions generated during this monitoring period were only claimed for Santander Ceramic Industry.

B.2.2. Corrections

On February 02[nd], 2015, the private entity C.I. Ecoeficiencia S.A. voluntary conducted the withdrawal of its participation in this project activity. All rights and obligations under the contract for the present project activity were transferred and assigned to Sustainable Carbon. The updated Cover Letter (Gold Standard - Annex S) and Terms and Conditions (Gold Standard - Annex M) were signed by all project participants.

The parameter EF_{BSL} (Emission factor for the baseline situation) is a fixed parameter in the Section B.7.2 of the registered PDD – Description of the Monitoring Plan. However, this parameter was not included in the Section B.6.2 of the PDD – Data and parameters that are available at validation. Thus, the first MR corrected this point and included this parameter in the Section D.1.: Data and parameters fixed ex ante or at renewal of crediting period.

In addition, the specific density for wood residues was corrected to 0.423 tonnes/m^3 in the first monitoring period. Santander Ceramic Industry utilizes municipal wood pruning and residues from the wood manufacturing industry as biomass. The previous $\rho_{biomass}$ value considered that wood residues would only be composed of chips, pieces, shavings and bark chips of wood. However, the ceramic industry also receives tree pruning in the form of wood branches, which has a different density. Thus, the specific density value was corrected to be in accordance with the biomass that is actually used by the industry. The same source of data was utilized[11], calculating the average density of all forest species presented in the Table 41 of the referred report. Besides, the density of the wood manufacturing industry was calculated as the average density of chips, pieces, shavings and bark chips of wood with 20% humidity. Then, the average between those two values was considered as specific density for wood residues. More information at Section D.1, parameter $\rho_{biomass}$.

[11] UNIDAD DE PLANEACION MINERO ENERGÉTICO (UPME). **Potencialidades de los Cultivos Energéticos y Residuos Agrícolas en Colombia**: Resumen Ejecutivo. Bogotá, 2013. Available at: <http://www.si3ea.gov.co/si3ea/documentos/documentacion/energias_alternativas/potencialidades/biomasa_CULTIVOS%20ENERGETICOS.pdf>. Last visit on 02/01/2016. Information on tables 39 and 41, Pages 94 and 95.

B.2.3. Changes to start date of crediting period

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

B.2.4. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

No permanent changes from registered monitoring plan, applied methodology or applied standardized baseline occurred during the current monitoring period.

B.2.5. Changes to project design of approved project

During the first monitoring period, Ladrillera Santander started using pulp and paper sludge as renewable biomass. This biomass is generated during the wastewater treatment and is considered a serious environmental problem. While landfilling is not a suitable solution from the environmental point of view, thermal treatment may be the most appropriate one. After dewatering, sludge can be incinerated and thus used for bio-energy production.

This biomass is considered renewable according to the Option 5 of the CDM definitions set out in Annex 18 of EB meeting 23[12]: "The biomass is the non-fossil fraction of an industrial or municipal waste". Furthermore, there are not competing uses for its utilization.
Furthermore, a cash flow analysis was carried out in the first monitoring report to confirm that the use of this new biomass type does not impact the project additionality. Input values used in this cash flow analysis were those applicable at the time of the investment decision taken by Santander Ceramic Industry. Pulp and paper sludge began to be utilized as renewable biomass by the ceramic company in 2013.

Therefore, the project activity implementation (installation of a more efficient kiln, acquisition of biomass technology, additional labor expenses, and maintenance costs) and the use of pulp and paper sludge as biomass seem to be financially unattractive without carbon credits revenues. Thus, even when considering no costs for pulp and paper sludge acquisition, the utilization of this renewable biomass type by Santander Ceramic Industry can be considered an additional activity to what would happen in the absence of project activity, i.e., the use of "Pampa" kilns using exclusively fossil fuels (coal). Baseline scenario would involve lesser costs than project scenario.

In addition, it is important to note that this project design change did not affect the applicability of the methodology or the appropriateness of the baseline scenario. Therefore, this change did not negatively impact the conservativeness of the quantification of GHG emission reductions.

SECTION C. Description of monitoring system applied by the project

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[13].

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.

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[12] Available at: <http://cdm.unfccc.int/EB/Meetings/023/eb23_repan18.pdf>. Last visit on: 22/12/2016.

[13] Available at: <http://www.goldstandard.org/sites/default/files/gs_methodology_switch_to_biomass_fuel.pdf>. Last visit on: December 11th, 2018.

The project activity 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 results in emission reductions lower than 60,000 tCO_2e per year.

Baseline emissions are the before-project scenario 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 in low efficient kilns (measured in tCO_2e/brick produced). This practice is responsible to discharge in the atmosphere the carbon that was stored in the coal. On the other hand, project emissions include emissions related to the use of fossil fuel (co-firing) after the fuel switch in more efficient kilns.

The owner of each ceramic industry was responsible for implementing the monitoring plan. In addition, ceramic employees were responsible for filling forms for data collection and further classification. The authority for the registration, monitoring, measurement and reporting in Santander Ceramic Industry was Mr. Jesus Palacios, and Mr. Yesid Ruiz for Las Tapias 3 Ceramic Industry.

The management structure relies on local technicians with a periodical operation schedule during the project. The technical team managed the monitoring, the quality control and quality assessment procedures. Monitored parameters are described in Section D and were monitored with the frequency described in Table 4 below. Monitored data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity.

Table 4. Information on the monitored and fixed parameters of the present project activity

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/tonne	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.	Annually
$Q_{renbiomass}$	Quantity of renewable biomass combusted during the year y	Tonnes or m^3	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	Annually
Leakage due to competing uses of biomass	This source of leakage is relevant for biomass residues. The quantity of renewable biomass used will be assessed annually to determine the occurrence of leakage	tCO_2e	Monitored by surveys and publications	Annually
EF_{CO_2}	CO_2 emission for the baseline fossil fuel (coal)	tCO_2/TJ	2006 IPCC Guidelines for National Greenhouse Gas Inventories. More	Not monitored

			reliable or updated data may be used if they are available in the future.	
NCV_{coal}	Net calorific value for the baseline fuel (coal)	TJ/tonne	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*	tonne/m³	Bibliography, described in respective table at Section D. 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 factory	Not monitored

The Figure below shows a diagram of the monitoring system and information flow in the present project activity.

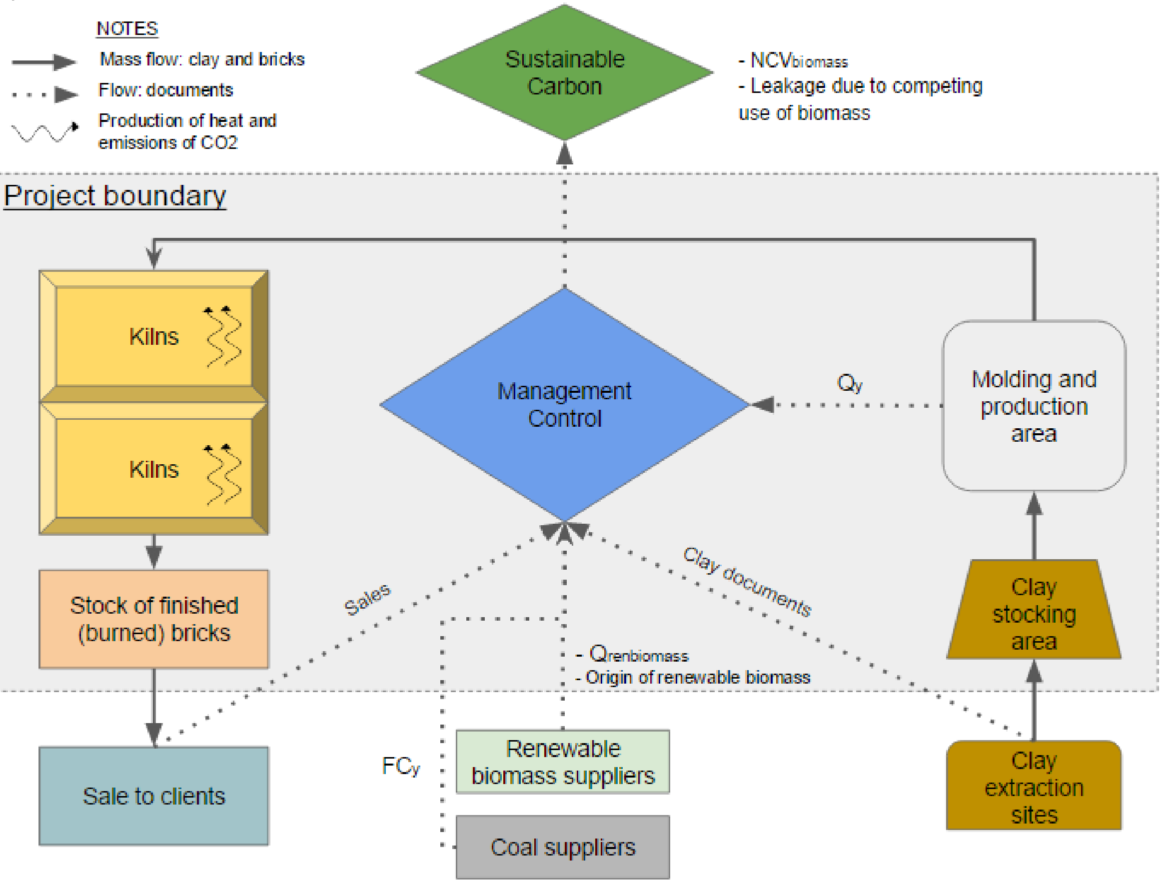

Figure 8. Diagram of the monitoring system and the information flow in the project activity

The diagram below shows the information flow of the monitored sustainability indicators inside the ceramic factory.

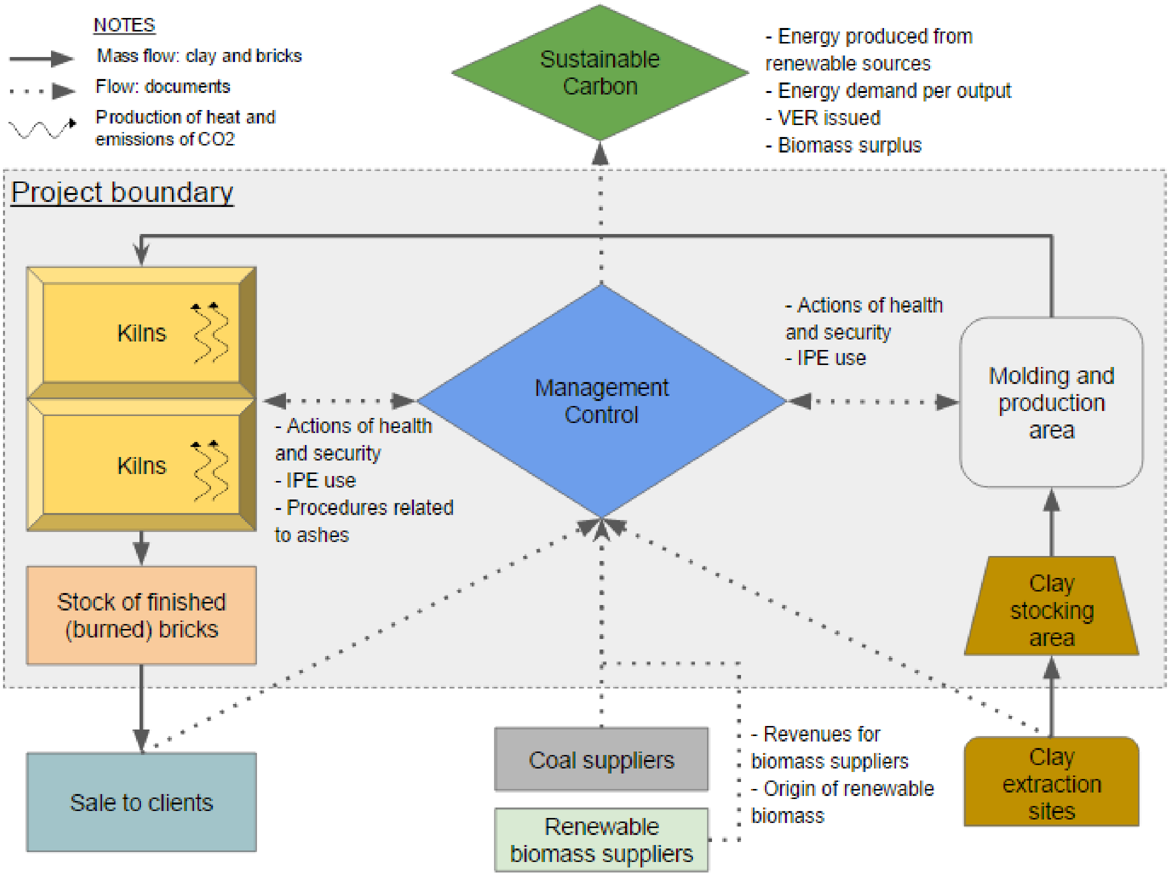

Figure 9. Diagram of the sustainability information flow in the project activity

SECTION D. Data and parameters

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

Relevant SDG Indicator	**SDG 13**
Data/parameter:	**EF_{CO_2}**
Unit	**tCO_2/TJ**
Description	CO_2 emission for the baseline fossil fuel (coal)
Source of data	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: 02/01/2017.
Value(s) applied)	94.6 tCO_2/TJ
Choice of data or measurement methods and procedures	In the baseline scenario, coal was used as an energy source. This is the common practice for the ceramic sector in Colombia. Default emission factors for coal are applied. Values were taken from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Purpose of data	This parameter was used to calculate baseline emissions from the use of the fossil fuel that would be used in the baseline scenario, i.e. coal.
Additional comments	Applicable for stationary combustion in manufacturing industries and construction. More reliable or updated sources/data may be used if they are available in the future.

Relevant SDG Indicator	SDG 13
Data/parameter:	**NCV_{coal}**
Unit	TJ/tonne
Description	Net calorific value for the baseline fuel (coal)
Source of data	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. Last visit on: 02/01/2017. Tests on the coal net calorific value are not part of the normal practice for coal purchase; therefore, default values were used.
Value(s) applied)	0.0282 TJ/tonne
Choice of data or measurement methods and procedures	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 were applied.
Purpose of data	This parameter was used to calculate baseline emissions, providing the energy generated by the amount of coal that would be used in the absence of the project activity.
Additional comments	More reliable or updated sources/data may be used if they are available in the future.

Relevant SDG Indicator	SDG 13
Data/parameter:	$\rho_{biomass}$
Unit	Tonne/m³
Description	Specific density of renewable biomass type *j*
Source of data	UNIDAD DE PLANEACION MINERO ENERGÉTICO (UPME). **Potencialidades de los Cultivos Energéticos y Residuos Agrícolas en Colombia**: Resumen Ejecutivo. Bogotá, 2013. Available at: <http://www.si3ea.gov.co/si3ea/documentos/documentacion/energias_alternativas/potencialidades/biomasa_CULTIVOS%20ENERGETICOS.pdf>. Last visit on 02/01/2016. Information on tables 39 and 41, Pages 94 and 95.
Value(s) applied)	**$\rho_{biomass}$ (in tonne/m³)** Sawdust: 0.190 Wood residues: 0.423
Choice of data or measurement methods and procedures	When the quantity of biomass combusted during the monitoring period was recorded in units of volume (m³) instead of units of weight, the Specific Density of the each biomass was used to convert from volume to weight.
Purpose of data	This parameter was used to convert the amount of biomass consumed by the project activity from volume to weight. Applicable for the calculation of leakage emissions due to competing use of biomass, and for the calculation of the ratio of biomass used in the project activity.
Additional comments	The considered humidity for sawdust was 20%. The specific density for wood residues was corrected in the **first** monitoring period. Santander Ceramic Industry utilizes municipal wood pruning and residues from the wood manufacturing industry as biomass. The previous $\rho_{biomass}$ value considered that wood residues would only be composed of chips, pieces, shavings and bark chips of wood. However, the ceramic industry also receives tree pruning that arrives as wood branches, which has a different density. Thus, the specific density value was corrected to be in accordance with the biomass that is actually used by the industry. The same

	source of data was utilized, calculating the average density of all forest species presented in the Table 41 of the referred report. Furthermore, the density of the wood manufacturing industry was calculated as the average density of chips, pieces, shavings and bark chips of wood with 20% humidity. Then, the average between those two values was considered as specific density for wood residues. More information is available in the MR Calculation spreadsheet. Data from published sources were used to determine this parameter. More reliable or updated sources/data may be used if they are available in the future.

Relevant SDG Indicator	**SDG 13**
Data/parameter:	**EF_{BSL}**
Unit	tCO_2e/thousand of bricks produced
Description	Emission factor for the baseline situation
Source of data	Historical information on brick production and fuel consumption in each ceramic industry.
Value(s) applied)	<table><tr><th rowspan="2">Data</th><th colspan="2">Value</th><th rowspan="2">Unit</th></tr><tr><th>Las Tapias 3 Ceramic</th><th>Santander Ceramic</th></tr><tr><td>EF_{BSL}</td><td>1.31</td><td>1.84</td><td>tCO_2e/thousand of bricks produced</td></tr></table>
Choice of data or measurement methods and procedures	Values were acquired using historical data on coal consumption and production of ceramic pieces when the ceramic industries used to consume fossil fuel in inefficient kilns. Data from year 2008 were used.
Purpose of data	Calculation of baseline emissions. This data was utilized to calculate the amount of GHG that would be emitted to produce a thousand bricks in the baseline scenario.
Additional comments	Data from 2008 (the last year before the project kilns became operational) from both ceramics were used for calculating this parameter. This value was calculated for each ceramic factory, through the multiplication of the total amount of fossil fuel consumed for captive energy generation in the baseline situation (FC_{BSL}) by the NCV for the baseline fuel (NCV_{coal}) by the CO_2 emission for the baseline fossil fuel (EF_{CO_2}), and then dividing this result by the net output generated in the baseline situation during the corresponding period of time for which the total fuel consumption was taken (Q_{BLS}). Although this parameter was included as a fixed parameter in the Section B.7.2 of the registered PDD – Description of the Monitoring Plan, it was not included in the Section B.6.2 – Data and parameters that are available at validation. Thus, the **first** MR included this parameter in the present Section D.1.

D.2. Data and parameters monitored

Relevant SDG Indicator	**SDG 13**
Data/parameter:	**Q_y**
Unit	Thousand of ceramic units
Description	Net output in the project activity in year *y*
Measured/calculated/default	Values used for calculations were taken from manual control of the amount of bricks loaded or unloaded from the kiln. Measurements were done by an internal control sheet monitored by ceramic employees.

Source of data	Controlled by ceramic industries owners.
Value(s) of monitored parameter	**Q_y (in thousands of bricks produced)** **Year** | **Las Tapias 3 Ceramic Industry** | **Santander Ceramic Industry** 2017 | 0 | 16,441 2018 | 0 | 12,536 TOTAL | 0 | 28,976
Monitoring equipment	No monitoring equipment was used to determine this parameter. Production was counted by trained personnel on each ceramic.
Measuring/reading/recording frequency:	This parameter was monitored by employees on each ceramic, quantifying the total production on a daily or weekly basis. Data was aggregated on a monthly and yearly basis.
Calculation method (if applicable):	Production was monitored through the number of bricks loaded in the kiln, which was manually measured on a daily or weekly basis and compiled into spreadsheets.
QA/QC procedures:	Both ceramic industries have an internal control of the quantity of pieces produced, which assures the proper monitoring of this parameter. Data was cross-checked according to the amount of fuel used by each ceramic.
Purpose of data:	This parameter was used to calculate baseline emissions, through the multiplication by the parameter EF_{BSL}. It was also used to calculate the amount of fossil fuel saved by the project activity, and the ratio between coal consumption and production of bricks during the monitored period.
Additional comments:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Relevant SDG Indicator	**SDG 13**
Data/parameter:	**FC_y**
Unit	Tonnes
Description	Amount of fossil fuel consumed for captive energy generation in the project activity in year *y*
Measured/calculated/default	Measured by fuel suppliers and controlled by ceramic owners. Data was individually controlled for each ceramic industry and fuel type.
Source of data	Controlled by each ceramic industry owner. This parameter was monitored through purchase invoice, delivery notes, receipts or other documents concerning the fossil fuel acquisition.
Value(s) of monitored parameter	**FC_y (in tonnes of coal)** **Year** | **Las Tapias 3 Ceramic Industry** | **Santander Ceramic Industry** 2017 | 0 | 3,243 2018 | 0 | 1,241 TOTAL | 0 | 4,484
Monitoring equipment	No monitoring equipment was used to determine this parameter.
Measuring/reading/recording frequency:	This parameter was monitored by documents concerning the acquisition of fossil fuel, quantifying the amount of coal purchased on a daily or weekly basis. Data was aggregated on a monthly and yearly basis. Measurement was done by a spreadsheet monitored by the project proponent. Information was cross-checked with production output.

	The amount of fossil fuel described above represents both the coal fired and coal stocked in the ceramic industries. These values are different from the actual coal fired at each ceramic. However, in the long term, fired and purchased values are likely to be similar.
Calculation method (if applicable):	Fossil fuel providers measure the amount of coal delivered to the ceramic industries due to financial payment. The amount of coal purchased on a daily or weekly basis was compiled into spreadsheets.
QA/QC procedures:	Both ceramic industries have an internal control of the quantity of fuel used. Data was cross-checked according to the receipts of purchase, delivery notes, receipts, or other documents concerning the acquisition of coal.
Purpose of data:	This parameter was used to calculate project emissions, through the multiplication by the parameters NCV_{coal} and EF_{CO2}. It was also used to calculate the amount of fossil fuel saved by the project activity, the ratio between coal consumption and production of bricks during the monitored period, and the ratio of renewable biomass use in the project activity.
Additional comments:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Relevant SDG Indicator	**SDG 13**
Data/parameter:	**$NCV_{biomass}$**
Unit	TJ/tonne
Description	Net calorific value for the renewable biomass
Measured/calculated/default	Default values from publications, scientific articles or laboratorial analysis.
Source of data	- Sawdust and wood residues Available at: <http://www.aalborg-industries.com.br/downloads/tabelas-tecnicas-aalborg-industries.pdf>. Last visited on: 06/01/2017. - Pulp and paper sludge Lab analysis carried out by the Fuel Combustion Laboratory of Universidad del Valle / Cali, Colombia in March 2015, required by Santander Ceramic Industry.
Value(s) of monitored parameter	**$NCV_{biomass}$ (in TJ/tonne)** Sawdust: 0.0147 Wood residues: 0.0158 Pulp and paper sludge: 0.0074
Monitoring equipment	No monitoring equipment was used to determine this parameter.
Measuring/reading/recording frequency:	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 different biomass net calorific values are not part of normal practices for biomass purchase; therefore, default values are used.
Calculation method (if applicable):	The NCV of wood residues was calculated through the average of NCVs from Eucalyptus bark, Eucalyptus woodchips, and wood pieces. This was done to be in accordance with the calculation of the wood residues density, which was calculated by the average of chips, pieces, shavings and bark chips of wood. The sludge analysis result carried out by the Fuel Combustion Laboratory of Universidad del Valle / Cali, Colombia measured its gross calorific value (GCV). The conversion from GCV to NCV was calculated according to 2006 IPCC Guidelines for National Greenhouse Gas Inventories, which recommended the use of the following study:

	"Calculation Tools for Estimating Greenhouse Gas Emissions from Pulp and Paper Mills, Version 1.1, July 8, 2005" page 8. Available at: <http://www.ghgprotocol.org/files/ghgp/tools/Pulp_and_Paper_Guidance.pdf>. Last visited on: 06/01/2016. According to the study above, an approximate relationship between NCV and GCV can be developed using a 0.95 ratio, thus: NCV/GCV = 0.95 It is important to note that the relation above is only valid when the energy content (in terms of both GCV and NCV) are expressed in terms of dry fuel, which was the case of the GCV analysis conducted by the Fuel Combustion Laboratory of Universidad del Valle / Cali, Colombia.
QA/QC procedures:	More reliable or updated sources/data may be used if they are available in the future.
Purpose of data:	This parameter was used to convert the amount of each biomass type consumed by the project activity from weight to energy. Applicable for the calculation of the renewable biomass use ratio in the project activity, which is related (not directly applied) for project emissions calculations.
Additional comments:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Relevant SDG Indicator	**SDG 13, SDG 7**
Data/parameter:	**$Q_{renbiomass}$**
Unit	Tonnes or m³
Description	Quantity of renewable biomass combusted during the year *y*
Measured/calculated/default	Measured by fuel suppliers and controlled by ceramic owners. Data was individually controlled for each ceramic industry and fuel type.
Source of data	Controlled by each ceramic industry owner. This parameter was monitored through purchase invoices, delivery notes, receipts or other documents concerning the biomass acquisition.
Value(s) of monitored parameter	(see table below)
Monitoring equipment	No monitoring equipment was used to determine this parameter.
Measuring/reading/recording frequency:	This parameter was monitored by documents concerning the acquisition of renewable biomass, quantifying the amount of each biomass purchased on a daily or weekly basis. Data was aggregated on a monthly and yearly basis. Measurement was done by a spreadsheet monitored by the project proponent. Information was cross-checked with production output. The amount of biomass described above represents both the biomass fired and stocked in the ceramic industries. These values are different from the actual biomass burned at each ceramic. However, in the long term, fired and purchased values are likely to be similar.
Calculation method (if applicable):	Biomass providers measure the amount of biomass delivered to the ceramic industries due to financial payment. The amount of biomass purchased on a daily or weekly basis was compiled into spreadsheets.

$Q_{renbiomass}$ (in tonnes of biomass)

Year	Las Tapias 3 Ceramic Industry	Santander Ceramic Industry			
		Sawdust	Wood residues	Pulp and paper sludge	Total
2017	0	588	2,856	8,008	11,453
2018	0	414	2,887	2,604	5,905
TOTAL	0	1,002	5,743	10,613	17,358

	In case any renewable biomass was measured in volume, default values of specific gravity ($\rho_{biomass}$) were used to convert it to tonnes.
QA/QC procedures:	Both ceramic industries have an internal control of the quantity of fuel used. Data was cross-checked according to the receipts of purchase, delivery notes, receipts, or other documents concerning the acquisition of renewable biomass.
Purpose of data:	This parameter was used to calculate leakage emissions due to competing use of biomass. It was also used to calculate the ratio of renewable biomass use in the project activity during this monitored period.
Additional comments:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Relevant SDG Indicator	**SDG 13, SDG 7**
Data/parameter:	**Origin of Renewable Biomass**
Unit	Not applicable
Description	Renewable origin of the biomass
Measured/calculated/ default	The guarantee of acquiring renewable biomass was achieved by invoices from biomass providers. Biomasses were considered renewable as fulfilling the options described in the Annex 18 of the 23rd meeting report of the CDM Executive Board.
Source of data	Controlled by ceramic industries owners.
Value(s) of monitored parameter	Not applied for calculations. All biomass used during the monitoring period are demonstrably renewable and traceable, since they comply with CDM definitions of renewable biomass.
Monitoring equipment	No monitoring equipment was used to determine this parameter.
Measuring/reading/ recording frequency:	This information was given by biomasses providers. The guarantee of acquiring renewable biomass was achieved through invoices or receipts from providers. All biomasses (sawdust, wood chips, and pulp and paper sludge) are considered renewable as fulfilling definitions of renewable biomass approved by the CDM Executive Board.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Ceramic owners shall store invoices, receipts of sales or other documents to allow for the assessment of the origin of the renewable biomass. In addition, legal documents (Registration at the Chamber of Commerce in Colombia or Environmental licenses) of each provider were also utilized to prove that the biomass was provided from a legal and renewable origin.
Purpose of data:	Not directly applied for calculations. This parameter is used to guarantee that all biomass acquired by the project activity has a renewable origin.
Additional comments:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later. This parameter incorporates indicator number 08 (Origin of renewable biomass) from the Sustainability Monitoring Plan from the previous monitoring report. It was adapted to include the values monitored in each monitoring report. This change occurred due to the changes from Gold Standard to Gold Standard for Global Goals. Since the proposals from both parameters are similar, they can be monitored just by one parameter.

<table>
<tr><th>Relevant SDG Indicator</th><th>SDG 13, SDG 7</th></tr>
<tr><td>Data/parameter:</td><td>Leakage due to competing uses of biomass</td></tr>
<tr><td>Unit</td><td>tCO2e</td></tr>
<tr><td>Description</td><td>This source of leakage is relevant for biomass residues, according to the general guidance on leakage in biomass project activities. The quantity of renewable biomass used by the project was annually assessed to evaluate the occurrence of leakage due to competing uses of biomass. This occurs if the quantity of available biomass in the region is 25% lower than the quantity of biomass that is utilized including the project activity.</td></tr>
<tr><td>Measured/calculated/ default</td><td>Calculated</td></tr>
<tr><td>Source of data</td><td>Monitored by surveys and publications</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Leakage emissions are calculated as 0 (zero) tCO2e in this monitoring period.
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 was considered:
<table>
<tr><th colspan="3">Leakage due to competing uses of biomass</th></tr>
<tr><th>Biomass</th><th>Surplus (tonnes)</th><th>Year</th></tr>
<tr><td>Sawdust</td><td>103,740</td><td>2003</td></tr>
<tr><td>Wood residues</td><td>264,810</td><td>2003</td></tr>
<tr><td>Pulp and paper sludge</td><td>420,000</td><td>2014</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>No monitoring equipment was used to calculate this parameter.</td></tr>
<tr><td>Measuring/reading/ recording frequency:</td><td>Biomass surplus was determined ex ante and Sustainable Carbon performs an annual assessment of the occurrence of leakage from this source.</td></tr>
<tr><td>Calculation method (if applicable):</td><td>According to the "General guidance on leakage in biomass project activities"[14], the project participant shall evaluate ex ante if there is a biomass surplus 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 monitoring 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.
Therefore, it is assumed that there is enough biomass surplus in the region to avoid the occurrence of leakage.</td></tr>
<tr><td>QA/QC procedures:</td><td>Data available regarding ceramic industries fuel consumption were utilized to monitor the leakage due to competing uses of biomass.</td></tr>
<tr><td>Purpose of data:</td><td>Calculation of leakage emissions due to competing use of biomass. This parameter is used to evaluate if there is any source of indirect emission related to renewable biomass. If applicable, leakage emissions are used to adjust emission reductions resulting from the project.</td></tr>
<tr><td>Additional comments:</td><td>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.</td></tr>
</table>

[14] Available at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentC.pdf>. Last visit on December 20th, 2018.

	This parameter incorporates indicator number 09 (Biomass surplus) from the Sustainability Monitoring Plan from the previous monitoring report. It was adapted to include the values monitored in each monitoring report. This change occurred due to the changes from Gold Standard to Gold Standard for Global Goals. Due to the fact that the proposals from both parameters are similar, they can be monitored just by one parameter. The research taken by leakage analysis approaches the biomass surplus measures defined in the indicator number 09.

Relevant SDG Indicator	**SDG 8**
Data/parameter:	**Actions of Health and Security**
Unit	-
Description	Monitoring of quantity and quality of Health and Security actions on the ceramic factory
Measured/calculated/ default	Measured according to the following indicator from SOCIALCARBON Standard: SOCIALCARBON indicators for Industries of the Ceramic Sector[15]: Actions of Health and Security.
Source of data	Evidence of participatory meetings, interviews, PPE control records, health and safety programs (CIPA PCMSO, PPRA), supervised PPE use (warnings, suspension), participant sign-in lists for lectures, contracts with health and safety professionals. In addition, site visits and interviews with employees and managers of ceramic factory are to be used as evidence of the health and security actions whenever feasible.
Value(s) of monitored parameter	The indicator "Actions of Health and Security" from SOCIALCARBON Standard allows classifying the project activity into following scenario: "Scenario 4: The company develops regular campaigns, meetings, training regarding occupational health and security in the last 12 months."
Monitoring equipment	No monitoring equipment was used to calculate this parameter.
Measuring/reading/ recording frequency:	The parameter is monitored by each monitoring period. The assessment on relevant score of the SOCIALCARBON indicator was performed on the current monitoring period.
Calculation method (if applicable):	To collect information on the quality of employment focusing on actions of health and security, it is applied the following indicator from SOCIALCARBON Standard: - Social Carbon indicators for Ceramic Industry: Actions of Health and Security – Evaluates the existence and performance of campaigns, leisure and goal and plans regarding to health and security. The project situation was analysed on a periodical basis and was scored from 1 to 6, where 1 represents a critical situation and 6 represents a sustainable scenario.
QA/QC procedures:	Ceramic owners shall store evidence of participatory meetings, interviews, PPE control records, health and safety programs (CIPA PCMSO, PPRA), supervised PPE use (warnings, suspension), participant sign-in lists for lectures, contracts with health and safety professionals.
Purpose of data:	Determine the score achieved by the project for the quality and quantity of actions of health and security, according to the sustainability monitoring plan.
Additional comments:	The baseline situation included some inefficient kilns that had no roofing or chimneys, thus not allowing the control of atmospheric emissions. These kilns exposed workers to significant levels of air pollution. According to the indicator "Actions of Health and Security" from SOCIALCARBON Standard, the baseline scenario of this parameter was:

15 <http://www.socialcarbon.org/wp-content/themes/socialcarbon/docs/Industries_Ceramic_Sector_v8.2_09_06_2011.pdf>. Last visited on March, 13th, 2019.

	"Scenario 3: Only occasional campaigns or lectures of awareness regarding the occupational health and security in the last 12 months AND/OR Security internal communication in specific places (ex: posters, warnings, etc)." This parameter incorporates indicator number 02 (Actions of Health and Security) and 03 (IPE Use) from the Sustainability Monitoring Plan from the previous monitoring report. It was adapted to include the values monitored in each monitoring report. This change occurred due to the changes from Gold Standard to Gold Standard for Global Goals. The junction occurs because the Actions of Health and Security indicator already monitors the IPE use, and for this reason it is not necessary a separate indicator for this action.

Relevant SDG Indicator	**SDG 7**
Data/parameter:	**Access to affordable and clean energy services**
Unit	%
Description	Percentage of renewable energy produced in comparison with the total energy produced.
Measured/calculated/default	Calculated
Source of data	The amount of renewable energy used by the ceramic factory was monitored during the monitoring period through purchase invoices, delivery notes or other documents concerning the acquisition of biomass and coal.
Value(s) of monitored parameter	The measures applied by the project activity resulted in renewable energy generation by utilizing renewable biomasses instead of fossil fuel. During the current monitoring period, Santander Ceramic Industry produced the following amount of renewable energy per year:
Monitoring equipment	No monitoring equipment was used to calculate this parameter.
Measuring/reading/recording frequency:	Annually.
Calculation method (if applicable):	The energy production from fossil fuel as well the energy production from renewable biomass are calculated utilizing the data regarding coal consumption and renewable biomass consumption and multiplying these values by each net calorific value. Then, the percentage of renewable participation in the total energy production is defined.
QA/QC procedures:	The ceramic factory has an internal control of the quantity of fuel used. Data used to calculate the energy generated was cross-checked according to the receipts of purchase, delivery notes, receipts, or other documents concerning the acquisition of coal.
Purpose of data:	Determine the quantity of renewable energy used for the production in comparison to the total energy used in the monitoring period.
Additional comments:	In the baseline situation, both ceramic industries used exclusively fossil fuels (coal) for thermal energy generation. The target is to generate more energy from renewable sources than the baseline situation. Thus, the project is expected to positively impact the access to affordable and clean energy sources, which were not utilized in the baseline scenario.

Year	Energy produced from renewable sources (TJ)	Energy produced from fossil fuel sources (TJ)	Total energy produced (TJ)	Renewable energy participation in total energy produced (%)
2017	113	91	205	55%
2018	71	35	106	67%
Total	185	126	311	59%

	This parameter corresponds to indicator number 05 (Total energy produced from renewable sources) from the Sustainability Monitoring Plan from the previous monitoring report. It was adapted to include the values monitored in each monitoring report. This change occurred due to the changes from Gold Standard to Gold Standard for Global Goals.

Relevant SDG Indicator	**SDG 7**
Data/parameter:	Procedures related to the control and disposal of ashes
Unit	-
Description	Monitoring the procedures related to the control and disposal of ashes
Measured/calculated/default	Measured according to the following indicator from SOCIALCARBON Standard: Social Carbon indicators for Ceramic Industry: Ashes
Source of data	Interviews and meetings with stakeholders and ceramic personal on each ceramic. In addition, photographs are to be used as evidence of the final destination whenever feasible.
Value(s) of monitored parameter	Santander Ceramic Industry provided a proper destination to ashes resulted from biomass combustion through one of the following options: - Ashes are taken to the waste material deposit and then grounded and mixed with the clay; - Ashes are sifted and then mixed and watered with the waste material, composing a mixture used for sealing kilns' doors; - Ashes are used in the maintenance of rural roads, helping communities of the project region. Ashes are sent in dump trucks and then watered and compressed. The indicator "Ashes" from SOCIALCARBON Standard allows classifying the project activity into following scenario: "Scenario 3: Ashes are totally reused or donated, but without specific control."
Monitoring equipment	No monitoring equipment was used to calculate this parameter.
Measuring/reading/recording frequency:	The parameter is monitored by each monitoring period. The assessment on relevant score of the SOCIALCARBON indicator was performed on the current monitoring period.
Calculation method (if applicable):	To collect information on the procedures related to control and disposal of ashes, it is applied the following indicator from SOCIALCARBON Standard: - Social Carbon indicators for Ceramic Industry: Ashes – Evaluates the procedures adopted by the entrepreneur in order to control the ashes and its destination. The project situation was analysed on a periodical basis and was scored from 1 to 6, where 1 represents a critical situation and 6 represents a sustainable scenario.
QA/QC procedures:	The ceramic factory has an internal control of the procedures to reuse or donate ashes. It is used interviews and meetings with stakeholders and ceramic personal on each ceramic. In addition, photographs are to be used as evidence of the final destination whenever feasible
Purpose of data:	Determine the procedures adopted by the ceramic factory for the control and disposal of ashes.
Additional comments:	This parameter corresponds to indicator number 01 (Procedures related to the control and disposal of ashes) from the Sustainability Monitoring Plan of the previous monitoring report. It was adapted to include the values monitored in each monitoring report. This change occurred due to the changes from Gold Standard to Gold Standard for Global Goals.

Relevant SDG Indicator	SDG 7
Data/parameter:	**Energy demand per production output**
Unit	TJ/thousand of ceramic pieces
Description	Energy demand per thousand of ceramic pieces.
Measured/calculated/default	Calculated
Source of data	It was used receipts of purchase, delivery notes, receipts, or other documents concerning the acquisition of coal and biomass. The production is checked trough an internal control of the quantity of pieces produced.
Value(s) of monitored parameter	The measures applied by the project activity resulted in the reduction of around 45% in the energy demand to produce 1,000 bricks in Santander Ceramic Industry. During the current monitoring period, Santander Ceramic Industry required the following energy demand per production output per year: <table><tr><th>Year</th><th>Total energy produced (TJ)</th><th>Production (in thousands of bricks)</th><th>Energy demand per production output (TJ/thousand bricks)</th></tr><tr><td>2017</td><td>205</td><td>16,441</td><td>0.012</td></tr><tr><td>2018</td><td>106</td><td>12,536</td><td>0.008</td></tr><tr><td>Average</td><td>156</td><td>14,488</td><td>0.011</td></tr></table>
Monitoring equipment	No monitoring equipment was used to calculate this parameter.
Measuring/reading/recording frequency:	Annually.
Calculation method (if applicable):	The energy demand per production output was monitored in order to determine the amount of energy (in TJ) needed to produce 1,000 ceramic pieces in Santander ceramic industry during each year of the monitoring period. The total energy utilized (both from coal and renewable biomasses) was obtained by multiplying the amount of each fuel (in tonnes or m³) by default NCV values. This result was then divided by the production output in the same period to determine the energy demand per thousands of bricks.
QA/QC procedures:	The ceramic factory has an internal control of the quantity of fuel used. Data used to calculate the energy generated was cross-checked according to the receipts of purchase, delivery notes, receipts, or other documents concerning the acquisition of coal and biomass. The production is monitored trough an internal control of the quantity of pieces produced, which assures the proper monitoring of this parameter.
Purpose of data:	Determine the quantity of energy is used to produce one thousand of ceramic pieces.
Additional comments:	This parameter corresponds to indicator number 05 (Energy demand per production output) from the Sustainability Monitoring Plan of the previous monitoring report. It was adapted to include the values monitored in each monitoring report. This change occurred due to the changes from Gold Standard to Gold Standard for Global Goals.

Relevant SDG Indicator	SDG 8
Data/parameter:	**Revenues for biomass suppliers**
Unit	CLP/ton of biomass
Description	Revenue (in CLP) for each biomass supplier provided by the project activity.
Measured/calculated/default	Calculated
Source of data	The total revenues are monitored by interviews with biomass suppliers, purchase invoices, receipts of sale and/or other documents concerning biomass acquisition.

<table>
<tr><td>Value(s) of monitored parameter</td><td>The project activity helps reducing costs related to waste handling and disposal by biomass suppliers. In the baseline situation, either private companies or public entities had to face higher costs to dispose residues in landfills. Thus, the project activity utilizes a residue as biomass for energy generation, giving a sustainable use for this waste and creating a renewable biomass supply chain.
The ceramic industry does not pay for the biomass, but the providers reduce their costs regarding the disposal of residues by sending it to the factory instead of a landfill. During the current monitoring period, Santander Ceramic Industry provided a revenue of CLP 170.000/ ton of pulp and paper sludge and CLP 370.000/ton of wood residues.
<table>
<tr><td></td><td>Pulp and paper sludge</td><td>Wood residues</td><td></td></tr>
<tr><td>Expanse with landfill/ton</td><td>200,000</td><td>400,000</td><td>CLP/ton</td></tr>
<tr><td>Expanse with transportation/ton</td><td>30,000</td><td>30,000</td><td>CLP/ton</td></tr>
<tr><td>TOTAL</td><td>170,000</td><td>370,000</td><td>CLP/ton</td></tr>
</table>
<table>
<tr><td>Quantity aquired</td><td>8,008</td><td>3,444</td><td>ton</td></tr>
<tr><td>TOTAL revenue</td><td>1,361,360,000</td><td>1,274,280,000</td><td>CLP</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>No monitoring equipment was used to calculate this parameter.</td></tr>
<tr><td>Measuring/reading/recording frequency:</td><td>Annually.</td></tr>
<tr><td>Calculation method (if applicable):</td><td>The value of revenues for biomass suppliers is calculated by the value of residue disposal in a landfill, which is avoided by sending the biomass to the ceramic factory. On this value is discounted the costs of transportation. The amount of biomass acquired by Santander Ceramic Industry is multiplied by the expanse avoided for ton of biomass. The result of the calculation is the revenue provided for each biomass supplier in each year monitored.</td></tr>
<tr><td>QA/QC procedures:</td><td>Total revenues are monitored by interviews with biomass suppliers, purchase invoices, receipts of sale and/or other documents concerning biomass acquisition.</td></tr>
<tr><td>Purpose of data:</td><td>Monitor the total revenues for each biomass supplier provided by the project activity.</td></tr>
<tr><td>Additional comments:</td><td>This parameter corresponds to indicator number 07 (Revenues for biomass suppliers) from the Sustainability Monitoring Plan of the previous monitoring report. It was adapted to include the values monitored in each monitoring report. This change occurred due to the changes from Gold Standard to Gold Standard for Global Goals.</td></tr>
</table>

Relevant SDG Indicator	**SDG 13**
Data/parameter:	**Voluntary Emission Reductions issued**
Unit	VERs
Description	Voluntary emission reductions issued
Measured/calculated/default	Calculated
Source of data	It was used the reports from the registry platform to control the amount of VERs that were issued.
Value(s) of monitored parameter	67,745 t issued.

Monitoring equipment	No monitoring equipment was used to calculate this parameter.
Measuring/reading/recording frequency:	The parameter is monitored by each monitoring period.
Calculation method (if applicable):	The calculation was made based on the quantity issued on the registry.
QA/QC procedures:	The control of issuances was compared to the reports from the registry platform.
Purpose of data:	To calculate the amount of VERs issued.
Additional comments:	This parameter corresponds to indicator number 06 (Voluntary Emission Reductions issued) from the Sustainability Monitoring Plan of the previous monitoring report. It was adapted to include the values monitored in each monitoring report. This change occurred due to the changes from Gold Standard to Gold Standard for Global Goals.

D.3. Implementation of sampling plan

Not applicable. No sampling approach was conducted.

SECTION E. Calculation of SDG outcomes

E.1. Calculation of baseline value or estimation of baseline situation of each SDG outcome

SDG 7 (Affordable and Clean Energy)
The contribution to SDG 7 is defined as the percentage of renewable energy participation in total energy produced. As there was no use of renewable biomass in the baseline, the baseline value is 0%.

SDG 8 (Decent Work and Economic Growth)
The contribution to SDG 8 is defined as the score of the project by applying Social Carbon indicators for Ceramic Industry: Actions of Health and Security[16]. The project situation was analysed on a periodical basis and was scored from 1 to 6, where 1 represents a critical situation and 6 represents a sustainable scenario. The baseline scenario of this parameter was: "Scenario 3: Only occasional campaigns or lectures of awareness regarding the occupational health and security in the last 12 months AND/OR Security internal communication in specific places (ex: posters, warnings, etc)".

SDG 13 (Climate Action)
Baseline emissions were estimated following procedures of the applied methodology: "Ecologically Sound Fuel Switch to Biomass with Reduced Energy Requirement", version 1.0. According to this methodology, baseline emissions are the current (i.e. before-project) emissions of the facility expressed as emissions per unit of output. Baseline emissions are calculated by multiplying the monitored units of output with the baseline emissions factor per unit of output, following equations below:

$$BE_y = EF_{BSL} * Q_y$$

Where,

BE_y Baseline emissions in the project activity in year y (tCO_2e);
EF_{BSL} Emission factor for the baseline situation (tCO2e/thousand of bricks produced);
Q_y Net output in the project activity in year y

[16] SOCIALCARBON Indicators for Red Ceramic Factories, Brazil. Available at <http://www.SOCIALCARBON.org/wp-content/uploads/2012/11/Red-Ceramic-Indicators_v02_05_09_2013.pdf> . Last visit on January 04th, 2019.

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, according to the equation below.

$$EF_{BSL} = (FC_{BSL} * EF_{CO_2} * NCV_{coal}) / Q_{BLS}$$

Where,

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

Box 1 - Sample calculations for formulae used for the calculation of baseline emissions

Example for Santander Ceramic Industry, year 2017

$BE_y = EF_{BSL} * Q_y$

$BE_y = 1.84 * 16{,}441$

$BE_y = 30{,}188\ tCO_2e$

Note: both EF_{BSL} and Q_y values in the example above are rounded.

Baseline emissions of the present project activity are described in Table 5 below, which shows values per year and per ceramic industry.

Table 5. Baseline emissions (BEy), in tCO2e

Year	Las Tapias 3 Ceramic Industry	Santander Ceramic Industry	Total
2017	0	30,188	30,188
2018	0	23,017	23,017
Total	0	53,205	53,205

E.2. Calculation of project value or estimation of project situation of each SDG outcome

>> (*Provide details of equations and approaches used to calculate/estimate project values.)*

SDG 7 (Affordable and Clean Energy)

The contribution to SDG 7 is defined as the percentage of renewable energy participation in total energy produced. The total amount of fossil fuel utilized is monitored through documents concerning the acquisition of coal and the total amount of renewable biomass is monitored through purchase invoices, delivery notes or other documents concerning the acquisition of the biomass.

The ratio of energy provided by biomass use is calculated as per the following equations:

$$EP_{fossilfuel} = (FF_c * NCV_{coal})$$

Where:

$EP_{fossilfuel}$: Energy production from fossil fuel (TJ)
FF_c: Coal consumption (ton)
NCV_{coal}: Net calorific value for the fossil fuel (TJ/ton)

$$EP_{biomass} = (RB_c * NCV_{biomass})$$

Where:
$EP_{biomass}$: Energy production from renewable biomass (TJ)
RB_c: Renewable biomass consumption (ton)
$NCV_{biomass}$: Net calorific value for renewable biomass (TJ/ton)

Then, the percentage of renewable energy participation (%RB) in total energy produced is defined as:

$$\%RB = EP_{biomass} / (EP_{biomass} + EP_{fossilfuel})$$

Considering this calculation procedure, during this monitoring period, the project used 55% of renewable energy in 2017 and 67% in 2018, as can be seen in table 6 below.

Table 6. Ratio in energy basis

	Ratio in energy basis			
Year	Energy production from coal (TJ)	Energy production from renewable biomass (TJ)	Total Energy Production (TJ)	% biomass
2017	91	113	205	55%
2018	35	71	106	67%
TOTAL	126	185	311	59%

SDG 8 (Decent Work and Economic Growth)

The project promotes inclusive and sustainable economic growth, employment and decent work, due to its positive impacts in the quality of employment. The baseline situation includes some inefficient kilns that had no roofing or chimneys, thus exposing workers to significant levels of air pollution. The Ceramic Companies modified the kilns and began to monitor the air quality in order to adapt to the legal requirements of Colombia. Besides that, the project includes a certain level of automation in the logistics, which improves the working conditions of employees responsible for feeding the kilns with bricks and fuels.

The Project Activity is also committed with actions of health and security for all employees. To monitor the project impact on the quality of employment, the project will apply an indicator from SOCIALCARBON Standard[17].

The Project classification applied is:

- Score 1: There is no control of PPE distribution. None of the health and safety programs required by law are being implemented.

[17] The SOCIALCARBON Standard is a certification adept at bringing demonstrable social, environmental and economic benefits to the stakeholders of carbon offset projects. More information at: < http://www.SOCIALCARBON.org/>. Last visit on: 04/01/2019.

- Score 2: PPE distribution is being controlled OR there is at least one health and safety program required by law being implemented.
- Score 3: The factory meets all legal requirements.
- Score 4: The factory meets all legal requirements and: (a) penalizes employees who do not properly use the PPE and/or (b) has signs encouraging the use of PPE in the factory and/or (c) The factory promotes lectures and events addressing issues related to health and safety in the workplace.
- Score 5: In addition to scenario 4, the factory contracts or has a technical professional or safety engineer on staff to ensure best practices in the company.
- Score 6: In addition to scenario 5, the factory develops complementary programs such as PPR, PPRPS and PCA; and/or The factory encourages physical activity or conducts activities for disease prevention.

During the current Monitoring Period, the Project was classified as Score 4, as the factory promoted lectures and events addressing issues related to health and safety in the workplace.

SDG 13 (Climate Action)

Project emissions are calculated using equation:

$$PE_Y = FC_Y * EF_{CO_2} * NCV$$

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_{CO_2} CO_2 emission factor for fossil fuel (tCO_2/TJ)
NCV Net calorific value for the fossil fuel (TJ/mass or volume unit)

Box 2 - Sample calculations for formulae used for the calculation of project emissions

Example for Santander Ceramic Industry, year 2017

$PE_y = FC_y * EF_{CO_2} * NCV_{coal}$

$PE_y = 3,243.35 * 94.6 * 0.0282$

$PE_y = 8,653$ tCO_2e

Note: Values in the example above are rounded up.

Project emissions due to the use of fossil fuel (coal) after the fuel switch are presented in Table 7 below, which describes project emissions per year and per project site.

Table 7. Project emissions (PEy), in tCO2e

Year	Las Tapias 3 Ceramic Industry	Santander Ceramic Industry	Total
2017	0	8,653	8,653
2018	0	3,310	3,310
Total	0	11,963	11,963

Project emissions related to A. Shifts of pre-project activities; B. Production of Biomass, and C. Competing uses of the Biomass (if the source is under control of project participants) do not occur in the present project activity.

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.

The Attachment C to Appendix B of the Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories[18] provides general guidance on leakage in biomass project activities. The document provides different emission sources based on the 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 leakage sources.

Table 8. Sources of leakage according to the biomass type

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

According to the table above, the sources of leakage relevant to the present project activity are the competing use of biomass residues or waste. Sources of leakage are described below according to each biomass type utilized by the project activity during the current monitored period.

<u>Sawdust</u>

The production of wood generates a large amount of residues, which can be reused to generate thermal energy. Sawdust is a 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, 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[19].

[18] Available at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentC.pdf>. Last visit on: 22/12/2016.

[19] UNIDAD DE PLANEACIÓN MINERO ENERGÉTICA. Potencialidades de los Cultivos Energéticos y Residuos Agrícolas en Colombia - Resumen Ejecutivo. Bogotá, D.C., 2003. Information on Sections 3.2 and 3.3. Available at: <http://www.si3ea.gov.co/si3ea/documentos/documentacion/energias_alternativas/potencialidades/biomasa_CULTIVOS%20ENERGETICOS.pdf>. Last visited on 11/01/2017.

Tables below provide an estimate on the production of Colombian forests and on the availability potential of wood residues.

Table 9. Wood production in Colombian native forests

Forest type/region	*Approximate Area* (hectares)	*Wood productivity* (m³ of wood per hectare)	*Wood residues* (%)	*Wood residues* (m³)
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 10. Wood production in Colombian commercial forests

Forest type/region	Approximate 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

Tables above show 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* (2003).

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 the total wood residues in the wood chain[20]. Moreover, sawmills in Colombia usually store large amounts of sawdust that mount up as a by-product of wood[21], which are often donated as long as the user pays for the transport[22]. In order to prove this information, a call between The Gold Standard and a local biomass provider occurred on April 25th, 2013. The biomass provider affirmed that a huge amount of wood residues (including sawdust) generated in Colombia are burnt in open dumps, and only a part of it is utilized or informally donated. He estimated that only 30% of the total wood residues generated are utilized.

[20] LÓPEZ, O. Estado del desarrollo tecnológico de la industria Forestal. En: Memorias conferencia Internacional de Bosques "Colombia: País de bosques y vida". Santa Marta: Peter Saile, María Angela Torre Editores. 544p. 2003.

[21] BUSTILLO, L. et al. 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, 2012.

[22] 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**, [S.l.], v. 9, n. 18, p. 98-108, nov. 2004. ISSN 0120-0739. Available at: <http://revistas.udistrital.edu.co/ojs/index.php/colfor/article/view/3050>. Last visited on 11/01/2017.

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

Table 11. Estimated availability of sawdust in Colombia

Forest type/region	Wood residues (m^3)	Sawdust (%)	Sawdust (tonnes)
Native forests	58,125,000	10%	1,104,375
Commercial forests	5,460,000	10%	103,740
Total	63,585,000	-	1,208,115

For the assessment of biomass surplus, only the fraction of sawdust from commercial forests was considered. This leads to a conservative estimate of 103,740 tonnes of sawdust per year. It is important to note 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 EB 23 Annex 18 (definition of renewable biomass)[23].

During the current monitored period, the sawdust consumption by this project activity was around 501 tonnes per year (Y). In addition, the other users consumption, which was estimated as 30% of the total sawdust generated (according to the biomass provider statement during the call with the GS), would represent around 31,122 tonnes per year (Z). From a total of 103,740 tonnes of sawdust produced annually in Colombia (X), the estimated surplus availability of this biomass was greater than 25%, as: ((X-Y-Z) / X) > 25%. This data is summarized in the table below.

Table 12. Estimated surplus availability of sawdust in the project region

Data	Value
Estimated availability of sawdust (X)	103,740 tonnes of sawdust/year
Project consumption (Y)	501 tonnes of sawdust/year
Other users consumption (Z)	31,122 tonnes of sawdust/year
Surplus availability ((X-Y-Z) / X)	70%

Therefore, based on the studies above, the surplus availability of sawdust in the project region was about 70%, which is greater than 25% and thus, avoiding the possibility of competing uses of biomass due to the project activity.

In addition, it is expected that the estimated surplus availability of this biomass would be even greater as only the fraction of sawdust from commercial forests was considered. Sawdust originating from native forest is also a considerable source of biomass.

Wood residues

The production of wood generates a large amount of residues, which can be reused to generate thermal energy. Colombian forest production is an important economic activity, although commercial reforestation is not widely developed in the Country. In 2003, commercial forests were estimated to occupy merely 0.15% of the Colombian territory. Colombian wood industries have historically used predominantly wood from natural forests under the Government administration[24].

[23] Available at: <http://cdm.unfccc.int/EB/Meetings/023/eb23_repan18.pdf>. Last visit on: 22/12/2016.

[24] UNIDAD DE PLANEACIÓN MINERO ENERGÉTICA. Potencialidades de los Cultivos Energéticos y Residuos Agrícolas en Colombia - Resumen Ejecutivo. Bogotá, D.C., 2003. Information on Sections 3.2 and 3.3. Available at: <http://www.si3ea.gov.co/si3ea/documentos/documentacion/energias_alternativas/potencialidades/biomasa_CULTIVOS%20ENERGETICOS.pdf>. Last visited on 11/01/2017.

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

Table 13. Wood production in Colombian native forests

Forest type/region	*Approximate Area* (hectares)	*Wood productivity* (m^3 of wood per hectare)	*Wood residues* (%)	*Wood residues* (m^3)
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 14. Wood production in Colombian commercial forests

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

Tables above show 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* (2003).

The same report provides values for expected density of wood residues. The density of wood residues was conservatively calculated as the average density of chips, pieces, shavings and bark chips of wood with 20% humidity, which resulted in around 194 kg/m^3. However, it is important to note that this value would be higher if wood branches were also taken into consideration.

Residues from wood processing (harvesting and sawmills) usually compose 75% of the total wood production volume in a plantation[25]. As a conservative estimate, it was assumed that wood residues that could be utilized as biomass would represent only 25% of the total wood residues production in Colombia, which would avoid the possibility of leakage by competing uses of biomass. This approach leads to the figures in the table below:

Table 15. Estimated availability of wood residues in Colombia

Forest type/region	Wood residues (m^3)	Wood residues (%)	Wood residues (tonnes)
Native forests	58,125,000	25%	2,819,062
Commercial forests	5,460,000	25%	264,810
Total	63,585,000	-	3,083,872

[25] LÓPEZ, O. Estado del desarrollo tecnológico de la industria Forestal. En: Memorias conferencia Internacional de Bosques "Colombia: País de bosques y vida". Santa Marta: Peter Saile, María Angela Torre Editores. 544p. 2003.

Furthermore, a call between The Gold Standard and a local biomass provider in the project region occurred on April 25th, 2013. The biomass provider affirmed that a huge amount of wood residues generated in Colombia are burnt in open dumps, and only a part of it is utilized or informally donated. He estimated that only 30% of the total wood residues generated are utilized.

For the assessment of biomass surplus, only the fraction of wood residues from commercial forests was considered. This leads to a conservative estimate of 264,810 tonnes of wood residues per year. It is important to note that the project may use wood residues 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 EB 23 Annex 18 (definition of renewable biomass)[26].

During the current monitored period, wood residues consumption by this project activity was around 2,872 tonnes per year (Y). In addition, the other users consumption, which was estimated as 30% of the total generated (according to the biomass provider statement during the call with the GS), would represent around 79,443 tonnes per year (Z). From a total of 264,810 tonnes of wood residues produced annually in Colombia (X), the estimated surplus availability of this biomass was greater than 25%, as: ((X-Y-Z) / X) > 25%.

Table 16. Estimated surplus availability of wood residues in the project region

Data	Value
Estimated availability of wood residues (X)	264,810 tonnes of wood residues/year
Project consumption (Y)	2,872 tonnes of wood residues/year
Other users' consumption (Z)	79,443 tonnes of wood residues/year
Surplus availability ((X-Y-Z) / X)	69%

Therefore, based on the studies above, the surplus availability of wood residues in the project region was about 69%, which is greater than 25% and thus, avoiding the possibility of competing uses of biomass due to the project activity.

In addition, it is expected that the estimated surplus availability of this biomass would be even greater due to conservative approaches described above. Wood residues originating from native forest is also a considerable source of biomass.

Pulp and paper sludge

The production of pulp and paper generates large quantities of wastewater that shall be purified to avoid severe pollution of the environment. However, wastewater treatment produces large volumes of solid residues, i.e., sludge. This residue is considered one of the most serious environmental problems within the pulp and paper industry. While landfilling is not a suitable solution from the environmental point of view, thermal treatment may be the most appropriate one. After dewatering, sludge can be incinerated and thus used for bio-energy production[27].

[26] Available at: <http://cdm.unfccc.int/EB/Meetings/023/eb23_repan18.pdf>. Last visit on: 22/12/2016.

[27] According to:
ORAL, J. et al. Processing of waste from pulp and paper plant. **Journal of Cleaner Production.** Brno, Czech Republic, p. 509-515. April 2005. Available at: <http://www.sciencedirect.com/science/article/pii/S0959652603001483>. Last visit on 29/12/2016.

HAGELQVIST, Alina. **Sludge from pulp and paper mills for biogas production:** Strategies to improve energy performance in wastewater treatment and sludge management. 2013. 58 f. Dissertation (Master) - Environmental and Energy Systems, Faculty of Health, Science and Technology, Karlstad University, Karlstad, Sweden, 2013. Available at: <https://www.diva-portal.org/smash/get/diva2:603009/FULLTEXT01.pdf>. Last visited on: 29/12/2016.

As an example, a Colombian paper industry that produces around 70 tonnes of paper per day generates about 30 tons of waste per day in all stages of the production process. From that total waste generated in the process, approximately 98% are sludge, which has as final destination landfills[28]. Thus, the example above estimates that the production of 1 tonne of paper produces around 400 kg of sludge, i.e., a ratio of 40%. However, the amount of sludge generated in the paper production process depends on the type of treatment process and on the utilized raw materials. Usually, the use of recycled fiber for paper production generates a higher amount of sludge, which is the common situation in Colombia[29].

Given that the production process of the pulp and paper industry sector generates high amounts of solid waste, mainly sludge generated during the wastewater treatment, it is important to promote new alternatives that help sustainable development through the use, treatment or adequate disposal of this sludge.

According to the National Association of Entrepreneurs of Colombia (ANDI), the paper production in Colombia was around 1,203,000 tonnes in 2014[30]. Considering a conservative sludge generation ratio of 35% for each tonne of paper produced, around 420,000 tonnes of sludge were produced in Colombia in 2014.

Moreover, the approximate quantity of paper sludge that had as final destination landfills in Colombia in 2014 was around 1,000 tonnes per day[31]. Therefore, around 85% of the total sludge generation is disposed in landfills, i.e., around 15% is utilized by other consumers.

During the current monitored period, the pulp and paper sludge consumption by this project activity was around 8,679 tonnes per year (Y). In addition, the other users consumption, which was estimated as 15% of the total generated, would represent around 63,000 tonnes per year (Z). From a total of 420,000 tonnes of paper sludge produced annually in Colombia (X), the estimated surplus availability of this biomass was greater than 25%, as: ((X-Y-Z) / X) > 25%.

Table 17. Estimated surplus availability of pulp and paper sludge in the project region

Data	Value
Estimated availability of paper sludge (X)	420,000 tonnes of sludge/year
Project consumption (Y)	8,679 tonnes of sludge/year
Other users consumption (Z)	63,000 tonnes of sludge/year
Surplus availability ((X-Y-Z) / X)	83%

[28] DAZA, Catalina Garnica. **Alternativas de gestión de lodos papeleros en la industria de papel Tisú y Kraft.** 71 pages. Facultad de Estudios Ambientales y Rurales, Pontificia Universidad Javeriana, Bogota, Colombia, 2013. Available at: <https://repository.javeriana.edu.co:8443/bitstream/handle/10554/12462/GarnicaDazaCatalina2013.pdf?sequence=1>. Last visited on: 23/01/2017.

[29] NIETO, C. M. L.; MEDINA, M. E. F. **Diseño de un proceso para la fabricación de papel reciclado ecológico a escala laboratorio usando peróxido de hidrógeno.** 115 pages. Facultad de Ingenieria, Programa de Ingenierĺa Quĺmica, Universidad de Cartagena, Cartagena de Indias, 2012. Available at: <http://190.242.62.234:8080/jspui/bitstream/11227/112/1/TESIS DE GRADO.pdf>. Last visited on: 23/01/2017.

[30] RIVEROS, Isabel. La industria papelera creció un 3,7% en Colombia: Andi: Consumo de papel supera el millón de toneladas. **El Heraldo.** Economía. Barranquilla, Colombia, 25 April 2015. Available at: <http://www.elheraldo.co/economia/la-industria-papelera-crecio-un-37-en-colombia-andi-192727>. Last visited on: 23/01/2017.

[31] DÍAZ, Melissa López. Ingeniero de Cartago es premiado por innovación con residuos de papel. **El País.** Cali, Colombia, 15 feb. 2014. Available at: <http://www.elpais.com.co/elpais/valle/noticias/ingeniero-cartago-premiado-por-innovacion-con-residuos-papel>. Last visited on: 23/01/2017.

Therefore, based on the studies above, the surplus availability of pulp and paper sludge in the project region was about 83%, which is greater than 25% and thus, avoiding the possibility of competing uses of biomass due to the project activity.

E.3. Calculation of net benefits as difference of baseline and project values or direct calculation for each SDG outcome

SDG 7 (Affordable and Clean Energy)

The outcomes of Affordable and Clean Energy are calculated using the following equation:

$$\%RB = \%RB_{CMP} - \%RB_{BSL}$$

Where:

$\%RB_{CMP}$ = Percentage of Renewable Energy used in the Current Monitoring Period
$\%RB_{BSL}$ = Percentage of Renewable Energy used in the Baseline Scenario
$\%RB$ = Percentage Increase in the Current Monitoring Period in comparison to the Baseline Scenario

During the current monitoring period, the Project Activity increased the usage of renewable energy from 55% in 2017 to 67% in 2018 on an energy basis, as can be seen in the table below. In the baseline scenario, the ratio usage of renewable energy was 0% of the total energy produced. Considering this, the project activity implemented a ratio of 67% of renewable energy in 2018.

Table 18. Average of fuel switch ratio per year achieved by Santander Ceramic Industry during the current monitoring period

Year	Average fuel switch ratio on an energy basis (%)
2017	55%
2018	67%
Average in the period	59%

SDG 8 (Decent Work and Economic Growth)

The project outcome regarding decent work and economic growth is defined as the improvement in SOCIALCARBON Indicator score achieved in the Monitoring Period, compared to the Baseline Scenario score. The following calculation is used:

$$SL_{Imp} = SS_{CMP} - SS_{BSL}$$

Where:
SL_{Imp}= SOCIALCARBON Level Improvement
SS_{CMP}= SOCIALCARBON Score in the Current Monitoring Period
SS_{BSL}= SOCIALCARBON Score in the Baseline

During the current Monitoring Period, the project activity improved 1 score level of the SOCIALCARBON Indicator “Actions of Health and Security”. The outcome is the Improvement of 1 score of SOCIALCARBON Indicator compared to the baseline scenario.

SDG 13 (Climate Action)

According to the applied methodology, the emission reductions achieved by the project activity is calculated as the difference between the baseline emissions and the project emissions, minus leakage, as follows.

$$ER_y = BE_y - PE_y - LE_y$$

Where,

ER_y Emission reductions in year y (tCO_2e);
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)

Therefore, baseline emissions are calculated based on historical data on production levels and fuel consumption and monitored units of output. Project emissions are calculated based on the fossil fuel consumption for the project scenario. Leakage emissions are estimated to be zero, since the project used primarily abundant biomass residues, thus not causing emissions from any of the leakage sources described in Section E.2. above.

Moreover, during the current monitoring period, Las Tapias 3 Ceramic Industry could not provide the necessary monitoring information and supporting documents. Thus, according to what has been agreed between Sustainable Carbon and Las Tapias 3, the emission reductions generated by Las Tapias 3 Ceramic Industry during this monitoring period was considered as 0 (zero).

Table 19 below summarizes the annual GHG emission reductions for each ceramic industry during the current monitoring period.

Table 19. GHG emission reductions by ceramic industry in the monitoring period

Emission Reductions (tCO_2e)			
Year	**Las Tapias 3 Ceramic Industry**	**Santander Ceramic Industry**	**Total**
2017	0	21,535	21,535
2018	0	19,707	19,707
Total	0	41,242	41,242

E.4. Summary of ex-post values of each SDG outcome for the current monitoring period

Item	Baseline estimate	Project estimate	Net benefit
SDG 7	0% of renewable energy used	59% of renewable energy used	59% of renewable energy used
SDG 8	Score 3 of SOCIALCARBON indicator	Score 4 of SOCIALCARBON indicator	1 Score level of SOCIALCARBON Indicator
SDG 13	53,205tCO2e	11,963 tCO2e	41,242 tCO2e

E.5. Comparison of actual value of outcomes with estimates in approved PDD

Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
SDG 7	85% of renewable energy used	59% of renewable energy used
SDG 8	Higher than Score 3 of SOCIALCARBON indicator	Score 4 of SOCIALCARBON indicator
SDG 13	28,985 tCO2e	41,242 tCO2e

The estimates of SDG 8 were not included in the approved PDD due to the fact that this parameter was not developed in the report.

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

During the current monitoring period, Las Tapias 3 Ceramic Industry could not provide the necessary monitoring information and supporting documents. Thus, according to what has been agreed between Sustainable Carbon and Las Tapias 3, the emission reductions generated by Las Tapias 3 Ceramic Industry during this monitoring period was considered as 0 (zero).

Therefore, in order to allow a proper comparison with the actual GHG emission reductions, the estimated emission reductions in *ex ante* calculation of registered PDD displayed at Section E.5 above only refers to Santander Ceramic Industry.

Colombia faces an unstable economic scenario, with the return of drug trafficking in the recent years, after a controlled period in the country. Besides that, the civil construction sector has observed constant decrease since 2016 (CAMACOL, 2018)[32]. This scenario resulted both in reduction in production and in the use of renewable biomass, compared to the previous monitoring period, impeding the project activity to achieve the expected use of renewable energy established in the PDD. Despite that, the factory is gradually

[32]CÁMARA COLOMBIANA DE LA CONSTRUCCIÓN (Colombia). Departamento de Estudios Económicos y Técnicos. Informe de Actividad Edificadora. Diciembre de 2016. 2017. 59 p. Available at: <http://camacol.co/informacion-economica/coyuntura-economica>. Last visited on: December 10, 2018.

increasing the usage of renewable biomass, rising this ratio from 55% in 2017 to 67% in 2018 as can be seen in table 20 below.

Table 20. Percentages of use of renewable biomass in PDD and MR in Santander Ceramic Industry

Year	Percentage of use of renewable biomass in energy basis (%)		Comparison between MR and PDD
	PDD	MR	
2017	65%	55%	-10%
2018	85%	67%	-18%
Average in the period	75%	59%	-16%

As shown in Table above, Santander Ceramic Industry had 16% less biomass usage rate than estimated in the registered PDD.

Production levels are mainly influenced by the market demand, as there is no logic in producing more than the factory is expected to sell. Besides, the use of renewable biomass and new technologies require additional costs to the ceramic industry. Although the income from the commercialization of carbon credits is essential to encourage and maintain the fuel switching process, it does not act as an incentive to increase production beyond market demand levels.

Although more project emissions occurred during the current MR than previously estimated in the PDD, the production increase mentioned above would lead to significantly higher project emissions if there were no efficiency gains.

The Figure 10 below shows the variation of the energy demand per production output in Santander Ceramic Industry during the monitoring period, and a comparison with the baseline scenario. During the baseline scenario (red line), around 0.019 TJ were necessary to produce one thousand bricks. Due to the project implementation, an average of 0.011 TJ/thousand bricks was obtained during the total monitoring period (green line), which represents an efficiency gain of around 45%. In addition, a decreased trend line during the period was observed (dashed line), representing a continuous energy efficiency improvement by the ceramic industry.

Energy efficiency was also responsible for the reduced consumption of coal during the current MR in comparison with the PDD, which resulted in higher GHG emission reductions for Santander Ceramic Industry.

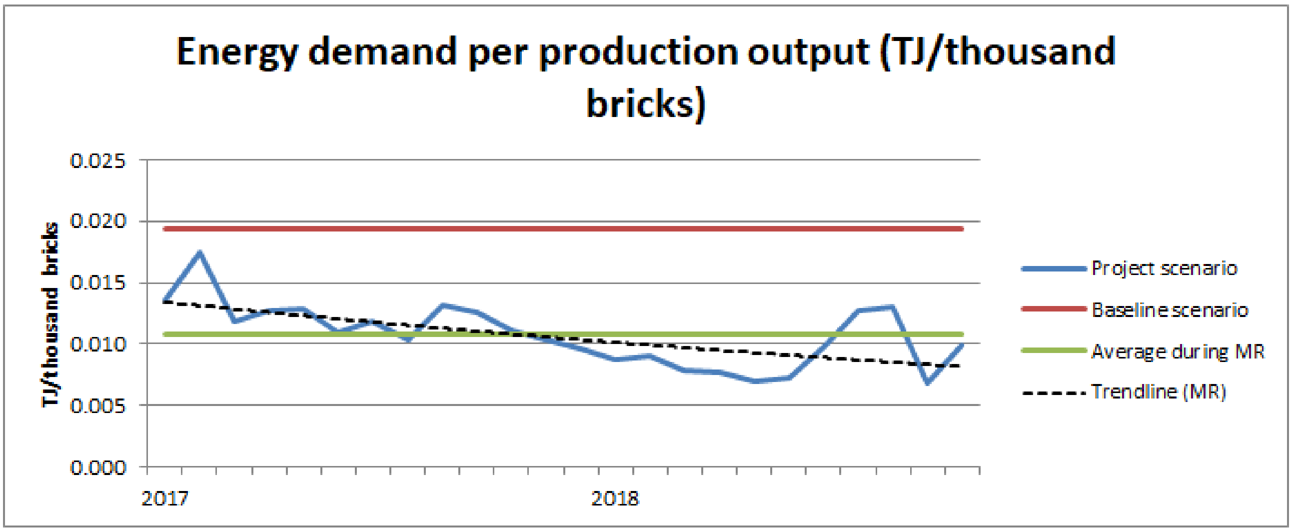

Figure 10. Energy demand per production output in Santander Ceramic Industry, in TJ/thousand bricks

SECTION F. Stakeholder inputs and legal disputes

F.1. List all inputs/grievances which have been received for the project during the monitoring period together with their respective answers/actions

No inputs were received for the project during the monitoring period.

F.2. List all inputs/grievances from previous monitoring period where follow up action is to be verified in this monitoring period

Not applicable.

F.3. Provide details of any legal contest or dispute that has arisen with the project during the monitoring period

No legal contests or disputes have arisen during the monitoring period.