



RIO NEGRO CERAMIC FUEL SWITCHING PROJECT



Document Prepared by Sustainable
Carbon – Projetos Ambientais Ltda.

Project title	Rio Negro Ceramic Fuel Switching Project
Project ID	943
Monitoring period	01-March-2019 to 31-August-2023
Original date of issue	27-November-2023
Most recent date of issue	18-July-2024
Version	04
VCS Standard Version	4.5
Prepared by	Sustainable Carbon – Projetos Ambientais Ltda.

CONTENTS

PROJECT DETAILS	4
1.1 Summary Description of the Implementation Status of the Project	4
1.2 Audit History.....	5
1.3 Sectoral Scope and Project Type	5
1.4 Project Proponent	6
1.5 Other Entities Involved in the Project	7
1.6 Project Start Date	7
1.7 Project Crediting Period	7
1.8 Project Location	8
1.9 Title and Reference of Methodology	8
1.10 Double Counting and Participation under Other GHG Programs	10
1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions.....	10
1.12 Sustainable Development Contributions	11
1.13 Commercially Sensitive Information.....	17
2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT	17
2.1 Stakeholder Engagement and Consultation.....	17
2.2 Risks to Stakeholders and the Environment.....	23
2.3 Respect for Human Rights and Equity	23
2.4 Ecosystem Health	26
3 IMPLEMENTATION STATUS	29
3.1 Implementation Status of the Project Activity	29
3.2 Deviations	31
3.3 Grouped Projects	36
3.4 Baseline Reassessment.....	36
4 DATA AND PARAMETERS.....	37
4.1 Data and Parameters Available at Validation	37
4.2 Data and Parameters Monitored.....	41
4.3 Monitoring Plan.....	55
5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	56
5.1 Baseline Emissions	56
5.2 Project Emissions	60

5.3	Leakage Emissions	62
5.4	GHG Emission Reductions and Carbon Dioxide Removals	66
APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION.....		59

PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

This Project activity was developed by *Sustainable Carbon Projetos Ambientais* LTDA (Social Carbon Company). Sustainable Carbon is the leading developer of high emission reduction projects and greenhouse gas management solutions in Latin America.

The purpose of this project activity is the reduction of greenhouse gas emissions through the substitution of non-renewable biomass for thermal energy generation to cook their ceramic pieces. The fuel switch was carried out at *Rio Negro Ceramic*, a red ceramic industry located in the municipality of *Irlanduba* in the northern region of Brazil. *Rio Negro* is a small-scale manufacturer, producing ceramic units, such as bricks and tiles, sold mainly in *Manaus*, in the State of *Amazonas*.

The productive process of *Rio Negro Ceramic* includes equipment to produce and mold bricks, which then are arranged at a furnace to dry and loaded to the kilns for burning. This emission reduction project did not involve modifications to most of the processes and equipment and was limited to allowing the ceramic factory to use renewable biomasses instead of non-renewable wood. According to VCS PD version 3 of the first crediting period, during validation the ceramic factory had six kilns, being one Hoffman, three Round and two *Paulista* kilns. During the 3rd Monitoring Period (VCS MR3 01-July-2013 to 31-December-2015), three round kilns and one Hoffman were deactivated. During the 4th Monitoring Period (VCS MR4 01 January 2016 to 28 February 2019), the ceramic factory started operating a Wagon kiln in addition to the two *Paulista* kiln. No changes were made during this Monitoring Period.

In the years prior to the project initiation the fuel employed to fire the ceramic units was native wood obtained from the Amazon biome, without management plan, which led to the deforestation of this biome. Therefore, the project aims to reduce greenhouse gases emissions through the substitution of native wood (non-renewable woody biomass) for wood residues from the Industrial Cluster of *Manaus*, from construction sector and from furniture and wood processing industries, as well as sawdust and woodchips made of these residues. Other renewable biomasses in the region are bamboo, elephant grass, and other regional fruits residues such as *açaí* for thermal energy generation. This fuel switching could only be feasible when considering the incomes from carbon credits, since the adaptation of kilns to the new biomasses and the purchase of new equipment required considerable investments.

The main goal of this project activity is to minimize the negative impacts of the deforestation of the Amazonian biome by discouraging the exploitation of the area. This is the second crediting period of the project, which started on 01-March-2019 and will end on 28-February-2029. The emission reductions due to the switching of non-renewable biomass to renewable biomass were equal to **41,704 tCO₂e** during the monitoring period from 01-March-2019 to 31-August-2023.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation (PD 1)	(02-February-2011–02-February-2011)	VCS	Bureau Veritas Certification SAS	Zero
Verification (MR 1)	(01-March-2009–31-March-2011)	VCS	Bureau Veritas Certification SAS	2.1 years (25 months)
Verification (MR 2)	(01-April-2011–30-June-2013)	VCS	Bureau Veritas Certification SAS	2.25 years (27 months)
Verification (MR 3)	(01-July-2013–31-December-2015)	VCS	RINA Services SpA	2.5 years (30 months)
Verification (MR 4)	(01-January-2016–28-February-2019)	VCS	ESPL – Earthood Services Private Limited	3.2 years (38 months)
Validation (PD 2)	(19-May-2020–19-May-2020)	VCS	ESPL – Earthood Services Private Limited	Zero
Verification (MR 5)	(01-March-2019–31-August-2023)	VCS	Ecolance Private Limited	4.5 years (54 months)

1.3 Sectoral Scope and Project Type

Sectoral scope ¹	1 – Energy industries (renewable/non-renewable sources)
Project activity type	Fuel switch from non-renewable biomass (native wood) to renewable biomass.

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

¹ Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: <https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes>

1.4 Project Proponent

Organization name	Cerâmica Rio Negro LTDA.
Contact person	Mr. Antonio da Mata Silva, Mr. Adriano Duarte and Ms. Ana Lúcia da Silva Pinheiro
Title	Mr. Antonio da Mata Silva, Director: Information and visit of the ceramic, detailed information on process and production lines, environmental challenges, technological challenges, research and development history, ceramic devices market challenges, detailed information and numbers on sales and how output data is handled and how data is stored and kept by <i>Rio Negro's</i> office. Since 2019, Ms. Ana Lúcia da Silva Pinheiro has taken over Mr. Adriano Duarte's responsibilities as Monitoring data: General data and information on inputs and outputs of the ceramic, detailed information and numbers on sales and how output data is handled, stored and kept by <i>Rio Negro's</i> office.
Address	Estrada do Brito, s/nº, Zona rural - Cacau Pirêra ZIP code: 69405-000
Telephone	+55 92 9142-9831 +55 92 9196-4021
Email	adriano.duartes@hotmail.com ceramica.rionegro@hotmail.com

Organization name	Sustainable Carbon – Projetos Ambientais Ltda
Contact person	Aline de Paulo Costa Glenda Fauth Mariana Vieira da Costa Talita Miranda Costa
Title	Aline de Paulo Costa: Technical Coordinator Glenda Fauth: Technical Analyst Mariana Vieira da Costa: Technical Assistant Talita Miranda Costa: Technical Assistant

Address	R. Doutor Bacelar. 368 – Conj. 23 – Vila Clementino São Paulo – SP – Brazil Postal Code: 04026-001
Telephone	+55 11 2649 0036
Email	tecnica@sustainablecarbon.com

1.5 Other Entities Involved in the Project

No other entity is involved in this project activity.

1.6 Project Start Date

Project start date	23-February-2009
Justification	On this date, according to version 03 of the VCS PD ² , the project began reducing or removing GHG emissions, i.e. the ceramic started using renewable biomass as fuel. In addition, the first VCS PD was completed on February 02, 2011, in accordance with the VCS program requirement to complete validation within two years of the project start date.

1.7 Project Crediting Period

Crediting period	☐ Seven years, twice renewable ☐ Ten years, fixed ☒ Other (Ten years, twice renewable. The crediting period is in line with the VCS 2007.1 Standard ³ , which was in force at validation of the first crediting period.)
Start and end date of first or fixed crediting period	01-March-2009 to 28-February-2019

² Document available at: < https://www.vcsprojectdatabase.org/#/project_details/943 >. Last visit on 22-September-2023.

³ Document available at: < https://verra.org/wp-content/uploads/Voluntary-Carbon-Standard-2007_1.pdf > Last visit on 18-January-2024

1.8 Project Location

The ceramic company is located in Brazil, in the State of *Manaus*, in the northern region of the country. The geographic location is illustrated in Figure 1. The project activity has the following location coordinates and postal addresses:

<i>Rio Negro</i> Ceramic coordinates	P1	P2	P3	P4	P5	P6
Latitude	3 ° 10' 12.71"	3 ° 10' 14.52"	3 ° 10' 16.68"	3 ° 10' 17.76"	3 ° 10' 18.11"	3 ° 10' 17.39"
Longitude	60 ° 4' 57"	60 ° 5' 0.23"	60 ° 4' 59.16"	60 ° 4' 57.72"	60 ° 4' 57.35"	60 ° 4' 54.11"

Estrada do Brito, s/nº, Zona Rural – Cacau Pirêra

Irاندوبا – Amazonas, BR

ZIP Code - 69405-000

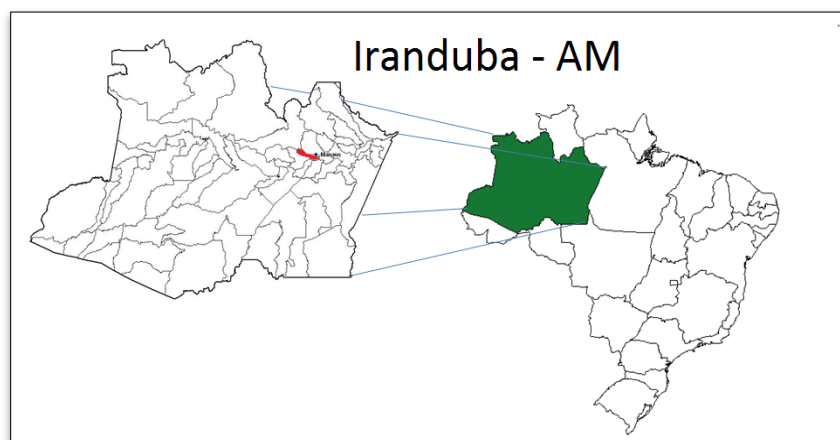


Figure 1. Geographic location of the cities of the project activity that has the following coordinates latitude: 03 ° 17'6"S, longitude: 60 ° 11'9"W.

1.9 Title and Reference of Methodology

The project applies the following small-scale methodology and tools approved under the Clean Development Mechanism:

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
---	--------------------------------	-------	---------

Methodology	AMS-I.E.	AMS-I.E: Switch from non-renewable biomass for thermal applications by the user.	09 ⁴
Tool	TOOL03	TOOL03 Methodological tool: Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion	03.0 ⁵
Tool	TOOL05	TOOL05 Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation	03.0 ⁶
Tool	TOOL07	TOOL07 Methodological tool: To calculate the emission factor for an electricity system	07.0 ⁷
Tool	TOOL11	TOOL11 Methodological tool: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period	03.0.1 ⁸

⁴ This version of the methodology is available at: <<https://cdm.unfccc.int/methodologies/DB/IO5FJLJFWT91R6B8S05BC7TXSK27I2>>. Last visited on 22/09/2023

⁵ Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion. Available at: <<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf>> Last visited on 22/09/2023.

⁶ Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation. Available at: <<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf>> Last visited on 22/09/2023.

⁷ Tool to calculate the emission factor for an electricity system. Available at: <<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf>> Last visit on 22/09/2023.

⁸ Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period. Available at: <<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf>> Last visited on 22/09/2023.

Tool	TOOL12	TOOL12 Methodological tool: Project and leakage emissions from transportation of freight	01.1.0 ⁹
Tool	TOOL16	TOOL16 Methodological tool: Project and leakage emissions from biomass	05.0 ¹⁰
Tool	TOOL30	TOOL30 Methodological tool: Calculation of the fraction of non-renewable biomass	04.0 ¹¹

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.10.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

⁹ Project and leakage emissions from transportation of freight. Available at: <<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf>> Last visited on 22/09/2023.

¹⁰ Project and leakage emissions from biomass. Available at: <<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-16-v5.0.pdf>> Last visit on 18/01/2024.

¹¹ Calculation of the fraction of non-renewable biomass. Available at: <<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v4.0.pdf>> Last visited on 18/01/2024.

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

1.12 Sustainable Development Contributions

During the monitoring period, the project activity contributed to the sustainable development of the host country by:

- Switching to renewable biomass fuel and thus using a clean and efficient technology. In addition, the use of renewable biomasses results in GHG emission reductions;
- Making frequent donations to the local community. The project proponents are aware of the environmental and social problems that the local community faces, and are always available to contribute to the community development;
- Contributing to the well-being and health of its employees.

By these means, the project is in accordance with Agenda 21, Brazilian Sustainable Development Criteria and Sustainable Development Goals. Specifically, the project contributes to the following SDGs:

- 3 – Good Health and Well-Being
- 7 – Affordable and clean energy
- 8 – Decent Work and Economic Growth
- 11 – Sustainable Cities and Communities
- 12 – Responsible Consumption and Production
- 13 – Climate Action

The project proponents keep records of the biomass purchased, the donations made, and the benefits provided to their employees, which allows Sustainable Carbon to monitor the social activities of the ceramic factory.

Table 1: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	3	Actions that promote wellbeing and a healthy lifestyle	Implemented activities to increase	The factory rents a soccer field for the employees to play on every week.	This initiative started on 2015 and since then the employees have had the opportunity to exercise, stay active and socialize with each other. This initiative is important considering that cardiovascular disease is one of the major causes of death in <i>Irاندوبا</i> city ¹² .

¹² According to the Brazilian Institute of Geography and Statistics (IBGE). Available at: <https://cidades.ibge.gov.br/brasil/am/iranduba/pesquisa/17/15752?tipo=grafico&indicador=15765> Last visited on 05-October-2023

2)	3	3.8.1 Coverage of essential health services	Implemented activities to increase	In each month of the monitored period, the factory promoted meetings of the Internal Commission for the Prevention of Accidents (CIPA) with the mean attendance of 20 employees. Each month's meeting focused on a different health-related topic, such as safety and hygiene in the workplace, alcoholism, prostate cancer, suicide, and malaria. Additionally, during this monitoring period, employees received weekly consultations, which amounted to approximately 233 consultations, and annual check-ups to detect and prevent risk diseases related to their work at the ceramic factory, which amounted to 5 check-ups.	The factory promoted meetings that raised awareness about important health-related topics on a regular basis. Throughout the project lifetime, the employees had at least 397 medical appointments and 15 check-ups (based on hazard mapping) and participated on vaccination campaign.
3)	7	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	During this monitoring period, the project activity displaced the use of 49,442.75 tons of non-renewable biomass to use renewable biomass instead.	During the project lifetime, 176,570.93 tons of non-renewable biomass was displaced to use renewable biomass instead.

4)	8	Proportion of youth with access to education, employment, or training	Implemented activities to increase	The factory donated R\$ 250.00 and 2,000 bricks to Jasmim Woman's Association, which promotes IT courses for youths and children.	Jasmim Woman's Association's mission is to promote and defend women's rights and financial independence, but their social actions has been extended to include the women's children as well. Since February-2022, the Association offers IT courses for youths and children above 8 years old. The Association attended an average of 80 youths and children between 8 and 17 years old per year. Since 2021 the donations amounted to R\$ 250.00 and 2,000 bricks. In 2014, the factory formalized a partnership with the Amazonas Technological Education Center (CETAM) to offer an internship program for students enrolled in the technical course. Four students benefited from the internship during one semester. In addition, towards the end of the course, the whole class had practical lesson at the <i>Rio Negro</i> ceramic.
----	---	---	------------------------------------	--	---

5)	8	Proportion of employed women.	Implemented activities to increase	Usually, in the ceramic sector, women are not hired for the operational sector due to the intensity and risk of the work. However, there are women occupying other sectors of the ceramic factory. In this Monitoring Period, 3 women are part of the workforce: one in the administrative area and two in the cafeteria.	• In the first Monitoring Period (MR), 3 women were part of the workforce; • In the second MR, 3 women were part of the workforce; • In the third MR, 1 women were part of the workforce; • In the fourth MR, 1 woman was part of the workforce.
6)	11	Proportion of green areas	Implemented activities to increase	No further changes in this monitoring period	In 2010, the factory planted 1.5 ha of <i>açaí</i> trees on the factory boundaries as part of a Project to Recover Degraded or Altered Areas.
7)	11	Contributing to adequate and safe housing	Implemented activities to increase	Donation of 22,300 bricks. The ceramic factory also donated 2 bundles of wood to build raised walkways in flooded areas in 2021.	The factory donated at least 47,000 bricks during the project lifetime.

8)	12	Tonnes of waste destined for recycling.	Implemented activities to increase	During the monitored period, the factory gave 18,581.2 kg of residue to a local selective waste association to reuse and recycle it. In addition, the ashes from the biomass burning are used to fertilize Sr. Antonio's vegetable garden.	The project destined 18,581.2 kg of residue to the local selective waste association.
9)	13	Tonnes of greenhouse gas emissions avoided	Implemented activities to increase	The project avoided the emission of 41,704 tCO ₂ in the atmosphere by switching from non-renewable biomass to renewable biomass as fuel.	Since the start date (01-March-2009), the project avoided the release of 191,730 tCO ₂ into the atmosphere.

1.13 Commercially Sensitive Information

None of the information exposed to the Validation and Verification Body was withheld from the public version of the report.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

In 2016, the project proponents invited stakeholders to a meeting to present the project. Among the stakeholders invited, there were seven members of the community, employees from the *Rio Negro* ceramic factory, two ceramic factory owners – *Montemar* ceramic factory and *Rio Solimões* ceramic factory –, the president of the SINDICER (Construction Ceramics and Pottery Industry Union), a representative of a recycling company - *R C Recuperação De Materiais Recicláveis De Resíduos Não Perigosos Ltda* -, a representative of a Construction Material Company - *S. M. de Almeida Materiais de Construção Ltda* -, and a representative of the “*Sou a esperança*” group. The latter was an association that promoted activities and provided food for children who, in return, were required to attend school. The ceramic factory often donated food staples and financial resources to this association. Of all the invited, five members of the community, twenty-nine employees from the *Rio Negro* ceramic factory and one ceramic factory owner – *Montemar* ceramic factory – attended. During the presentation, *Rio Negro*’s ceramic factory owner Mr. Antônio da Mata explained the carbon project developed in partnership with Sustainable Carbon and its environmental and social benefits, as well as how the carbon credit is traded and invested.

Stakeholder Identification

Stakeholders were identified at validation and there were no changes since then. The stakeholder identification process was based on mapping the groups likely to be impacted by the environmental outcomes of the project activities.

The main stakeholders considered in this project are the following:

- Environmental Protection Institute of the Amazonas State (IPAAM);
- Iranduba City Hall;
- The ceramic sector syndicate (ACERAM);

	• The Brazilian Service of Support to the Micron and Small Companies of Amazonas State (SEBRAE-AM); • Government of the State of Amazonas; • Federation of Industries of Amazonas State (FIEAM); • <i>Rio Negro</i> ceramic employees and the local community. A letter informing about the project activity was sent to the stakeholders. In addition to that, the letter was posted on the employee's board in the ceramic facility, which is a visible place with high circulation of employees. The letter was available for 7 days and the comments were expected for a period of 7 days after the letter has been posted. Moreover, having the ceramic sector syndicate being aware of the project, other local stakeholders were informed about the proposed project activities since the ceramic sector association has great visibility through different parts of the community and public entities on different levels, such as Municipality, State and Federal organizations.
Legal or customary tenure/access rights	The project is being developed at a ceramic factory located on private property. The stakeholders who live closest to the ceramic factory, at 2 km away, are the residents of <i>Cacau Pirêra</i>, a district on <i>Iranduba</i> city. The stakeholders were aware of the project at the validation period, and there are no legal or customary tenure/access rights to territories and resources of the project, nor collective and conflicting rights held by stakeholders.
Stakeholder diversity and changes over time	The project involves stakeholders ranging from government agencies to the residents of <i>Cacau Pirêra</i> community. Therefore, it can be considered that the project covers the social, economic, and cultural diversity of the different stakeholders.

	No changes were identified among the stakeholders involved with the project. Any future significant changes will be informed in this section.
Expected changes in well-being	During the project revalidation, the risks and impacts were analyzed and described in the section “2.1 No Net Harm”. The only negative impact identified is that the project activity generates ashes due to the burning of the biomass, but this impact is mitigated by using the ashes as fertilizer. Regarding the stakeholders, specifically the local community, their well-being can be considered positively impacted by the donations and social actions promoted by the project proponent using carbon credit income. In addition, switching to renewable biomass avoids deforestation, which benefits biodiversity, ecosystem services conservation, and climate change mitigation, improving the well-being of local communities.
Location of stakeholders	The ceramic factory is located on <i>Rio Negro</i>’s riverbank, 2 km away from <i>Cacau Pirêra</i>, a district on <i>Iranduba</i> city, which, in turn, is approximately 17 km away from the ceramic factory. Across <i>Rio Negro</i> River, at 5 km from the ceramic factory, is the city of <i>Manaus</i>. Part of the stakeholder group is composed of the local community and the employees who live in <i>Cacau Pirêra</i> and <i>Iranduba</i> city. <i>Iranduba</i> City Hall and the Ceramic Sector Syndicate (ACERAM) are in <i>Iranduba</i> city. The Environmental Protection Institute of the Amazonas State (IPAAM), the Brazilian Service of Support to the Micron and Small Companies of Amazonas State (SEBRAE-AM), the Government of the State of Amazonas, and the Federation of Industries of Amazonas State (FIEAM) are in <i>Manaus</i>. The project is not expected to cause any negative impact on the boundaries or outside of the ceramic factory.

Location of resources	Stakeholders do not own or have customary access to territories or resources from the project activity.
-----------------------	---

2.1.2 Stakeholder Consultation and Ongoing Communication

The formal stakeholder consultation was carried out during the validation of the project. Currently, the company's administrative employees are available to receive any kind of suggestions and comments from the local community via telephone, social media, email or even personally.

Ongoing consultation	The project proponent is available to the stakeholders via telephone, social media, email or even personally at the ceramic facilities: Telephone: +55 92 9196-4021 Social Media: www.facebook.com/ceramicarionegro/ Email: ceramica.rionegro@hotmail.com Sr. Antonio is always open and available to receive comments and suggestions from the employees at the ceramic factory. The Sustainable Carbon team is also available to discuss the project and is easily accessible via email and telephone: Email: tecnica@sustainablecarbon.com Telephone: +55 11 2649 0036 In addition, every document regarding the project is public and accessible on the VERRA registry page: https://registry.verra.org/app/projectDetail/VCS/943
Date(s) of stakeholder consultation	History of stakeholder consultation: 13-January-2010 – Stakeholders were consulted to the project validation; 09-March-2016 – During the 4th Monitoring Period, <i>Rio Negro's</i> ceramic factory owner Mr. Antonio da Mata invited several stakeholders to a Project presentation. During the presentation, the project proponent explained the carbon project developed in partnership with Sustainable Carbon and its

	environmental and social benefits, as well as how the carbon credit is traded and invested. During this Monitoring Period, the ceramic factory was available to all stakeholders on their means of communication: Email: ceramica.rionegro@hotmail.com Telephone: +55 92 9196-4021 Social Media: www.facebook.com/ceramicarionegro/
Communication of monitored results	No comments or suggestions were received from the stakeholders during this Monitoring Period. If there are any in the future, they will be answered in a culturally appropriate and in a timely manner. When improvements are made on the ceramic factory, Sr. Antonio always informs the employees that the improvements are due to the carbon credit trading. The monitored results were made public by posting a flyer on the ceramic factory's communication board.
Consultation records	Mr. Antonio records the stakeholder consultation in a notebook kept in the ceramic factory office.
Stakeholder input	Stakeholders did not suggest any changes to the project design. If there are any in the future, they will be answered in a culturally appropriate and in a timely manner.

2.1.3 Free, Prior, and Informed Consent

Consent	The project did not encroach on private, stakeholder or government property, nor relocate people off their lands. Stakeholder's consent was obtained in consultation during the project validation. The stakeholders received a letter informing them about the project activity, the methodology used, the objectives and the means of communication with the project proponent to express their opinions and learn more about the project. No comments or objections were raised during the consultation, meaning that the stakeholders agree with the project.
---------	---

	Since then, there has been no conflict between project proponents and stakeholders.
Outcome of FPIC	The outcome of the stakeholder consultation was the project validation. The project did not encroach on private, stakeholder or government property, nor relocate people off their lands. Stakeholder's consent was obtained in consultation during the project validation. The stakeholders received a letter informing them about the project activity, the methodology used, the objectives and the means of communication with the project proponent to express their opinions and learn more about the project. No comments or objections were raised during the consultation, meaning that the stakeholders agree with the project.

2.1.4 Grievance Redress Procedure

During this monitoring period, no grievances were raised. Currently, the company's administrative employees are available to receive any kind of suggestions and comments from the local community via telephone, social media, email or even personally. In the event of any grievance, it will be resolved within a reasonable time period, taking into account culturally appropriate conflict resolution methods. In addition, the procedure and documentation of disputes resolved through the procedure will be made publicly available.

Grievances received	Resolution and outcome
N/A	N/A

2.1.5 Public Comments

During this Monitoring Period, no comments were received. Currently, the company's administrative employees are available to receive any kind of suggestions and comments from the local community via telephone, email or even personally.

Summary of comments received	Actions taken
N/A	N/A

2.2 Risks to Stakeholders and the Environment

	Risk identified	Mitigation or preventative measure taken
Risks to stakeholder participation	No risk identified.	The project does not offer any risk to the stakeholders.
Working conditions	No risk identified.	The project does not offer any working conditions risk.
Safety of women and girls	No risk identified.	The project does not offer any risk to the safety of women and girls.
Safety of minority and marginalized groups, including children	No risk identified.	The project does not offer any risk to the safety of minority and marginalized groups.
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	No risk identified. The only negative impact identified is that the project activity generates ashes due to the burning of the biomass.	This impact is mitigated by using the ashes as fertilizer.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	No complaints of discrimination or sexual harassment were made, as evidenced by the Declaration of Human Rights Compliance sent with this Monitoring Report.
Management experience	During this Monitoring Period, no new entity was involved in the project design or implementation.
Gender equity in labor and work	Usually, in the ceramic sector, women are not hired for the operational sector due to the intensity and risk of the work. However, there are women occupying other sectors of the ceramic factory. - In the first Monitoring Period (MR), 3 women were part of the workforce; - In the second MR, 3 women were part of the workforce; - In the third MR, 1 women were part of the workforce;

	• In the fourth MR, 1 woman was part of the workforce; • And in this MR, 3 women were part of the workforce.
Human trafficking, forced labor, and child labor	The ceramic factory is not involved with human traffic, forced labor, and child labor, as evidenced by the Declaration of Human Rights Compliance sent with this Monitoring Report.

2.3.2 Human Rights

The Brazilian International Labour Organization (ILO) office was funded in the 1950s, and in 1989 Brazil ratified the Convention N°. 169¹³. Brazil is also aligned with the United Nations Declaration on the Rights of Indigenous Peoples (IP)¹⁴.

The rights of IP in Brazil are guaranteed by the National Foundation for Indigenous Peoples (FUNAI), which is the official indigenist body linked to the Ministry of Indigenous Peoples.

The Socio-Environmental Institute (ISA) is a Brazilian Civil Society Organization of Public Interest that maps indigenous lands across the Brazilian territory. According to their database¹⁵, there are no IPs or customary right holders living on the ceramic factory's boundaries, as it can be evidenced by Figure 2. The red lines indicate an indigenous territory, and none are near Iranduba city (circled in blue).

¹³ Document available at: <https://www.oas.org/dil/port/1989%20Conven%C3%A7%C3%A3o%20sobre%20Povos%20Ind%C3%ADgenas%20e%20Tribais%20Conven%C3%A7%C3%A3o%20OIT%20n%20C2%BA%20169.pdf> Last visited on 12-01-2024

¹⁴ Document available at: https://www.camara.leg.br/Internet/comissao/index/perm/cdh/Tratados_e_Convencoes/Indios/declaracao_universal_direitos_povos_indigenas.htm Last visited on 12-01-2024

¹⁵ Available at: <<https://terrasindigenas.org.br/pt-br/brasil>> Last visited on 19-01-2024



Figure 2. Indigenous territories of Amazonas State, according to ISA database.

Similarly, the Google earth view of *Rio Negro* Ceramic factory shows that no local community lives near the ceramic factory boundaries (Figure 3).



Figure 3. Google earth view of the ceramic factory's geographic coordination.

The project proponent is always available to attend the needs of the local community.

2.3.3 Indigenous Peoples and Cultural Heritage

Not applicable. There are no IPs living near the ceramic factory's boundaries.

2.3.4 Property Rights

Not applicable. The project did not encroach on private, stakeholder or government property, nor relocate people off their lands. Stakeholder's consent was obtained in consultation during the project validation. The stakeholders received a letter informing them about the project activity, the methodology used, the objectives and the means of communication with the project proponent to express their opinions and learn more about the project. No comments or objections were raised during the consultation, meaning that the stakeholders agree with the project.

Disputes over rights to territories and resources	N/A.
Respect for property rights	N/A

2.3.5 Benefit Sharing

Not applicable. The project did not impact property rights.

Summary of the benefit sharing plan	N/A.
Benefit sharing during the monitoring period	N/A.

2.4 Ecosystem Health

The only negative impact identified is that the project activity generates ashes due to the burning of the biomass, but this impact is mitigated by using the ashes as fertilizer.

The burning of the new biomasses also emits particulate material and CO₂, as well as when using native wood. However, GHG emission reductions will be improved since they are renewable biomasses which have carbon neutral lifecycles.

The project does not cause any further negative impacts since all the energy generated is result of the best natural resources available. On the contrary, the project activity will improve the local environmental conditions by establishing proper treatment for the renewable biomasses and by contributing to the reduction of the deforestation rate.

Environmental Laws related to the plant activities:

The Environmental National Policy, *Política Nacional do Meio Ambiente* - PNMA, instituted by the Brazilian Law 6.938/81, establishes that the construction, installation, amplification and operation of any enterprise or activity which may exploit natural resources, and are considered potentially pollutant, or capable of degrading the environment, will be possible only if they obtain a previous environmental permission; according to the Brazilian Constitution of 1988. One of the tools settled by the PNMA, in order to monitor and study the potential impacts generated by these kinds of enterprises, is the Environmental Impact Assessment (EIA). However, an EIA was not required for the project activity.

Besides that, the National Environment Council (CONAMA) Resolution nº 237/97 establishes that ceramic companies must have an operational license as well as a clay extraction license, both emitted by competent municipal, state or federal authority, under a valid time. *Rio Negro* ceramic factory has two valid operation licenses emitted by the Environmental Protection Institute of the Amazonas State (IPAAM). The operation license numbered 028/00-14 is valid until 10-July-2025 and authorizes clay extraction, and the operation license numbered 438/99-13 is valid until 12-January-2025 and authorizes the production of ceramic material. *Rio Negro* ceramic factory also has a clay extraction license emitted by the Iranduba City Hall that is valid until 17-March-2024.

	Risk identified	Mitigation or preventative measure taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified.	An analyzes conducted at validation showed that the project increases the biodiversity preservation.
Soil degradation and soil erosion	No risk identified.	An analyzes conducted at validation showed an improvement of soil conditions due to the vegetation conservation. The <i>Rio Negro</i> Ceramic Factory is currently authorized to carry out clay extraction under the license nº 001/2023 issued by the City Hall of <i>Iranduba</i> . The operation license emitted by the Environmental Protection Institute of the Amazonas State (IPAAM) numbered 028/00-14 also authorizes clay extraction.
Water consumption and stress	No risk identified.	An analyzes conducted at validation showed a preservation of ground water quality as well as

		preservation of the water cycle renewal. In 2008, the <i>Rio Negro</i> Ceramic Factory obtained a permit to construct a well, issued by the Environmental Protection Institute of the Amazonas State (IPAAM) under the process n° 0869/T/08.
Usage of fertilizers	No risk identified.	There is no use of fertilizers on the project.

2.4.1 Rare, Threatened, and Endangered species

Species or habitat	The project is located on the Amazon biome, which is a habitat for a rich biodiversity, including rare, threatened, and endangered species. In the years prior to the project initiation the fuel employed to fire the ceramic units was native wood obtained from the Amazon biome, without management plan, which led to the deforestation of this biome. The switch to renewable biomass avoids deforestation, which is beneficial for biodiversity conservation as well as for the local community and ecosystem services. Therefore, the project does not adversely impact habitats for rare, threatened, or endangered species during the monitoring period.
--------------------	--

2.4.2 Introduction of species

Not applicable.

Species introduced	Classification	Justification for use	Adverse effects and mitigation
N/A	N/A	N/A	N/A

Existing invasive species	Mitigation measures to prevent spread or continued existence of invasive species
N/A	N/A

2.4.3 Ecosystem conversion

Not Applicable.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The VCS PD of the first crediting period was validated by the Designated Operational Entity Bureau Veritas Certification Holding SAS, and the last monitoring report (MR4 – 01-January-2016 to 28-February-2019) was verified by Designated Operational Entity Earthood Services Private Limited. The VCS PD of the second crediting period was validated by Designated Operational Entity Earthood Services Private Limited, and this present monitoring report is being verified by Ecolance Private Limited.

The project has been fully operational since the starting date of the first crediting period (01-March-2009). This means the ceramic industry is operating using exclusively renewable biomass, thus mitigating their baseline emissions.

As described in the VCS PD version 03 of the first crediting period, during the validation process the ceramic facility had six kilns, being one Hoffman, three Round and two *Paulistas* kilns. However, as described in the third monitoring period (VCS MR3 01-July-2013 to 31-December-2015), due to the *Rio Negro* River's flood occurred in September 2012 and in June 2013, three round kilns and one Hoffman had to be deactivated because the water damaged the structure of the kilns. During the first crediting period, a Wagon Kiln was constructed. This kiln type is more efficient compared to the Round and Paulista kilns, involving more advanced technology and requiring less labor. The ceramic factory now operates two "Paulista" kilns and one Wagon kiln.

During this 5th monitoring period, the first monitoring of the second crediting period, it was observed that the project's efficiency increased due to the introduction of the new Wagon Kiln. This means the ceramics factory was able to produce more ceramic pieces with less biomass usage. Consequently, an additionality assessment was conducted in accordance with TOOL 21: Demonstration of additionality of small-scale project activities - Version 13.1, to confirm that all additionality criteria and tests remain valid. For more detailed information regarding the additionality assessment, please refer to section 3.2.2 - Project Description Deviations.

Table below shows the different kiln types operated by this project activity during the first crediting period and in this 5th monitoring period.

	Hoffman kiln	Paulista kiln	Round kiln	Wagon kiln
VCS PD v03	1	2	3	0
1 st Monitoring Period	1	2	3	0
2 nd Monitoring Period	1	2	3	0
3 rd Monitoring Period (Until 2014)	1	2	1	0
3 rd Monitoring Period (Until 2015)	1	2	0	0
4 th Monitoring Period	0	2	0	1
5 th Monitoring Period	0	2	0	1

Table 2. Historical of different kiln types operated by the project activity.

The production of the new Wagon kiln was not considered during the third monitoring period (VCS MR3 01-July-2013 to 31-December-2015) once only some tests were carried out at the end of 2015, around 16% of total production in December/2015. The fourth monitoring period (VCS MR4 01-January-2016 to 28-February-2019) included the new Wagon kiln.

The emission reductions from the last monitoring periods of *Rio Negro* ceramic are available on Table 3 below.

First monitoring period		Second monitoring period		Third monitoring period		Fourth monitoring period	
Period	ER _y (tCO ₂ e)	Period	ER _y (tCO ₂ e)	Period	ER _y (tCO ₂ e)	Period	ER _y (tCO ₂ e)
March 2009 - Dec 2009	11,789	April 2011 to Dec 2011	12,353	2013	7,905	2016	12,538
2010	18,737	2012	14,832	2014	17,383	2017	11,093
Jan 2011 - March 2011	4,508	Jan 2013 - June 2013	6,906	2015	16,057	2018	13,985
-	-	-	-	-	-	Jan. and Feb.-2019	1,937
Total in period	35,034	Total in period	34,091	Total in period	41,345	Total in period	39,553

Table 3. Historical GHG Emissions Reductions generated by the project activity.

Regarding the production data, the monitoring information was kept according to the monitoring plan described in the project description document. This Monitoring Report refers to the fifth monitoring period of this project and includes data from 01-March-2019 to 31-August-2023.

3.2 Deviations

3.2.1 Methodology Deviations

There were no methodology deviations during this monitoring period.

3.2.2 Project Description Deviations

As described in VCS PD Version 07, for the renewal of the crediting period, Rio Negro Ceramic currently operates two 'Paulista' kilns and one Wagon kiln. Only renewable biomass is used to fuel these kilns, and this parameter is registered by the project proponent and monitored by Sustainable Carbon as part of the QA/QC procedure for $Q_{renbiomass}$. This includes maintaining internal records of renewable biomass usage, production and calculating energy consumption. The VVB has verified purchase records, ensuring all data is double-checked.

As stated in section 3.1 of this 5th Monitoring Report, due to the floods of the Rio Negro River in September 2012 and June 2013, three round kilns and one Hoffmann kiln had to be deactivated as the water damaged their structures. During the first crediting period, a Wagon kiln was constructed. Consequently, an additionality analysis was conducted at that time (4th Monitoring Period) to ensure the project's additionality.

The table below summarizes the kiln status and installation and deactivation years.

Quantity	Kiln	Status	Installation year	Deinstallation year
3	Round Kilns	Inactive	Prior to the carbon project	2012, 2013 and 2014
1	Hoffman Kiln	Inactive	Prior to the carbon project	2015
2	Paulista Kilns	Active	Prior to the carbon project	-
1	Wagon Kiln	Active	2015	-

Table 4. Kilns under the project activity

During this 5th monitoring period, the first monitoring of the second crediting period, it was observed that the project's efficiency increased due to the introduction of the Wagon Kiln. This means the ceramics factory was able to produce more ceramic pieces with less renewable biomass usage. Consequently, an additionality assessment was conducted in accordance with TOOL 21, Version 13.1, to confirm that all additionality criteria and tests remain valid.

This deviation does not impact the applicability, small scale thresholds, additionality, appropriateness of baseline or the methodology of the project activity.

The applicability of the project remains valid, considering that the methodology applies to technologies that replace non-renewable biomass with renewable energy. Only renewable biomasses are being used to feed all kilns under the project activity.

Even with the installation of the Wagon kiln, the project generated 2.56 MW_{thermal}, which still places it within the small-scale category for biomass renewable energy projects (capacity <45MW_{th}).

A comparison of biomass utilization and production was conducted, as these are the primary data monitored before and after the installation of the Wagon Kiln:

	Period	PRy - Production (tonnes of ceramic units)	Renewable biomass (Tonnes)	PRy/Tonnes of Renewable Biomass
Before Wagon Kiln Installation	1st MR: 01-March-2009 to 31-March-2011	60,944.85*	39,713.98	1.53
	2nd MR: 01-April-2011 to 30-June-2013	59,170.63*	20,431.82	2.89
	3rd MR: 01-July-2013 to 31-December- 2015	77,474.04*	29,609.75	2.61
	Total	197,589.52	89,755.55	-
After Wagon Kiln Installation	4th MR: 01-January-2016 to 28-February- 2019	78,776.16	12,257.22	6.42
	5th MR: 01-March-2019 to 31-August-2023	107,484.23	23,500.52	4.57
	Total	186,260.39	35,757.74	-

*PRy (in ceramic units) available in the MRs multiplied by the average weight of 2.2 kg (0.0022 tons) for unit conversion to tons, as approved in the VCS PD.

Table 5. Comparison between Production and Renewable Biomass Before and After Wagon Kiln Installation

When calculating the tonnes of ceramic units produced with the corresponding tonnes of renewable biomass, it is evident that the installation of the Wagon Kiln resulted in significant efficiency gains. Consequently, the assessment of additionality was conducted following TOOL 21: Demonstration of additionality for small-scale project activities - Version 13.1, to ensure the continued validity of all additionality criteria.

Regulatory Surplus

The project is not mandated by any systematically enforced law, statute or other regulatory framework or policies that give comparative advantage to less emissions-intensive technologies or activities relative to more emissions-intensive technologies or activities need not be taken into account.

Technological barrier

As previously mentioned, due to the natural disaster (flood) that occurred at the ceramics factory in 2012 and 2013, three Round kilns and one Hoffmann kiln had to be deactivated because the water damaged their structures. During the current monitoring period, it was observed that the project's efficiency increased due to the introduction of the Wagon Kiln. It is important to note that the changes in the kilns had to be carried out due to the natural disaster (flood) and would have occurred even without the implementation of the project activity. Nonetheless, the factory owner could have chosen to use native firewood as non-renewable biomass, as it is the most common and economical practice in the region but chose to continue with the carbon project and use only renewable biomass.

The installation of a Wagon Kiln at Rio Negro Ceramics demonstrates the factory's commitment to investing in technology, improving efficiency, and enhancing its production processes. This type of kiln offers significant technical, economic, and environmental benefits, including lower thermal energy demand, a higher share of first-quality products, reduced labor, increased production speed, reduced emissions, and the ability to produce a variety of products¹⁶.

Furthermore, some disadvantages of the Round Kiln, three of which were deactivated at the ceramics factory, include uneven heating rates between the upper and lower zones, high specific energy consumption, a high demand for labor compared to other types of kilns, increased losses due to combustion and product handling deficiencies, lower product quality in the lower zone, and unhealthy conditions for unloading the kiln (due to high internal temperatures and dust). Regarding the Hoffmann Kiln, also deactivated at the time, its disadvantages include expensive construction, more complex operation compared to other types of kilns (constant opening and closing of registers, positioning of paper barriers, and rhythm of chamber advancement), high

¹⁶ Manual de Fornos Eficientes para a Indústria de Cerâmica Vermelha (in English: "Efficient Kilns Manual for the Red Ceramic Industry"), pg 33. Available at: <<https://www.gov.br/int/pt-br/central-de-conteudos/ceramica-vermelha/manual-fornos-eficientes-2a-edicao>> Last Visit on: July, 2024.

labor input, production limited to blocks, excessive handling of the product, reburning at the base and underburning at the crown, leaks in the channels, and lateral stains on the products caused by insufficient air during firing.

Currently, the ceramics factory operates with two “Paulista” Kilns with a capacity of 24,000 pieces each and one Wagon Kiln with a capacity of 50,000 pieces¹⁷.

Table 6 provides data comparing the efficiency and technology of various kilns, showing the Wagon Kiln's superior performance relative to the Round Kiln.

	Energy Consumption (kcal/kg)	Capacity (units) ¹⁸	Thermal Efficiency	High-Quality Pieces	Soot Emission
Round Kiln (Inactive)	536 to 860	25,000	38%	60 to 80%	Low
Hoffman Kiln (Inactive)	418 to 637	68,800	50%	>90%	Very Low
Wagon Kiln (Active)	450 to 580	50,000	49%	>90%	Very Low
Paulista Kiln (Active)	583 to 914	24,000	35%	50 to 70%	Low

Table 6. Comparison between Round, Hoffman and Wagon kilns¹⁹

The table above demonstrates that round kilns are a less technologically advanced alternative to the project, although they entail lower risks due to their widespread use in Brazil. Round kilns are widely employed in Brazil, accounting for 40% of the kilns in operation in the Brazilian red ceramics industry. Additionally, round kilns exhibit lower thermal efficiency and higher energy consumption. Regarding atmospheric emissions, they have higher soot emissions.

As for the Hoffmann Kiln, a type of kiln also replaced due to structural issues caused by flooding, it was observed that both kilns have similar thermal efficiencies (50% for Hoffmann versus 49% for Wagon). Nevertheless, the capacity of the Hoffmann is higher than that of the Wagon. For this

¹⁷ The capacity data pertains to the kilns at Rio Negro Ceramic, which is available in the 'Cer Rio Negro Ceramic Monitoring Spreadsheet'.

¹⁸ The capacity data pertains to the kilns at Rio Negro Ceramic, which is available in the 'Cer Rio Negro Ceramic Monitoring Spreadsheet'.

¹⁹ CERÂMICA VERMELHA - Projeto EELA no Brasil (in English: “RED CERAMIC – EELA Project in Brazil”) pg 69. Available at: <<https://www.gov.br/int/pt-br/central-de-conteudos/ceramica-vermelha/livro-ceramica-vermelha-projeto-eela-no-brasil>>; Last visited on July, 2024.

reason, it has been concluded that the Wagon kiln, although similar in efficiency when compared to the Hoffmann, is more efficient when compared to the Round kiln. Therefore, the implementation of a Wagon kiln provided high-quality pieces with lower energy consumption compared to the previous scenario.

Financial barrier

Due to all the reasons mentioned, the ceramic industry faced significant investment challenges. The construction of the Wagon Kiln at Rio Negro Ceramics required a substantial financial outlay. Various adaptations were necessary within the ceramic facility. The Wagon Kiln installed has a larger capacity of 50,000 bricks per firing and can cost more than R\$ 550,000²⁰. Of this cost, around 40% is allocated to thermal insulation using ceramic fiber, with the remainder covering the metal and masonry structure, electrical installation, control system, and other installation expenses.

Despite these changes not being directly linked to the project activity but rather to a natural disaster, efficiency gains were observed due to the kiln replacements. Therefore, the additionality assessment considered the Financial Barrier very important. Considering that in the baseline scenario the Wagon kiln would use native wood, the replacement for renewable biomass would follow the same additionality analysis as provided in the validation phase: the costs of fuel would increase significantly with the replacement by renewable biomass. Although the Wagon kiln is more efficient, this increase of efficiency would have been observed also in the baseline scenario. A comparison was made between the costs of renewable and non-renewable biomass in the baseline scenario of Rio Negro Ceramics and during the 5th monitoring period²¹, as detailed in the table below.

	Costs (R\$/t)	
	Baseline Price	5 th Monitoring Period Price
Renewable Biomass (R\$/t)	R\$ 35.03	R\$ 103.49
Non-renewable biomass (R\$/t)	R\$ 34.58	R\$ 73.16 ²²

Costs of Delivery Heat	
Non-renewable biomass (R\$/TJ)	Renewable Biomass (R\$/TJ)
R\$ 4,690.01	R\$ 6,633.66

²⁰ Manual de Fornos Eficientes para a Indústria de Cerâmica Vermelha (in English: "Efficient Kilns Manual for the Red Ceramic Industry"), pg 37. Available at: <<https://www.gov.br/int/pt-br/central-de-conteudos/ceramica-vermelha/manual-fornos-eficientes-2a-edicao>> Last Visit on: July, 2024.

²¹ The 5th Monitoring Period represents the estimated renewable and non-renewable biomass costs in 2022.

²² Estimated using the Baseline cost (2009) adjusted by the inflation observed in the. Since the Rio Negro Ceramic only use renewable biomass in the operation. Therefore, there is no contact with Non-Renewable Wood sources.

Table 7. Cost of renewable and non-renewable biomass

In both the baseline and the current monitoring period, the data indicate that the cost of purchasing non-renewable biomass is financially more attractive than that of renewable biomass. The chart below compares the cost of delivered heat between the two types of biomass during the 5th monitoring period.

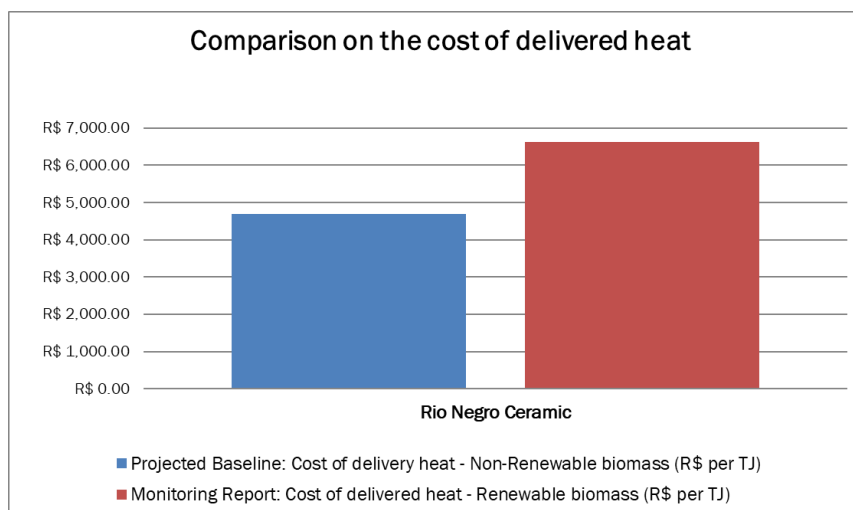


Chart 1. Comparison between the cost of delivered heat at the 5th monitored period.

When comparing the cost per unit of energy generated, Rio Negro Ceramic spent BRL 6,633.66 per TJ using renewable biomass, compared to the expected BRL 4,690.01 per TJ if non-renewable wood had been used. These values indicate that non-renewable biomass is more financially attractive than wood residue biomass. This comparison reinforces the validity of all additionality criteria and tests. Furthermore, this deviation does not affect the applicability of the methodology or the adequacy of the baseline scenario, as these changes were not caused by the project activity.

3.3 Grouped Projects

Not applicable. This is not a grouped project.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$f_{NRB,y}$
Data unit	Percentage
Description	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass.
Source of data	Based on national and international articles, databases and data searched by the project developer.
Value applied	93.80
Justification of choice of data or description of measurement methods and procedures applied	As per "TOOL30: Calculation of the fraction of non-renewable biomass".
Purpose of data	Calculation of baseline emissions
Comments	The parameter will be fixed during the whole crediting period as per tool 30. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$EF_{\text{projected fossil fuel}}$
Data unit	tCO ₂ /TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers.
Source of data	AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user - Version 9.0 Available at: < https://cdm.unfccc.int/filestorage/Q/W/J/QWJA0G7VOXCS4UPELMYN9HFDI3TZ85/EB100_repan10_AMS-I.E.pdf?t=VXI8cG05OWtifDD8kNWLh-O2xdJ9w-CWapYO > Last visit on 11/09/2023
Value applied	63.70
Justification of choice of data or description of measurement methods and procedures applied	As per "AMS.I-E: Switch from non-renewable biomass for thermal applications by the user".
Purpose of data	Calculation of baseline emissions.
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.

Data / Parameter	BF_y
Data unit	Tonne of wood per tonne of ceramic devices
Description	Consumption of non-renewable biomass per tonne of ceramic devices
Source of data	Historical data from project proponent
Value applied	0.4600
Justification of choice of data or description of measurement methods and procedures applied	Data is in accordance with TAPIA, 2000, which estimates an approximate value for the kinds of kilns utilized at <i>Rio Negro Ceramic</i> .
Purpose of data	Calculation of baseline emissions
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.

Data / Parameter	EF_{CO2,i,y}
Data unit	tCO ₂ /TJ
Description	Upper CO ₂ emission factor of fuel type i
Source of data	Value was checked at: -IPCC: Intergovernmental Panel on Climate Change
Value applied	During the first crediting period <i>Rio Negro Ceramic</i> factory did not utilize any fossil fuel, so it does not exist a reference data. Even so, if in the future <i>Rio Negro</i> utilize fossil fuel, the emission factor data from IPCC will be taken into consideration.
Justification of choice of data or description of measurement methods and procedures applied	The source of data is the IPCC default value, as recommended by the applied methodology and by the Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion, on data/parameter Table 5, source of data option d.
Purpose of data	Calculation of project emissions
Comments	Applicable only if the industry utilizes fossil fuel associated with the operation of manufacturing process and biomass treatment and processing. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	NCV_{i,y}
------------------	--------------------------

Data unit	TJ/ tonne
Description	Upper net calorific value of the fuel
Source of data	Value was check at: IPCC: Intergovernmental Panel on Climate Change.
Value applied	During the first crediting period <i>Rio Negro</i> Ceramic factory did not utilize any fossil fuel, so it does not exist a reference data. Even so, if in the future <i>Rio Negro</i> utilize fossil fuel the emission factor data from IPCC will be taken into consideration.
Justification of choice of data or description of measurement methods and procedures applied	The source of data is the IPCC default value, as recommended by the applied methodology and by the Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion, on data/parameter table 4, source of data option d.
Purpose of data	Calculation of project emissions
Comments	Applicable only if the industry utilizes fossil fuel or NRB associated with the operation of manufacturing process and biomass treatment and processing. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

Data / Parameter	<i>TDL_{j,y}</i>
Data unit	%
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation. Available at: < https://cdm.unfccc.int/methodologies/PAMethodologies/tools/a-m-tool-05-v3.0.pdf > Last visit on 11/09/2023
Value applied	20%
Justification of choice of data or description of measurement methods and procedures applied	The source of data is the methodological tool default value, as recommended by the applied methodology and by the tool, on data/parameter table 3, in case of scenario; A (Electricity consumption from the grid) <i>TDL_j</i> , can assume the following value option 2.
Purpose of data	Calculation of project emissions
Comments	Applicable only if the industry presents electricity consumption associated with the biomass treatment and processing. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

Data / Parameter	EF_{CO2,f}						
Data unit	gCO ₂ /t km						
Description	Default CO ₂ emission factor for freight transportation activity f						
Source of data	Methodological tool: Project and leakage emissions from transportation of freight. Available at: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/a-m-tool-12-v1.1.0.pdf Last visit on 11/09/2023						
Value applied	<table> <tr> <th>Vehicle class</th><th>Emission factor</th></tr> <tr> <td>Light vehicle</td><td>245</td></tr> <tr> <td>Heavy vehicles</td><td>129</td></tr> </table>	Vehicle class	Emission factor	Light vehicle	245	Heavy vehicles	129
Vehicle class	Emission factor						
Light vehicle	245						
Heavy vehicles	129						
Justification of choice of data or description of measurement methods and procedures applied	The source of data was the methodological tool default values, a reliable validated document developed by UNFCCC.						
Purpose of data	Calculation of project emissions						
Comments	This parameter was utilized to calculate project emissions for freight that exceeded 200 km. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.						

Data / Parameter	$\rho_{biomass}$
Data unit	ton/m ³
Description	Specific gravity of non-renewable biomass
Source of data	BARROS, S. V. S. Avaliação da biomassa de espécies exóticas e nativas como fonte alternativa para geração de energia. Dissertação (Mestrado). Universidade Federal do Amazonas, Manaus, 2006.
Value applied	0.5542
Justification of choice of data or description of measurement methods and procedures applied	The amount of wood used in the baseline was measured by volume units, so this data was used to the unity conversion.
Purpose of data	Calculation of project emissions
Comments	The species used to calculate the average value are typical trees of Amazon Biome and usually employed as fuel in the ceramic industries of the region.

4.2 Data and Parameters Monitored

Data / Parameter	NCV_{biomass}
Data unit	TJ/tonne
Description	Net Calorific Value of non-renewable woody biomass that will be substituted
Source of data	AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user - Version 9.0 Available at: < https://cdm.unfccc.int/filestorage/Q/W/J/QWJA0G7VOXCS4UPELMYN9HFDI3TZ85/EB100_repan10_AMS-I.E.pdf?t=VXI8cG05OWtifDD8kNWLh-O2xdJ9w-CWapY0 > Last visit on 12/09/2023
Description of measurement methods and procedures to be applied	IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried'. This data was used since the fuel used in project device was also woody biomass.
Frequency of monitoring/recording	Annually
Value monitored	0.0156
Monitoring equipment	No monitoring equipment was used to determine this parameter.
QA/QC procedures to be applied	-
Purpose of the data	Calculation of baseline emissions
Calculation method	Not applicable
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.

Data / Parameter	PR_y
Data unit	Tonnes of ceramic devices
Description	Production of ceramic devices
Source of data	Controlled by the project proponent (ceramic company).

Description of measurement methods and procedures to be applied	The amount of ceramic pieces produced is monitored by counting the total production of one year, based on data from last crediting period. This parameter was monitored by the project proponent (meaning the ceramic owner). The amount was acquired by counting the total production (in units of ceramic devices) of the period considered for the ceramic factory and data was aggregated on a monthly and yearly basis.		
Frequency of monitoring/recording	Annually		
Value monitored	Year	Period	<i>Rio Negro</i> production (tonnes)
	2019	March	2,321.62
		April	2,060.93
		May	1,939.70
		June	2,327.71
		July	2,488.49
		August	2,567.79
		September	2,049.43
		October	1,953.70
		November	1,702.22
		December	2,108.30
		Total 2019	21,519.89
	2020	January	2,044.43
		February	2,132.49
		March	1,937.53
		April	1,536.50
		May	1,383.51
		June	2,353.48
		July	2,950.41
		August	2,469.94

		September	2,445.86
		October	2,336.64
		November	1,950.48
		December	1,863.73
		Total 2020	25,404.98
	2021	January	1,452.95
		February	1,606.55
		March	1,995.80
		April	1,837.81
		May	1,798.81
		June	1,749.61
		July	1,705.03
		August	2,221.58
		September	2,001.95
		October	1,823.39
		November	1,908.46
		December	1,714.19
		Total 2021	21,816.13
	2022	January	1,665.13
		February	1,540.08
		March	1,987.13
		April	1,715.10
		May	1,992.88
		June	1,923.63
		July	1,988.69
		August	2,310.44
		September	2,229.57
		October	2,169.63
		November	2,170.72

		December	1,563.33
		Total 2022	23,256.34
	2023	January	1,596.76
		February	1,499.73
		March	1,690.61
		April	1,707.71
		May	1,822.90
		June	2,163.13
		July	2,547.32
		August	2,458.73
		Total 2023	15,486.88
More detailed information, please see VCS MR Calculations <i>Rio Negro</i> spreadsheet.			
Monitoring equipment	No monitoring equipment was used to determine this parameter. Production was counted by trained personnel on <i>Rio Negro</i> ceramic.		
QA/QC procedures to be applied	The ceramic has an internal control of the quantity of pieces produced.		
Purpose of the data	Calculation of baseline emissions.		
Calculation method	The ceramic industry has an internal control of the quantity of ceramic units produced. The amount was rechecked according to the biomass employed in the ceramic kilns.		
	The weight value of each type of ceramic piece was used to convert the units of ceramic pieces to tons.		
	Weight of the ceramic units		
	Type	Ceramic	Weight
	TIJOLO COMUM 8 FUIROS (9X19X19)	Bricks	0.00220
	MACIÇO (19X10X5)	Bricks	0.00200
	LAJOTA PISO (19X14X1,5)	Tiles	0.00170
	LAJE (27X7X19)	Roof Tiles	0.00260
	MACIÇO 2 FUIROS (19X10X5)	Bricks	0.00123
	TIJOLO 6 FUIROS (9X14X19)	Bricks	0.00152
	TIJOLO CUNHA (19X14X{7X5}25°)	Bricks	0.00282
BLOCO ESTRUTURAL (14X19X29)	Bricks	0.00480	

	The weight values were provided by the ceramic factory.
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.

Data / Parameter	$Q_{renbiomass}$
Data unit	Tonnes per month
Description	Amount of renewable biomass utilized
Source of data	Through all the receipts and invoices of biomass received by the ceramic industry.
Description of measurement methods and procedures to be applied	The amount of biomass was monitored in accordance to the volume described at the receipt. The VCS PD establishes that values in the receipts described in m³ (when applicable), shall be converted into tonnes through the specific gravity of each biomass. For wood residue, it was utilized Specific Gravity values from Pinus and Eucalyptus woodchips values, once the wood residues composition is mainly made of the woodchips of these species of trees. The values are available at: <http://www.ipef.br/publicacoes/scientia/nr74/cap02.pdf>. Last visit on 12/09/2023. The source of the specific gravity value for açai residue biomass is available at: SEYE, et al. Caracterização do caroço de açai como insumo para geração de eletricidade via gaseificação. <https://www.osti.gov/etdeweb/servlets/purl/21379974> Last visit on: October, 2023. The biomass providers bring the biomass to the ceramic company with invoices or receipts. Some of these evidences describe the amount of biomass in tons, which requires a calibration of the equipment used to measure the weight. Since this information is used for commercial purposes, it is considered that even though calibration of equipment does not occur, data from the suppliers are a reliable source. As a conservative measure, the project developer considered a 5% error margin in the measurement. Therefore, the amount of biomass that arrives in tons was multiplied by 95%. The specific gravity values of each renewable biomasses used in this Monitoring Period are:

	Sources of data:														
	<table><tr><th>Biomass</th><th>Specific gravity (tonnes/m³)</th></tr><tr><td>Açaí residue</td><td>0.723</td></tr><tr><td>Wood Residues</td><td>0.7575</td></tr></table>	Biomass	Specific gravity (tonnes/m³)	Açaí residue	0.723	Wood Residues	0.7575								
	Biomass	Specific gravity (tonnes/m³)													
	Açaí residue	0.723													
Wood Residues	0.7575														
Frequency of monitoring/recording	Monthly														
Value monitored	Total amount during this monitoring period: <table><tr><th>Year</th><th>Q_{renbiomass} (tonnes)</th></tr><tr><td>Total 2019*</td><td>2,122.02</td></tr><tr><td>Total 2020</td><td>8,923.30</td></tr><tr><td>Total 2021</td><td>4,814.52</td></tr><tr><td>Total 2022</td><td>4,460.39</td></tr><tr><td>Total 2023**</td><td>3,180.29</td></tr><tr><td>Total period</td><td>23,500.52</td></tr></table> *From March to December ** From January to August	Year	Q _{renbiomass} (tonnes)	Total 2019*	2,122.02	Total 2020	8,923.30	Total 2021	4,814.52	Total 2022	4,460.39	Total 2023**	3,180.29	Total period	23,500.52
Year	Q _{renbiomass} (tonnes)														
Total 2019*	2,122.02														
Total 2020	8,923.30														
Total 2021	4,814.52														
Total 2022	4,460.39														
Total 2023**	3,180.29														
Total period	23,500.52														
Monitoring equipment	No monitoring equipment was used to determine this parameter.														
QA/QC procedures to be applied	The ceramic has monthly records of the quantity of biomass acquired. Data was rechecked according to the receipts of purchase. This parameter was also used to calculate the Thermal Energy generated in the ceramic industry, which was 2.56 MW, thus demonstrating that the project fits into the small-scale category for biomass renewable energy projects (capacity <45MWth).														
Purpose of the data	Calculation of leakage														
Calculation method	The energy generated by the amount of renewable biomass was calculated based on the Net Calorific Value of each biomass, as can be seen on the VCUs Estimatives Calculation spreadsheet. Values in the receipts from biomass providers may be described in m³ or in tonnes, therefore if the receipts are in m³ it is necessary the conversion to tonnes through the specific gravity of each biomass.														

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.
----------	---

Data / Parameter	$FC_{i,j,y}$
Data unit	tonne/year
Description	Quantity of fossil fuel combusted
Source of data	Monitored by <i>Rio Negro</i>
Description of measurement methods and procedures to be applied	No fossil fuel was combusted during this monitoring period. Therefore, no fossil fuel consumption has been reported.
Frequency of monitoring/recording	Monthly
Value monitored	0
Monitoring equipment	No monitoring equipment is required.
QA/QC procedures to be applied	The project participant is responsible for gathering and maintaining in adequate archives all documents related to fossil fuel consumption and purchase.
Purpose of the data	Calculation of project emissions
Calculation method	Not applicable.
Comments	This parameter was not monitored during the first crediting period. Values started to be monitored at the Monitoring Report from now on. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$D_{f,m}$
Data unit	Kilometre
Description	Return trip distance between the origin and destination of freight transportation activity <i>f</i> in monitoring period <i>m</i>
Source of data	Monitored

Description of measurement methods and procedures to be applied	Determined once for each freight transportation activity f for a reference trip using the vehicle odometer or any other appropriate sources (e.g. on-line sources).																																			
Frequency of monitoring/recording	To be updated whenever the distance changes.																																			
Value monitored	<table><tr><th>Provider</th><th>Origin</th><th>Destiny</th><th>Return trip distance (in kilometers) Df,m</th></tr><tr><td>A.J DE OLIVEIRA COM. DE MADEIRA EIRELI</td><td>Rod. BR210 KM57LT395 Zona Rural São Luiz/RR</td><td rowspan="10"><u>Estrada do Brito, s/nº.</u> <u>Zona rural – Cacao Pirêra</u> <u>ZIP code: 69405-000</u></td><td>1,198.00</td></tr><tr><td>AMAZON AGRARIA EMP. AGROFLORESTA IS LTDA</td><td>Rod.AM 010 KM 56 S/Nº ZF1 KM 12-Rio Preto Da Eva /AM</td><td>133.60</td></tr><tr><td>AMAZON ECOGAS LTDA</td><td>Rua Tendo,642 - Distrito Industrial II Manaus/AM</td><td>65.40</td></tr><tr><td>ARIPUANA IND. E COM. DE MADEIRA EIRELE</td><td>Est do Agricola, 60, Zona Rural - Novo Aripuana - AM. Postal Code 69260000</td><td>965.26</td></tr><tr><td>BOMPALETE FABRICA DE EMBAL DE MADEIRA EIRELI</td><td>Rua Carmem De Souza 2585A Morada Do Sol Manacapuru/AM</td><td>169.00</td></tr><tr><td>CAP 40 EMPREENDIME NTO IMOBILIARIOS SPE</td><td>Avenida Thales Loureiro, n. 5335, Lote 318 - Ponta Negra - Manaus/AM</td><td>42.2</td></tr><tr><td>CARLOS EDUARDO DA SILVA COSTA EIRELI</td><td>Rua Jardim Olinda Nº2 Novo AleixoQD J7 LT 2 Loteamento Aguas Claras</td><td>49.60</td></tr><tr><td>CONSTRUTORA ETAM LTDA</td><td>Avenida Margarita 420- Nova Cidade Manaus/AM</td><td>55.40</td></tr><tr><td>E A FERREIRA AGROSOLO SERRARIA E COM. LTDA</td><td>Estrada Guaranatuba S/N Zona Rural - Maues/AM</td><td>1,018.78</td></tr></table>				Provider	Origin	Destiny	Return trip distance (in kilometers) Df,m	A.J DE OLIVEIRA COM. DE MADEIRA EIRELI	Rod. BR210 KM57LT395 Zona Rural São Luiz/RR	<u>Estrada do Brito, s/nº.</u> <u>Zona rural – Cacao Pirêra</u> <u>ZIP code: 69405-000</u>	1,198.00	AMAZON AGRARIA EMP. AGROFLORESTA IS LTDA	Rod.AM 010 KM 56 S/Nº ZF1 KM 12-Rio Preto Da Eva /AM	133.60	AMAZON ECOGAS LTDA	Rua Tendo,642 - Distrito Industrial II Manaus/AM	65.40	ARIPUANA IND. E COM. DE MADEIRA EIRELE	Est do Agricola, 60, Zona Rural - Novo Aripuana - AM. Postal Code 69260000	965.26	BOMPALETE FABRICA DE EMBAL DE MADEIRA EIRELI	Rua Carmem De Souza 2585A Morada Do Sol Manacapuru/AM	169.00	CAP 40 EMPREENDIME NTO IMOBILIARIOS SPE	Avenida Thales Loureiro, n. 5335, Lote 318 - Ponta Negra - Manaus/AM	42.2	CARLOS EDUARDO DA SILVA COSTA EIRELI	Rua Jardim Olinda Nº2 Novo AleixoQD J7 LT 2 Loteamento Aguas Claras	49.60	CONSTRUTORA ETAM LTDA	Avenida Margarita 420- Nova Cidade Manaus/AM	55.40	E A FERREIRA AGROSOLO SERRARIA E COM. LTDA	Estrada Guaranatuba S/N Zona Rural - Maues/AM	1,018.78
Provider	Origin	Destiny	Return trip distance (in kilometers) Df,m																																	
A.J DE OLIVEIRA COM. DE MADEIRA EIRELI	Rod. BR210 KM57LT395 Zona Rural São Luiz/RR	<u>Estrada do Brito, s/nº.</u> <u>Zona rural – Cacao Pirêra</u> <u>ZIP code: 69405-000</u>	1,198.00																																	
AMAZON AGRARIA EMP. AGROFLORESTA IS LTDA	Rod.AM 010 KM 56 S/Nº ZF1 KM 12-Rio Preto Da Eva /AM		133.60																																	
AMAZON ECOGAS LTDA	Rua Tendo,642 - Distrito Industrial II Manaus/AM		65.40																																	
ARIPUANA IND. E COM. DE MADEIRA EIRELE	Est do Agricola, 60, Zona Rural - Novo Aripuana - AM. Postal Code 69260000		965.26																																	
BOMPALETE FABRICA DE EMBAL DE MADEIRA EIRELI	Rua Carmem De Souza 2585A Morada Do Sol Manacapuru/AM		169.00																																	
CAP 40 EMPREENDIME NTO IMOBILIARIOS SPE	Avenida Thales Loureiro, n. 5335, Lote 318 - Ponta Negra - Manaus/AM		42.2																																	
CARLOS EDUARDO DA SILVA COSTA EIRELI	Rua Jardim Olinda Nº2 Novo AleixoQD J7 LT 2 Loteamento Aguas Claras		49.60																																	
CONSTRUTORA ETAM LTDA	Avenida Margarita 420- Nova Cidade Manaus/AM		55.40																																	
E A FERREIRA AGROSOLO SERRARIA E COM. LTDA	Estrada Guaranatuba S/N Zona Rural - Maues/AM		1,018.78																																	

	EUROMAD COM. DE MADEIRAS LTDA	Rod. AM 010KM 56 Ramal ZF1KM12 GL Distrito Agropecuario Rio Preto/AM	133.60
	EXPRESS COM. VAREJISTA DE DERIVADOS DE PETROLEO LTDA	Avenida do Turismo, n. 1860, Taruma - Manaus/AM. Postal Code 69041-010	30.60
	GLOBAL IND. E COM. DE MADEIRAS EIRELI	Estrada Feliciano Sá, S/N, Dom Bosco, Zona Rural - Manicoré - AM	1,261.34
	IGUAÇU AGROINDUSTRIAL LTDA	Chacara São Pedro, S/Nº, Estrada NAP 01, KM 01 , Zona Rural - Novo Aripuana - AM.	962.26
	IMADAM IND. DE MADEIRAS DO AMAZONAS LTDA	Marg Esquerda do Igarapé do Leandro, Afluente do Rio Aracu, SN, Zona Rural - Novo Aripuana, AM. Postal Code: 69260000	970.36
	IPA INDUSTRIA DE PISOS DA AMAZONIA LTDA	Margem Esquerda Do Rio Solimoes S/N Areia Preta - Iranduba/AM	80.80
	ISAIAS SAMPAIO DA SILVA-ME	Rod. AM010 KM 187 Vila De Lindoia, 731 Itacoatiara/AM	378.00
	J.L DA TRINDADE	AV. Gilberto Mestrinho Morada Do Sol Iranduba/AM	81.40
	JAIR LAZAROTTO-ME	Margem Direita Do Rio Aracu 190 Das Palmeiras Novo Aripuana	1,060.34
	JANICE RAMIRES OBANDO	Av. Prof. Nilton Lins, Nº 877, Pq das Laranjeiras - Manaus - AM	32.60
	JATAPU IND. E COM. DE MADEIRA EIRELI	Rua Bandeirantes, 200 Nova Colina - Rorainopolis/RR	978.00
	L.F DOS SANTOS CASTRO EIRELE EPP	Ramal do Bahia, 14, Lote 05, Zona Rural - Novo Aripuana - AM. Coordenadas	974.00

		60°21'49.5"W - 05°08'13.2"S		
	LUIS RENATO COSTA DOS SANTOS	Rod.AM070 Manoel Urbano KM 82LT2 QD11 Morada Do Sol- Manacapuru/AM	198.60	
	MADEIREIRA SATERE LTDA - EPP	Rua Paracuni, 1153, Mirante do Edem - Maues - AM. Postal Code: 69190000	1,012.42	
	MADEREIRA VITORIA REGIA, IND. COM. TRANSP. IMP. & EXP. DE MADEIRA	BR 174, KM 500, Vila Novo Paraíso - Caracarai - RR	1,048.00	
	MAGDALÃO COM. ATAC. DE MADEIRA E PRODUTOS DERIVADOS LTDA	Estrada Guaranatuba, KM 03, Área de Expansão Urbana, 90, Mario Fonseca - Maues - AM. Postal Code: 69190000	1,014.54	
	MIRANDA CORRÊA ENERGIA LTDA	Rua Tenta - Distrito Industrial II. Postal Code: 69007820.	63.60	
	NORTH POLPAS COM. DE PROD. ALIMENTICIOS	Rua Monte Dos Anjos,423 Colonia Terra Nova Lot Rio Piorini Manaus/AM	38.80	
	RR INDUSTRIA E COMERCIO DE MADEIRAS EIRELI-EPP	BR 174 km 458 - RORAINOPOLIS/RR	732.00	
	RURAL FERTIL AGROPECURARI A COM.REP.IMP.E XP.LTDA	Rod. BR 174 S/N KM 4,5 - Gleba Cauame Boa Vista/RR	560.00	
	SAQUAREMA EMPREENDIME NTO IMOBILIARIOS LTDA	Rua Acre, n. 428, Quadra50, Sala 36, Nossa Senhora Das Gracas - Manaus - AM, Postal Code 69053-130	43.20	
	TRINDADE E TRINDADE LTDA ME	Rua Gilberto Mestrinho, S/N, Morada do Sol - Iranduba - AM.	81.40	

		Postal Code: 69415000																	
	W. DOS SANTOS CORREA - ME	Av. Lacerda Gago, S/N - Nova Colina		978.00															
The table below presents the cumulative values of $D_{r,m}$ (year) for each year of this monitoring period. The applicable values for each year are calculated based on the renewable biomass supplier for that year whose distance exceeded 200 km from the ceramic factory. <table border="1"> <thead> <tr> <th colspan="5">$D_{r,m}$ (year)</th></tr> <tr> <th>2019 (From March onwards)</th><th>2020</th><th>2021</th><th>2022</th><th>2023 (Until August)</th></tr> </thead> <tbody> <tr> <td>5,499.2</td><td>8,077.8</td><td>5,019.9</td><td>1,935.6</td><td>2,235.3</td></tr> </tbody> </table> More detailed information available in the VCS-MR Calculation <i>Rio Negro</i> spreadsheet.					$D_{r,m}$ (year)					2019 (From March onwards)	2020	2021	2022	2023 (Until August)	5,499.2	8,077.8	5,019.9	1,935.6	2,235.3
$D_{r,m}$ (year)																			
2019 (From March onwards)	2020	2021	2022	2023 (Until August)															
5,499.2	8,077.8	5,019.9	1,935.6	2,235.3															
Monitoring equipment	No monitoring equipment is used to determine this parameter.																		
QA/QC procedures to be applied	Data available regarding the ceramic industry freight of biomass transportation.																		
Purpose of the data	Calculation of project emissions.																		
Calculation method	The Return trip distance (km) for this Monitoring Period was calculated using Google Maps. The origin (biomass providers) and destination (<i>Rio Negro</i> Ceramic Factory) addresses were added to Google Maps and the distance provided was multiplied by 2 to cover the round trip.																		
Comments	This parameter was not monitored during the first crediting period. Values started to be monitored at the Monitoring Report from now on. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.																		
Data / Parameter	$EC_{PJ,j,y}$																		

Data unit	MWh/yr
Description	Quantity of electricity consumed by the project.
Source of data	Onsite measurements. Indirect measurement by project participants
Description of measurement methods and procedures to be applied	During the present monitoring period, no equipment to process biomass was used. Therefore, no quantity of electricity consumed was accounted.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value monitored	0
Monitoring equipment	No monitoring equipment is used to determine this parameter.
QA/QC procedures to be applied	The project participant is responsible for gathering and maintaining in adequate archives all documents related to fossil fuel consumption and purchase.
Purpose of the data	Calculation of project emissions
Calculation method	No biomass processing equipment was used during this monitoring period. Therefore, no amount of electricity consumed was reported.
Comments	This parameter was not monitored during the first crediting period. Values started to be monitored at the Monitoring Report from now on. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter	$EF_{EF,j,y}$
Data unit	tCO ₂ /MWh
Description	Grid emissions factor per MWh of power produced in year y
Source of data	Brazilian DNA ²³

²³ Fatores de emissão da margem de operação pelo método da análise de despacho. Available at <https://www.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/emissao_despacho.html> Last visit on 22-September-2023.

Description of measurement methods and procedures to be applied	According to TOOL 07 to calculate the emission factor for an electricity system <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf> Last visit on 13/09/2023. According to the Brazilian Ministry of Science, Technology, Innovations, and Communications (MCTI) <https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/dados-e-ferramentas/fatores-de-emissao> Last visit on 22/09/2023.	
	Year	EF_{grid,BM,y} - Build margin emission factor (tCO₂/MWh) EF_{grid,OM,y} - Operation margin emission factor (tCO₂/MWh)
	2019*	0.10200.5306
	2020	0.09790.4539
	2021	0.05400.5985
	2022	0.02700.3963
	2023**	0.02700.3621
*From March to December ** From January to August		
Frequency of monitoring/recording	Continuous measurement and at least annual average available.	
Value monitored	Year EF_{EF,j,y} - Grid emissions factor per MWh of power produced (tCO₂/MWh)	2019* 0.21 2020 0.19 2021 0.19 2022 0.12 2023** 0.11
*From March to December ** From January to August		
Monitoring equipment	No monitoring equipment is used to determine this parameter.	
QA/QC procedures to be applied	The monitoring of this parameter was based in national database. The sources provided the Brazilian interconnected energy system emission factor calculated according to Tool to calculate the emission factor for an electricity system.	
Purpose of the data	Calculation of project emissions	
Calculation method	Information in section 5.2 - Project Emissions	

Comments	This parameter was not monitored during the first crediting period. Values started to be monitored at the Monitoring Report from now on. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.
----------	--

Data / Parameter	FR _{f,m}			
Data unit	tonnes			
Description	Total mass of freight transported in freight transportation activity f in monitoring period m.			
Source of data	Records by project participants or records by truck operators.			
Description of measurement methods and procedures to be applied	This parameter is recorded by the ceramic in a sheet with the distance between the ceramic and the furnisher. Information in section 5.2 - Project Emissions			
Frequency of monitoring/recording	Annually			
Value monitored	Year	Açaí pits	Wood residue	Total
	2019*	0.00	2,122.02	2,122.02
	2020	0.00	8,923.30	8,923.30
	2021	910.98	3,903.54	4,814.52
	2022	54.23	4,406.17	4,460.39
	2023**	0.00	3,180.29	3,180.29
	Total	965.21	22,535.30	23,500.51
	*From March to December **From January to August			
Monitoring equipment	No monitoring equipment was used to determine this parameter.			
QA/QC procedures to be applied	Data available regarding the ceramic industry freight of biomass transportation.			
Purpose of the data	Calculation of project emissions			
Calculation method	Information in section 5.2 - Project Emissions			

Comments	This parameter was not monitored during the first crediting period. Values started to be monitored at the Monitoring Report from now on. 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.
----------	--

4.3 Monitoring Plan

The monitoring is done with the aim of determining the most approximate quantity of non-renewable wood that in the absence of the project would be used in the ceramics' kilns and consequently the amount of GHG that would be emitted in tonnes of CO₂e. Section 4.2 describes data and parameters monitored, as well as the procedures involved on the monitoring plan.

Ceramic personnel are responsible to monitor the operating conditions on the factory, including the amount of renewable biomass consumed and the monthly production of ceramic devices (parameters $Q_{renbiomass}$ and PR_y). Ceramic personnel are also responsible to store invoices, receipts of sales and other documents related to purchase or acquisition of biomass.

Based on this information, Sustainable Carbon is responsible to assess if the biomasses are from renewable origin, to evaluate if there is a surplus of renewable biomass and to calculate emission reductions, including an assessment of leakage emissions-. Sustainable Carbon also assists the Ceramic personnel to double check the monitored data on biomass consumption and ceramic units production.

In the current monitoring period, Sustainable Carbon performed an analysis to verify if biomass and production data are being correctly filled in the monitoring spreadsheets.

Analysis on production data is performed by a series of comparisons between different measurement points of production (molding machine, kiln loading and kiln unloading) to detect inconsistencies or suspicious data. Analysis on biomass data is performed by a series of comparisons between the amount of biomass and the cost over months to identify inconsistencies or unexpected variations in these parameters.

The data analysis did not reveal any non-conformities or inconsistencies. Any questions or additional documentation requested by the Sustainable Carbon technical team were answered by Rio Negro ceramic personnel.

Sustainable Carbon is responsible for providing the required guidance to the ceramic factory, to register Biomass and Production data, in order to minimize errors, including assisting the ceramic in case the person in charge of the project monitoring is replaced. Sustainable Carbon's technical team is responsible for preparing the present monitoring report and calculating emission reductions, as well as double-checking all information and data received from *Rio Negro* ceramic. The technical coordinator is responsible for oversight and review.

Rio Negro ceramic personnel involved on this monitoring report includes administrative staff who have significant experience with management of the ceramic production. For this purpose, the authority for the registration, monitoring, measurement and reporting was Mr. Antonio da Mata Silva and Ms. Ana Lúcia da Silva Pinheiro.

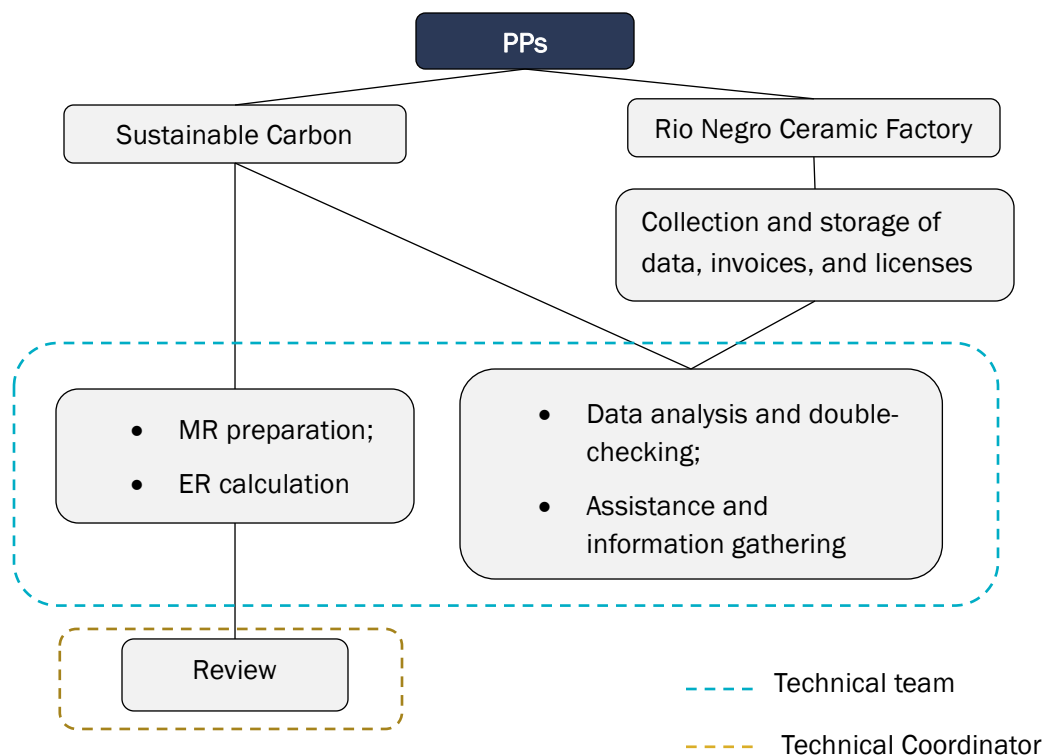


Figure 4. Organization structure of the monitoring team.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The calculation of emission reductions is described below:

$$BE_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossil_fuel} \quad \text{Equation 1}$$

Where:

BE_y Baseline emissions during the year y in tCO₂e

B_y	Quantity of woody biomass that is substitute or displaced in tonnes
$f_{NRB,y}$	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass (fNRB)
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne)
$EF_{projected_fossil_fuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 63.7 tCO ₂ /TJ

The B_y is calculated from the thermal energy in the project activity as:

$$B_y = \sum_i^n \frac{HG_{p,y}}{NCV_{biomass} \times \eta_{old,i}} \quad \text{Equation 2}$$

Where:

$HG_{p,y}$ Quantity of thermal energy generated by the new renewable energy technology in the project in year y (TJ)

$\eta_{old,i}$ Efficiency of pre - project device per type of device i

Considering that $HG_{p,y}$ is calculated as follow:

$$HG_{p,y} = SGE \times PR_y \quad \text{Equation 2.1}$$

Where:

SGE Specific energy, which has to be generated in the process to produce a certain amount of ceramic units in TJ/tonnes of ceramic units fired.

PR_y Amount of product produced in year y in tonnes of ceramic units.

And $\eta_{old,i}$:

$$\eta_{old,i} = \frac{SGE}{SFE} \quad \text{Equation 2.2}$$

Where:

SFE Specific fuel energy needed for the process to produce a certain amount of ceramic units in TJ/ tonnes of ceramic units

Which SFE is calculated as:

$$SFE = BF_y \times NCV_{biomass} \quad \text{Equation 2.3}$$

Where:

BF_y Consumption of non-renewable biomass per tonne of ceramic units fired in year y (tonnes/tonnes of pieces).

With equations 2.1, 2.2 and 2.3 we conclude that:

$$B_y = PR_y \times BF_y \quad \text{Equation 3}$$

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

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

Year	Period	Rio Negro production (tonnes)	B_y (tonnes)	BE_y (tCO ₂ e)
2019	March	2,321.62	1,067.95	995.00
	April	2,060.93	948.03	883.00
	May	1,939.70	892.26	831.00
	June	2,327.71	1,070.74	998.00
	July	2,488.49	1,144.71	1,066.00
	August	2,567.79	1,181.18	1,100.00
	September	2,049.43	942.74	878.00
	October	1,953.70	898.70	837.00
	November	1,702.22	783.02	729.00
	December	2,108.30	969.82	903.00
	Total 2019	21,519.89	9,899.15	9,220.00
2020	January	2,044.43	940.44	876.00
	February	2,132.49	980.94	914.00
	March	1,937.53	891.26	830.00
	April	1,536.50	706.79	658.00
	May	1,383.51	636.41	593.00

	June	2,353.48	1,082.60	1,009.00
	July	2,950.41	1,357.19	1,265.00
	August	2,469.94	1,136.17	1,059.00
	September	2,445.86	1,125.09	1,048.00
	October	2,336.64	1,074.86	1,001.00
	November	1,950.48	897.22	836.00
	December	1,863.73	857.32	799.00
	Total 2020	25,404.98	11,686.29	10,888.00
2021	January	1,452.95	668.36	622.00
	February	1,606.55	739.01	688.00
	March	1,995.80	918.07	855.00
	April	1,837.81	845.39	787.00
	May	1,798.81	827.45	771.00
	June	1,749.61	804.82	750.00
	July	1,705.03	784.31	731.00
	August	2,221.58	1,021.93	952.00
	September	2,001.95	920.90	858.00
	October	1,823.39	838.76	781.00
	November	1,908.46	877.89	818.00
	December	1,714.19	788.53	734.00
	Total 2021	21,816.13	10,035.42	9,347.00
2022	January	1,665.13	765.96	713.00
	February	1,540.08	708.44	660.00
	March	1,987.13	914.08	852.00
	April	1,715.10	788.95	735.00
	May	1,992.88	916.73	854.00
	June	1,923.63	884.87	824.00

	July	1,988.69	914.80	852.00
	August	2,310.44	1,062.80	990.00
	September	2,229.57	1,025.60	955.00
	October	2,169.63	998.03	930.00
	November	2,170.72	998.53	930.00
	December	1,563.33	719.13	670.00
	Total 2022	23,256.34	10,697.92	9,965.00
2023	January	1,596.76	734.51	684.00
	February	1,499.73	689.88	643.00
	March	1,690.61	777.68	724.00
	April	1,707.71	785.55	732.00
	May	1,822.90	838.54	781.00
	June	2,163.13	995.04	927.00
	July	2,547.32	1,171.77	1,092.00
	August	2,458.73	1,131.01	1,054.00
	Total 2023	15,486.88	7,123.97	6,637.00
	Total	107,484.23	49,442.75	46,057.00

Table 8. Baseline emissions (BE_y) for *Rio Negro* Project activity.

5.2 Project Emissions

The project emissions are those related to the CO₂ emissions from fossil fuels consumption and transportation of biomass. The project emissions are calculated according to the methodological TOOL 03 version 03.0, TOOL 05 version 03.0, TOOL 12 version 01.1.0, as mentioned at section 1.9.

The project emissions (PE_y) are calculated through equation 04:

$$PE_y = PE_{fuel,y} + PE_{TR,y} + PE_{ele,y} \quad \text{Equation 4}$$

Where:

PE_y	Project emissions in year y (tCO ₂)
$PE_{fuel,y}$	Project emissions due to fossil fuel or NRB consumption in year y (tCO ₂)
$PE_{TR,y}$	Project emissions from transportation of freight monitoring period m (tCO ₂)
$PE_{ele,y}$	Project emissions due to electricity consumption in year y (tCO ₂)

It is worth mentioning that project emission due to solid waste and wastewater were disregarded once the composting and water treatment does not represent Brazilian ceramic industries scenario.

In addition, TOOL16 Methodological tool: Project and leakage emissions from biomass - version 05.0 it is not applicable once the management areas do not represent a biomass cultivation, do not represent a forest plantation and the biomass from native forest management do not represent a residue.

The parameter $PE_{fuel,y}$ is utilized to calculate the emissions of fossil fuel or NRB consumption (including auxiliary use) associated with the operation of manufacturing process and biomass treatment and processing. During this monitoring period, no fossil fuels were used in the production process. Therefore, the parameter $PE_{fuel,y}$ was not calculated.

The emissions resulted by transportation were applied only when the distance between the biomass provider and the ceramic factory was over than 200km. It was calculated through the following equation:

$$PE_{TR,y} = \sum_i D_{f,m} \times FR_{f,m} \times EF_{CO_2,f} \times 10^{-6} \quad \text{Equation 4.1}$$

Where:

$D_{f,m}$	Return trip distance between the origin and destination of freight transportation activity f in monitoring period m (km)
$FR_{f,m}$	Total mass of freight transported in freight transportation activity f in monitoring period m (t)
$EF_{CO_2,f}$	Default CO ₂ emission factor for freight transportation activity f (gCO ₂ /t km)
f	Freight transportation activities conducted in the project activity in monitoring period m

According to TOOL05 Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation - version 03.0²⁴, the electricity

²⁴ Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation Available at: <<https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-05-v3.0.pdf>> Last visited on 22-September-2023

consumption considered here refers to (including auxiliary use) associated with the biomass treatment and processing. During this monitoring period, no electricity was consumed to treat and process biomass. Therefore, the parameter $PE_{ele,y}$ was not calculated.

Period	PE_y
2019*	139.00
2020	1,081.00
2021	395.00
2022	240.00
2023**	191.00
Total	2,046.00

*From March to December

**From January to August

Table 9. Project Emissions for *Rio Negro* Ceramic.

The detailed calculation can be found in the VCS-MR Calculation *Rio Negro* spreadsheet.

5.3 Leakage Emissions

Applying TOOL16: Project and leakage emissions from biomass version 5.0, considering that the present project activity utilizes native wood from management, which does not represent a biomass cultivation in a dedicated plantation, the leakage due to shift of pre-project activities was disregarded. Leakage due to the transportation and processing of biomass residues outside the project boundaries were also disregarded once the transportation and processing occurs inside the project boundaries and the biomass from native forest management do not represent a residue.

It is worth mentioning that leakage emission due to charcoal use was also disregard once it does not represent Brazilian ceramic industries scenario.

According to TOOL 16 version 05.0 the leakage emission due to diversion of biomass residue from other applications take into consideration the following biomass classification:

- 1) B1: The biomass residues are dumped or left to decay mainly under aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields;
- 2) B2: The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to landfills, which are deeper than five meters. This does not apply to biomass residues that are stock-piled or left to decay on fields;

- 3) B3: The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes;
- 4) B4: The biomass residues are used for energy or non-energy applications, or the primary source of the biomass residues and/or their fate cannot be clearly identified.

The renewable biomass that was utilized in *Rio Negro Ceramic Factory* classification and its availability are described below:

Biomass residue type	Biomass residue source	Biomass residue fate in the absence of the project activity	Biomass residues use in project scenario	Representativeness consumption
<i>Babaçu</i> residues	Off-site from a biomass provider	Dumped (B1)	Thermal energy generation on-site	Less than 10%
Cashew tree wood	Off-site from a biomass provider	Dumped (B1)	Thermal energy generation on-site	Less than 5%
Cashew nut husk	Off-site from a biomass provider	Dumped (B1)	Thermal energy generation on-site	Less than 1%
Coconut husk	Off-site from a biomass provider	Dumped (B1)	Thermal energy generation on-site	Less than 1%
<i>Mamona</i> Husk	Off-site from a biomass provider	Dumped (B1)	Thermal energy generation on-site	Less than 5%
Forest residue (sawdust and wood residue)	Off-site from a biomass provider	Dumped (B1)	Thermal energy generation on-site	Less than 5%
<i>Algaroba</i> wood	Off-site from a biomass provider	Dumped (B1)	Thermal energy generation on-site	-

Furthermore, the analysis of each biomass surplus availability within the project region, which is conducted to evaluate leakage emissions from competing use of each biomass, is detailed below.

Elephant grass

In case of using elephant grass, it will be cultivated in pasture or degraded areas, in which there is no vegetation to be deforested. This practice does not generate competing use of biomass and it does not deforest a vegetated area, therefore the leakage that would be applicable is the emission from biomass generation/cultivation.

Currently, elephant grass has been acquiring national importance as biomass²⁵ to generate thermal energy due to its high productiveness and easy adaptation in Brazilian climate and soil conditions; it also dismisses the use of fertilizers (NPK)²⁶.

Wood Residue

Wood residues are also a potential fuel for the ceramic units burning. The main source to be applied in *Iranduba* Ceramic Pole is the construction sector and sawmills as well as pallets from the Industrial Pole of *Manaus*.

According to Biasi *et al.* (2006)²⁷, 80% volume of the wood consumed from the Amazon Biome is from small companies with low technical support, which results in high levels of waste. Consequently, the large amount of waste generated from wood industry production was burnt in order to remove it from the site, without reusing this waste as a potential energy generator.

The efficiency of wood used in the industrial process varies depending on its function and type, the scale of the industry and the equipment that were used, among other factors. The main residues are wood chip and sawdust, with the production index varying from 25% to 70% of the total volume of wood consumed (Biasi *et al.*, 2006).

Therefore, being conservative, around 25% of the wood produced will be residue. The production of wood in the State of *Pará*, which is a bordering state, was 5,224,112 m³ in 2017²⁸. Thus, at least 1,306,028 m³ will be wood residue.

The project activity should utilize around 26,940 m³ of wood residue per year, which represents approximately 0.5% of the total generated in the State of *Pará*.

²⁵ BORGES, L.S., AQUINO, F.C., EVANGELISTA, A.F. Potencial do capim elefante para geração de bioenergia - Revisão. Available at: < https://www.nutritime.com.br/arquivos_internos/artigos/356_-_4518-4523_-_NRE_13-1_jan-fev_2016.pdf>. Last Visited on 22-September-2023

²⁶ Embrapa. Formação e Utilização de Pastagem de Capim-Ellefante. Instrução Técnica para o produtor de Leite. Available at: < <https://www.embrapa.br/gado-de-leite/busca-de-publicacoes/-/publicacao/595898/formacao-e-utilizacao-de-pastagem-de-capim-elefante-em-sistemas-intensivos-de-producao-de-leite>>. Last Visited on 22-September-2023.

²⁷ Biase, C. P.; Rocha, M. P. RENDIMENTO EM MADEIRA SERRADA E QUANTIFICAÇÃO DE RESÍDUOS PARA TRÊS ESPÉCIES TROPICAIS. FLORESTA, Curitiba, PR, v. 37, n. 1, jan./abr. 2007. Available at: <<http://ojs.c3sl.ufpr.br/ojs2/index.php/floresta/article/viewFile/7845/5537>>. Last Visited on 22-September-2023.

²⁸ IBGE. Extração Vegetal e Silvicultura 2017. Available at: <<https://cidades.ibge.gov.br/brasil/pa/pesquisa/16/0?ano=2017>>. Last Visited on 22-September-2023.

This way, this renewable biomass does not have potential to generate leakage emissions due to its high availability.

Açaí Residues

According to IBGE – Brazilian Institute of Geography and Statistics, 2017's *açaí* production in Brazil was 219,885 tons, with the States of *Amazonas* and *Pará* responsible for 87.5% of this production²⁹. This way, the *açaí* production on the states of *Amazonas* and *Pará* was around 192,400 tons in 2009.

Furthermore, the *Codajás* municipality, which is located in the state of *Amazonas*, does not have adequate use of its *açaí* and wood residues. The number of residues generated is very high and it is usually thrown away into rivers or left on inadequate places causing water and soil pollution³⁰.

To solve this problem, the mayor of *Codajás* and *Sebrae/AM* (Brazilian Service to help Micro and Small size companies) made a partnership to collect *açaí* and wood residues to be applied as energy source in the Ceramic Poles of *Iranduba/AM* and *Manacapuru/AM*.

The project activity would employ approximately 25,252 tons of *açaí* pits per year, representing around 28.85% of the total amount produced. Therefore, the project activity will not disturb in any aspects this renewable fuel market once there in plenty of this kind of biomass available.

Bamboo

Bamboo is a fast-growing plant, and efficiently performs the functions of soil protection and carbon sequestration and provides food and raw material for many applications. Furthermore, this plant is commonly utilized as quickset in rural properties, and its pruning is normally done in order to avoid the undesirable dispersion due to its invader characteristics. Unlike trees, the bamboo can be harvested without the destruction of the crop because just the stem of the bamboo is utilized, and the rhizome remains in the ground. When it is properly harvested and managed, the plantation continues full of younger individuals, and it is difficult to realize that a harvest was done.

There is perspective of the amount that this project activity would use of bamboo. However, there is no source of the production of Bamboo in the Amazon Biome. If the ceramic company uses this kind of biomass in the future, the availability and production of Bamboo will be measured in order to guarantee that the project activity will not disturb this renewable fuel market.

²⁹ IBGE. Produção da Extração Vegetal e da Silvicultura. 2017. Available at <https://agenciadenoticias.ibge.gov.br/media/com_mediaibge/arquivos/15f538e9095614fc3204f828b22fa714.pdf> Last visited on 22-September-2023.

³⁰ Ecodebate. No lugar de madeira resíduos de açaí. Available at: <<https://www.ecodebate.com.br/2009/06/09/residuo-do-acai-substitui-queima-de-madeira-nativa/>>. Last visited on 22-September-2023.

According to the CDM Methodology AMS I.E., B_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which cases surveys are not required, following the equation below:

$$LE_y = (B_y \times (1 - 0.95)) \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossil_fuel} \quad \text{Equation 4.2}$$

Where:

LE_y	Leakage emissions during the year y in tCO ₂ e
B_y	Quantity of woody biomass that is substitute or displaced in tonnes
$f_{NRB,y}$	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass (fNRB)
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne)
$EF_{projected_fossil_fuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 63.7 tCO ₂ /TJ

5.4 GHG Emission Reductions and Carbon Dioxide Removals

The Emission Reductions are estimated based on the equation below:

$$ER_y = BE_y - PE_y - LE_y \quad \text{Equation 4.3}$$

Where:

ER_y	Emission reductions in year y, in tCO ₂ e
PE_y	Project emissions in year y, in tCO ₂ e
LE_y	Leakage emissions in year y, in tCO ₂ e

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Reduction VCUs (tCO ₂ e)	Removal VCUs (tCO ₂ e)	Total VCUs (tCO ₂ e)
01-Mar-2019 to 31-Dec-2019	9,220	139	462	8,619	0	8,619
01-Jan-2020 to 31-Dec-2020	10,888	1,081	545	9,262	0	9,262

01-Jan-2021 to 31-Dec-2021	9,347	395	468	8,484	0	8,484
01-Jan-2022 to 31-Dec-2022	9,965	240	499	9,226	0	9,226
01-Jan-2023 to 31-Aug-2023	6,637	191	333	6,113	0	6,113
Total	46,057	2,046	2,307	41,704	0	41,704

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
01-Mar-2019 to 31-Dec-2019	9,380	8,619	8.11%	Although the ex-ante and ex-post estimated values are different, they still remain similar to the foreseen. This variation is already expected due to the fluctuation and difference in the values of production and use of biomass used in the monitored period.
01-Jan-2020 to 31-Dec-2020	11,256	9,262	17.71%	
01-Jan-2021 to 31-Dec-2021	11,256	8,484	24.63%	
01-Jan-2022 to 31-Dec-2022	11,256	9,226	18.03%	
01-Jan-2023 to 31-Aug-2023	7,504	6,113	18.54%	
Total	50,652	41,704	17.66%	

APPENDIX 1: COMMERCIALY SENSITIVE INFORMATION

Section	Information	Justification
N/A	N/A	N/A