FUTURE CARBON METHANE CAPTURE GROUPED PROJECT

Document Prepared by Future Carbon Group

Project Title	Future Carbon Methane Capture Grouped Project
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1 PROJECT DETAILS

1.1 Summary Description of the Project

Future Carbon Group is developing a sustainability project with the aim of improving animal waste management systems, reducing greenhouse gas (GHG) emissions, improving the living conditions of the population in the project sites and contributing to the sustainable development. The project consists of replacing or modifying baseline anaerobic manure management systems on livestock farms and/or treating manure collected from multiple farms in a centralized plant to achieve methane recovery and destruction by flaring/combustion and/or energy use of the recovered biogas.

Prior to project implementation, animal manure waste would be left to decompose in an anaerobic manure management system on cattle and swine farms, where methane would be emitted directly into the atmosphere without any recovery or destruction. In addition to reducing greenhouse gas emissions, the project activity will provide better treatment and stabilization of organic matter for later application in the soil, reduce the risk of waste runoff and leaching into the soil, reduce odour, combat proliferation of vectors and improve the working conditions for the farm owner and their families.

The methodologies used allow the recovery and destruction of methane by burning, combustion or energy use of methane recovered in a treatment plant for biogas generation. For the latter case, the project also generates renewable electricity to replace the energy that would be supplied by the grid, generating a second source of greenhouse gas emission reductions.

This is a grouped project. A centralized manure management plant operated by the International Center for Renewable Energy – CIBIOGAS serves as the first project instance. Such plant was designed to generate renewable electricity from the captured biogas and avoid environmental impacts due to inadequate treatment of swine manure. The plant is located in the municipality of Toledo, State of Paraná, in the South Region of Brazil and will replace animal waste management systems (anaerobic lagoons) from fourteen swine confinement farms located in the same city.

Brazil is the geographic boundary for this grouped project for its new project activity instances. This means that other instances located in Brazil shall be included in this grouped project, as long as they comply with all applicable requirements, as set forth in this Project Document.

Based on its first instance, this project is expected to reduce 93,085 tCO_2e for its first crediting period, ranging from 01-March-2023 to 28-February-2030. Incremental emission reductions might be achieved with the inclusion of new project instances.

1.2 Sectoral Scope and Project Type

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

Methodology: AMS-I.D.: Grid connected renewable electricity generation --- Version 18.0

Sectoral Scope: 1. Energy (renewable/non-renewable)

Methodology: AMS-III.D.: Methane recovery in animal manure management systems --- Version 21.0

Sectoral Scope: 13. Waste handling and disposal

This is a grouped project.

1.3 Project Eligibility

The project is eligible under the scopes of the VCS Program Version 4.4 and the applied GHG methodologies (AMS-III.D, version 21 and AMS-I.D, version 18), which are both valid. In addition:

- The project meets all applicable rules and requirements set out under the VCS Program;
- The project applies two methodologies approved under the Clean Development Mechanism (CDM), which are eligible under the VCS Program. The project also complies with the limits for small-scale under the CDM[1];
- The implementation of this project activity does not lead to the violation of any applicable law;
- The project meets two sectoral scopes eligible under the VCS Program;
- This project does not qualify as REDD+ (Reducing Emissions from Deforestation and Degradation) and therefore does not need Jurisdictional Requirements and Nested REDD+.

In addition to the above requirements, Section 3.2 describes how the project complies with the version 21.0 of AMS-III.D[2] and version 18.0 of AMS-I.D[3].

1.4 Project Design

☐ The project includes a single location or installation only

[1] More specifically, the Project complies with small-scale limit for type III Project activities (emission reductions every year will not go beyond the limits of 60 ktCO2e/y over the entire crediting period). Information available at: https://cdm.unfccc.int/Reference/catalogue/document?doc_id=000002183

[2] This methodology is available at: https://cdm.unfccc.int/UserManagement/FileStorage/1AWXEKHVTYF423LCN56Z9GIMQOS8JR

[3] This methodology is available at: https://cdm.unfccc.int/UserManagement/FileStorage/2P7FS6ZQAR84LG3NMKYUH50WI9ODBC

☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project

☒ The project is a grouped project

Eligibility Criteria

VCS Standard Eligibility criteria for the inclusion of new project activity instances	Future Carbon methane capture Grouped Project	Instance 1 – CIBiogás Project Activity
Projects shall meet the applicability conditions set out in AMS-III.D, as detailed in Section 3.2. Project instances that generate electricity from the capture methane/biogas shall also comply with requirements of AMS-I.D.	The GHG emission reductions shall be calculated in accordance with AMS-III.D. (Methane recovery in animal management systems Project version 21.0) and, where applicable, AMS-I.D (Grid connected renewable electricity generation, version 18.0).	The Project Activity of Instance 1 – CIBiogás complies with AMS-III.D and AMS-I.D , as it reduces GHG emissions from swine manure through the recovery of methane by a biogas plant, with the objective of generating electricity.
Projects shall use the technologies or measures specified in the project description.	All new instances must use and apply any of the technologies or measures specified in this Project description: the livestock population on the farm is managed in confined conditions; the technology for treating residues from the animal manure management system must be anaerobic; technical measures must be used (including required flaring) to ensure that all biogas produced by the digester is used or flared.	The Project Activity of Instance 1 – CIBiogás meets the proposed baseline scenario and the development of the grouped Methane Recovery Project in animal waste systems. This first instance is located in the project region (Brazil) described in the VCS PD.

VCS Standard Eligibility criteria for the inclusion of new project activity instances	Future Carbon methane capture Grouped Project	Instance 1 – CIBiogás Project Activity
Projects are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	The Project must conform to one or both of the baseline scenarios set out in Section 3.4. from the VCS PD: 1. In the baseline scenario, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere; 2. The livestock population on the farm is managed in confined conditions; 3. No recovery and destruction of methane by burning or combustion for profitable use takes place in the baseline scenario; 4. Farms do not release manure into natural water resources.	The Project Activity of Instance 1 – CIBiogás complies with the baseline determined by AMS-III.D. In all farms included in the project instance, animal manure is treated in anaerobic lagoons and methane is emitted into the atmosphere, the livestock population is managed in confined conditions, there is no profitable use of methane flaring and the farms do not release manure into natural water resources. Therefore, this instance complies with the baseline scenarios set out in Section 3.4 of the vCS PD.
Projects must have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area. For example, do the new project activity instances have financial, technical and/or other parameters (such as the size/scale of the instances) consistent with the initial instances, or do they face the same investment, technological and/or other barriers as the initial instances.	All instances must be additional to be included in the grouped Project. The project activity must be consistent with the grouped Project Description: promote replacement or modification of existing anaerobic manure management systems, or treatment of manure collected from multiple farms in a centralized plant to achieve methane recovery and destruction by flaring /combustion or energy use of recovered methane. In assessing additionality, each instance shall determine the appropriate analysis method among those provided by AMS-III.D and AMS-I.D. For project instances that meet AMS-III.D, additionality will be assessed by demonstrating	As described in Section 3.5, all farms included in Instance 1 – CIBiogás have historically used anaerobic lagoons as a manure management system. The continuation of such a practice is considered the most plausible baseline scenario and the proposed project activity, methane recovery in animal manure management systems that generate biogas is considered additional as it is not required by law nor is it a common practice in the region.

VCS Standard Eligibility criteria for the inclusion of new project activity instances	Future Carbon methane capture Grouped Project	Instance 1 – CIBiogás Project Activity
	that: 1. Methane recovery by manure management systems are not proposed by law and; 2. The proposed measures are not common practice in the region. The project captures and uses biogas from animal handling in digesters, the instances will be able to burn the biogas and/or generate energy. The instances that generate energy must have less than 5MW of installed capacity. In such cases, according to paragraph 16 of AMS-III.D., version 21.0, it is not necessary to apply the 'Guidelines on the demonstration of additionality of small-scale project activities.	
New Project Activity Instances shall occur within one of the designated geographic areas specified in the project description.	Projects must be located in Brazil as described in Section 3.4 of the VCS PD.	Instance 1 – CIBiogás is located in Brazil, more specifically in the city of Toledo, in the State of Paraná, located in the southern region of Brazil.

VCS Standard Eligibility criteria for the inclusion of new project activity instances	Future Carbon methane capture Grouped Project	Instance 1 – CIBiogás Project Activity
Instances must meet at least one complete set of eligibility criteria for the inclusion of new project activity instances. Partial compliance with multiple sets of eligibility criteria is insufficient.	All instances must meet the full set of eligibility criteria for the inclusion of new instances of project activities.	Instance 1 – CIBiogás meets all eligibility criteria for inclusion of a new project activity instance.
Instances must be included in the monitoring report with sufficient technical, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and allow for sampling by the validation/verification body.	Instances of the Project activity must be included in the Monitoring Report with sufficient technical, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and allow for sampling by the validation/verification body.	Instance 1 – CIBiogás meet this criterion, as it was included in this Grouped PD as the first instance of the project activity, with sufficient information to demonstrate the compliance will all eligible criteria.
New Project Activity Instances must be validated at the time of verification against the applicable set of eligibility criteria.	The inclusion of new instances of the Project activity must be done in the Grouped Project follow-up report, being validated at the time of verification.	Instance 1 – CIBiogás Project Activity meets this criterion, as it is included in this PD as the first instance of a project activity.

VCS Standard Eligibility criteria for the inclusion of new project activity instances	Future Carbon methane capture Grouped Project	Instance 1 – CIBiogás Project Activity
New Project Activity Instances shall have evidence of ownership of the project, in relation to each project activity instance, maintained by the project proponent as of the respective start date of each project activity instance (i.e., the date on that the project activity instance has started to reduce or remove GHG emissions).	All instances of Project activity must provide evidence of Project ownership (land title and related documents) and Project start date (agreements, protection or management plan, or other as per applicable VCS Standard definitions).	CIBiogás has made agreements with landowners of all farms included in Instance 1 – CIBiogás, in accordance with the definitions of the VCS Standard. Evidence of Project ownership and Project start date has been provided as described in sections 1.7 and 1.8 of the VCS PD.
New Project Activity Instances must have a start date equal to or later than the grouped project start date	The activity start date for each instance must be equal to or later than the grouped project start date as set out in Section 1.8 of the VCS PD.	This Instance 1 – CIBiogás Project Activity is the starting date of the grouped project. This is described in more detail in Section 1.8 of the VCS PD.
Instances will be eligible for credit from the instance start date until the end of the project crediting period (only). Please note that when a new instance of project activity starts in a previous verification period, no credits can be claimed for reductions or removals of GHG emissions generated during a previous verification period and new instances are eligible for credit from the beginning of the next verification period.	Instances will be eligible for credit from the instance activity start date until the end of the grouped project crediting period, i.e. the instance must not generate credits after the grouped project end date. When a new project instance starts in a previous verification period, no credits can be claimed for reductions or removals of GHG emissions generated during a previous verification period and new instances are eligible for credit	This Instance 1 – CIBiogás Project Activity has the same start and end date as the grouped Project, as described in section 1.8 of the VCS PD

VCS Standard Eligibility criteria for the inclusion of new project activity instances	Future Carbon methane capture Grouped Project	Instance 1 – CIBiogás Project Activity
	from the beginning of the next verification period.	

1.5 Project Proponent

Organization name	Future Carbon Holding S.A. (Future Carbon Group)
Contact person	Ana Elisa Iemini Guilherme Prado Lucas Faustino Thiago Othero
Title	Ana Elisa Iemini - Technical Analyst Guilherme Prado - Head of Operations Lucas Faustino - Technical Coordinator Thiago Othero - VP of Operations
Address	R. Elvira Ferraz, 250 - Conjunto 601 - Vila Olímpia, São Paulo - SP, 04552-040
Telephone	+55 11 99831-3474
Email	tecnica@futurecarbon.com.br

1.6 Other Entities Involved in the Project

Organization name	Centro Internacional de Energias Renováveis - CIBIOGÁS
Role in the project	Development of the first instance of the grouped project
Contact person	Juliana Gaio
Title	Director of Technological Development
Address	Rodovia PR 239, Km 04, s/n° Centro. Toledo – PR, 85900-970
Telephone	+55 45 9914-7757
Email	juliana.somer@cibiogas.org

1.7 Ownership

Future Carbon Group has entered into agreements with Cibiogás in regard to the ownership of the emission reductions and removals resulting from the Project. Therefore, Future Carbon Group holds enforceable and irrevocable agreements with the holders of the statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission reductions or removals which vests project ownership in the project proponent. All legal documents to confirm such claim will be made available to the auditors during the validation process.

1.8 Project Start Date

According to the rules established by the VCS Standard V4.3, non-AFOLU projects shall complete validation within two years of the project start date.

Therefore, the expected start date of the Project is March 1, 2023. On this date, the Toledo Bioenergy Center will start operating with the first generation of electricity generated. All future instances of the grouped project activity must have the same start date or later.

1.9 Project Crediting Period

For non-AFOLU projects, the project crediting period shall be either seven years, twice renewable for a total of 21 years, or ten years fixed.

This project will consider a renewable crediting period, and the first crediting period will range from March 1, 2023 until February 28, 2030.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
2023	11,393
2024	13,258
2025	13,258
2026	13,258
2027	13,258
2028	13,258
2029	13,258
2030	13,258
Total estimated ERs	93,085
Total number of crediting years	7
Average annual ERs	13,298

1.11 Description of the Project Activity

Brazil is the fourth largest swine meat producers in the world[2]. Among the factors that collaborate for this performance are investments in the development of technology which led to increasingly automated units. Unfortunately, the same technological advance observed in production process was not seen in the management of swine wastes, which is mostly based on anaerobic lagoons to store and stabilize the wastes for later soil application. Swine farmers generally consider anaerobic lagoons as simple systems, with low costs and that allows them to meet environmental requirements. However, anaerobic lagoons have a high capacity to produce methane, which is a greenhouse gas (GHG).

[2] Associação Brasileira de Proteína Animal (ABPA), 2021 Annual Report. Document available at: https://abpa-br.org/relatorios/. Information on Page 54.

The project was developed to reduce methane emissions and adequately treat the waste produced by small and medium-sized swine and cattle farms in feedlots. The project activity involved the installation of a centralized waste treatment plant (*Biodigesters* or bioenergy plants), with the capture of biogas that will be used to generate energy in biogas generator systems. This will replace anaerobic lagoons, which are considered the baseline scenario for livestock farms. Confinement livestock farms may be included as long as it is possible to establish that the manure management system of the baseline scenario is the use of anaerobic lagoons as defined in AMSD-III.D, version 21.

Biodigestion is a anaerobic process that produces a lot of GHG, but with the process of capturing and destroying these gases, its emissions are low. Emission reductions will occur as a result of the low methane emissions result from biodigesters compared to the large amount of this GHG that would be released to the atmosphere if anaerobic lagoons were used to treat animal manure.

For this, Future Carbon will include instances where the management of animal waste (pig or cattle) is carried out in individual biodigesters or on centralized plants where the waste to be treated will have such management practices:

1. Receipt of waste in the biodigester. Afterwards, the waste will be discharged into the biomanager where there will be aeration that will accelerate the decomposition process.
2. The decomposition will produce biogas composed mostly of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and hydrogen sulfide (H_2S), which will serve as fuel to generate energy through generators.
3. The energy generated will replace the site's consumption of electricity coming from the National Interconnected System (NIC) and/or will be injected to this same grid.
4. The biofertilizer produced during the composting process will be reused by producers to fertilize their crops.

The process of biodigestion takes place inside a biodigester which is a constructive structure formed by a closed chamber in which the organic material for decomposition is placed. It may be a lined tank covered with an impermeable blanket, which, with the exception of the inlet and outlet pipes, is fully sealed, creating an anaerobic environment (without the presence of oxygen).

Biodigesters can be classified[3] according to the form of supply: **batch** and **continuous**.

Batch biodigesters – in this type of biodigester the amount of organic material to be digested is placed only once, then it is hermetically closed and after the determined period the gas

[3] Suinocultura de baixa emissão de carbono, 2016 Ministério da Agricultura, Pecuária e Abastecimento. Document available at: https://www.embrapa.br/documents/1355242/0/Biog%C3%A1sFert+-+Suinocultura+de+baixa+emiss%C3%A3o+de+carbono.pdf

production starts and continues until the material is consumed of the entire batch and the process ends.

Continuous biodigesters – can be supplied daily, allowing that with each entry of organic substrate to be processed there is an exit of already treated material.

The type that will be used in the first instance of is continuous, where the input of residues will be monitored through a field record. Other types of biodigesters will be allowed in the grouped project

The biodigester favors clean and sustainable production and reduces the environmental risks associated with waste management. This system significantly diverges from common practice in the project region.

Ex-ante estimates (described in section 1.7) indicate that the project will result in a GHG emission reduction of 93,085 tonness of CO_{2e} in instance 1.

1.12 Project Location

The project location for the Future Carbon methane capture Grouped Project is the entire Brazilian territory. This means any project instance that complies with the eligibility criteria may be included in the project, as long as it is located within Brazilian borders. According to the Brazilian Institute of Geography and Statistics[4] (IBGE, Instituto Brasileiro de Geografia e Estatística), the Brazilian territory has an area of 8,515,767.049 km² and the following border coordinates:

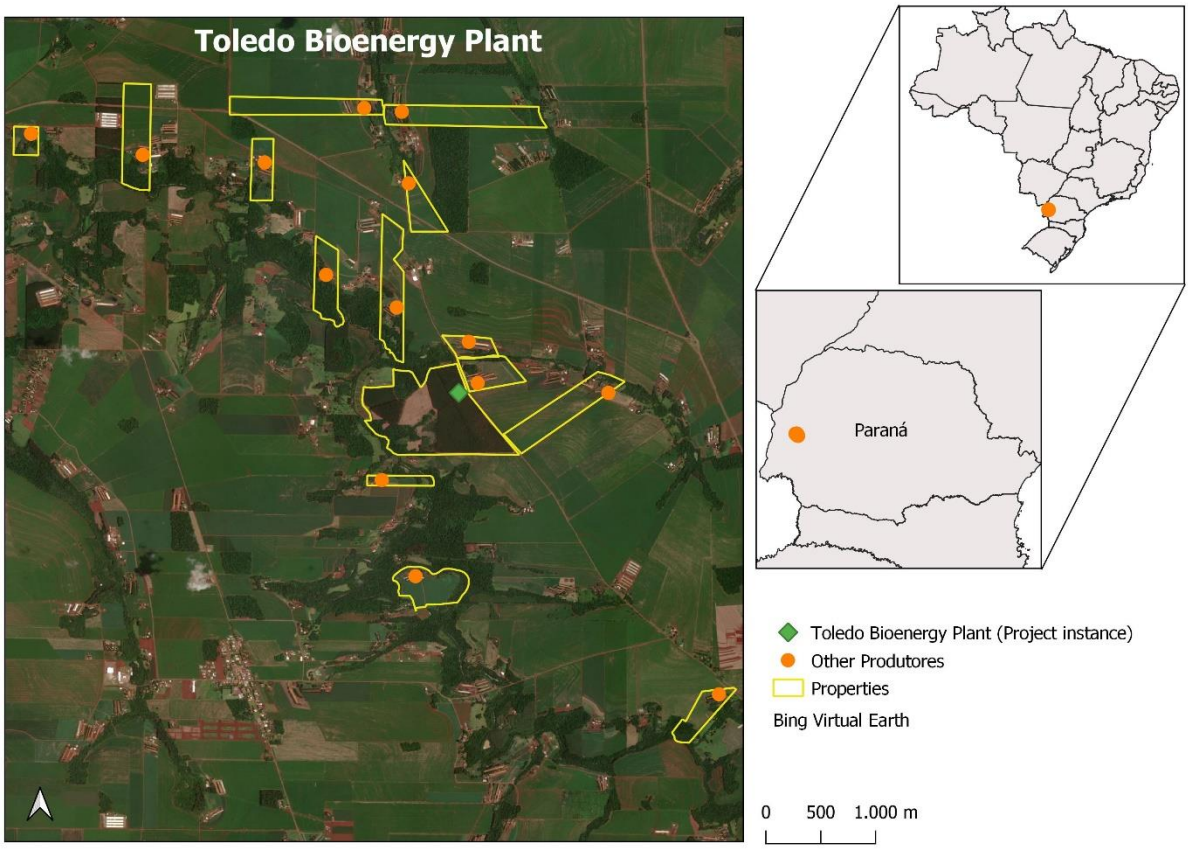
Table xx. Geographic coordinates of Brazilian borders.

Cardinal direction	Latitude	Longitude	Location City (State)
North	+05° 16'19"	-60° 12'45"	Uiramutã (Roraima)
South	-33° 45'07"	-53° 23'50"	Chuí (Rio Grande do Sul)
East	-07° 09'18"	-34° 47'34"	Cabo Branco (Paraíba)
West	-07° 32'09"	-73° 59'26"	Mâncio Lima (Acre)

The first project activity instance is located in Toledo, a city in the west of region of Paraná, a State in the Southeast region of Brazil. The exact location of the first project activity instance, as well as the location of each farm was made available as a KML file, as required by the VCS and is also illustrated in figure 1.

[4] Information available at: https://brasilemsintese.ibge.gov.br/territorio/dados-geograficos.html

Figure 1. Instances location.



1.13 Conditions Prior to Project Initiation

This grouped project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal, or destruction. On the other hand, the project aims to promote appropriate animal manure treatment in Brazil. These activities are expected to promote emission reductions and increase farm's resilience to climate change.

Information from December, 2019 published by the Brazilian Ministry of Agriculture, Livestock and Supply (Ministério da Agricultua, Pecuária e Abastecimento - MAPA) indicates that the baseline for swine and catlle farms AWMS is anaerobic lagoons.

The conditions prior to the project initiation are expected to match the baseline conditions described on Section 2.4 for all project activity instances to be included in the grouped project. This is actually the case for the first project activity instance, as described in Section 2.4.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

Different procedures are required to obtain an environmental license for pig and cattle farms in confinement depending on their size (measured in terms of herd size). Larger farmers are required to submit a Simplified Environmental Study (Estudo Ambiental Simplificado), while medium-sized farms must submit a Preliminary Environmental Report (Previous Environmental Report). Finally, smaller farms receive an Environmental License (Environmental Authorization) without the need to present such documentation.

All the farms involved in the first instance have already obtained the environmental licenses. The compliance with laws, statutes and other regulatory requirements will be confirmed for the inclusion of future project instances.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project is not registering in another program and is also not seeking registration in another program.

1.15.2 Projects Rejected by Other GHG Programs

The project was not rejected by another GHG program Other.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project activity is not included in an emission trading program or any other mechanism that includes GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

The project is not creating any other form of environmental credit under any specific program.

Supply Chain (Scope 3) Emissions

Have the owner(s) or retailer(s) of the impacted goods and services[5] posted a public statement saying, “VCUs may be issued for the greenhouse gas emission reductions and removals associated with Centro Internacional de Energias Renováveis - CIBIOGÁS” since the project’s start date?

[5] Impacted goods and services are all goods and services directly impacted by the technologies and measures specified as project activities in the project description. Please see the VCS Program document *VCS Program Definitions* for additional information.

☐ Yes ☒ No

The statement will be included on the entity's website before the project start date. Other project owners or retailers will make a similar statement where applicable.

Has the project proponent posted a public statement saying, “VCUs may be issued for the greenhouse gas emission reductions and removals associated with [name of good or service] [describe the region or location, including organization name(s), where practicable].”

☒ Yes ☐ No

Explain your response.

Have the producer(s) or retailer(s) of the impacted good or service been notified of the project and the potential risk of Scope 3 emissions double claiming via email?

☒ Yes ☐ No

Producers will be notified of project emissions.

In all other cases, demonstrate that a public statement(s) by the owner(s) or retailer(s) of the impacted good(s) or service(s) or project proponent (as applicable) has been made throughout the project crediting period. Where applicable, also demonstrate that the impacted good or service's producer(s) or retailer(s) have been notified of the project and the potential risk of Scope 3 emissions double claiming via email. Evidence of the public statement(s) and email(s) must be provided in this report or attached as an appendix.

1.17 Sustainable Development Contributions

The primary objective of the project is to reduce greenhouse gas emissions and to provide better treatment of animal manure. Other benefits are odour reduction, combating vector proliferation, improve working conditions and net generation of jobs (temporary and permanent), income distribution, access to technology, capacity building of the people involved and encouraging regional integration and the development of similar projects with a view to sustainable development.

These measures contribute to several nationally stated sustainable development priorities, such as the objectives from the Brazilian Government related to the UN Sustainable Development Goals (SDGs) and the Nationally Determined Contribution (NDC).

In Brazil, the National Commission for Sustainable Development Objectives (CNODS) is responsible for internalizing, disseminating, and providing transparency to the process of implementing the 2030 Agenda for Sustainable Development in Brazil. The Commission is made up of eight government representatives (Government Secretariat of the Presidency of the Republic; Civil House of the Presidency of the Republic; Ministry of Foreign Affairs; Ministry of Citizenship; Ministry of Economy; Ministry of Environment; representative of the state/district levels; representative of the municipal level) and by eight representatives of civil society and the

private sector. The monitoring of the country's advances in relation to the SDGs established as priorities is carried out by the Institute of Applied Economic Research (IPEA) and the Brazilian Institute of Geography and Statistics (IBGE), which are also permanent technical advisory bodies.

There is no monitoring at the specific level of projects, and progress at the national level can be accompanied by the synthesis report carried out by IBGE and by the IPEA reports. In addition, in 2018 there was the SDG Award, an initiative of the Federal Government whose objective is to encourage, value and give visibility to practices that contribute to achieving the goals of the 2030 Agenda throughout the national territory. The first edition of the Award had 1,045 entries to compete in four categories: government; for-profit organizations; non-profit organizations; and teaching, research and extension institutions.

The Future Carbon methane capture Grouped Project main planned contributions to the Brazilian Priority Goals are listed below.

- SDG 2: Zero hunger

  Target 2.4 “By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality”.

  Contribution: The project reduces the impact of waste management on the ecosystem and contribute to the maintenance of farm activities by facilitating operational procedures and the environmental compliance on farms. Hence, the project leads to more sustainable and resilient farming practices.

- SDG 6: Clean water and sanitation

  Target 6.6 “By 2030, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes”.

  Contribution: the project prevents groundwater from being contaminated by animal waste, which is an abundant wastewater in the region, with a high contamination potential. Therefore, the use of biodigesters technology protects local rivers and aquifers.

- SDG 12: Responsible consumption and production

  Target 12.2 “By 2030, achieve the sustainable management and efficient use of natural resources”;

  Target 12.4 “By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment”;

Target 12.6 “Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle”.

Contribution: the project promotes sustainable management of wastes, thus reducing air, water and land pollution.

- SDG 13: Climate action

Target 13.3 “Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning;

Target 13.b “Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities”.

Contribution: Reduction of greenhouse gas emissions by converting from a high-emission to a low-emission scenario. Producers neighboring the project are interested in learning about the technology.

1.18 Additional Information Relevant to the Project

Leakage Management

Not applicable.

Commercially Sensitive Information

No information disclosed to the validation team is to be withheld from the public version of this Project Description.

Further Information

This description of the grouped project refers to avoiding the emission of CH_4 through the proper disposal of animal’s manure. Originally, the waste is destined for anaerobic lagoons and with the project activity, it will be destined for biodigesters where they will recover CH_4. Therefore, an activity with lower GHG emissions.

The project is eligible according to:

- Legislative: the project is in compliance with all legal requirements.
- Technical: alterations/adaptations required are technically feasible;

- Economic: revenues from the sale of carbon credits will support the continuation of the technology by the farmers involved in the project.
- Sectoral: the project promotes the adoption of good practices to the sector, leading to reduced GHG emissions and better treatment conditions for animal manure.
- Environmental: the project is in compliance with all legal requirements and negative environmental impacts are not predicted.
- Geographic /site specific: all AWMS involved in the project can be uniquely geographically identified.
- Temporal information: the project will not double count the GHG emissions during the ten years renewable crediting period.

2 SAFEGUARDS

2.1 No Net Harm

The plant went through an environmental licensing process that considered the potential negative impacts and sought to apply mitigation measures for its construction and operation.

2.2 Local Stakeholder Consultation

As recommended in the VCS 4.4 standard (item 3.16.11), the project proponent will carry out an evaluation with local stakeholders who are potentially impacted by the project. Information about local stakeholders at the start of the project is included in this section of the VCS PD. The visit to stakeholders will take place online on the 25th of January and in person on the 20th of April 2023.

Local entities having some influence and activities developed in the Reference Region were chosen through a process to identify them and their impact on the project activity. Stakeholders chosen for local consultation also included potentially impacted communities and neighbours.

Thus, the output list of stakeholders from this analysis is described below:

Stakeholder Classification	Stakeholder	Justification
Government agency and/or representatives -	Prefeito da cidade de Toledo – PR Vice-prefeito da cidade de Toledo - PR	The carbon project is believed to be in the public sector's interest as it can help the state and municipalities achieve their goals of mitigating greenhouse gas

Stakeholder Classification	Stakeholder	Justification
Direct public administration (State and Municipality)	Secretaria Municipal de Meio Ambiente	emissions and environmental protection. In addition, partnerships with the public sector are very important for the development of activities throughout the project.
	Secretaria do Agronegócio, de Inovação, Turismo e Desenvolvimento Econômico	
	Secretaria da Fazenda e Captação de Recursos	
	Secretaria de Recursos Humanos	
	Instituto de Água e Terra - IAT /Chefe: Taciano Cesar Freire Maranhão	
	SECRETARIA DA AGRICULTURA E DO ABASTECIMENTO / Núcleo Regional de Toledo	
	AGÊNCIA DE DEFESA AGROPECUÁRIA DO PARANÁ - ADAPAR / Unidade Local de Sanidade Agropecuária - ULSA de Toledo	
	AGÊNCIA DE DEFESA AGROPECUÁRIA DO PARANÁ - ADAPAR / Gerência de Saúde Animal / Fiscal de Defesa Agropecuária Médico Veterinário Rafael Gonçalves Dias	
	AGÊNCIA DE DEFESA AGROPECUÁRIA DO PARANÁ - ADAPAR / Programa de Sanidade dos Suinos / Fiscal de Defesa Agropecuária Médico Veterinário João Humberto Teotônio de Castro	
	EMATER-Empresa de Assistência Técnica de Extensão Rural do Paraná	
	Secretaria Municipal de Meio Ambiente	

Stakeholder Classification	Stakeholder	Justification
	Secretaria do Agronegócio, de Inovação, Turismo e Desenvolvimento Econômico	
	Secretaria da Fazenda e Captação de Recursos	
	Secretaria de Recursos Humanos	
	Instituto de Água e Terra - IAT /Chefe: Taciano Cesar Freire Maranhão	
	SECRETARIA DA AGRICULTURA E DO ABASTECIMENTO / Núcleo Regional de Toledo	
	AGÊNCIA DE DEFESA AGROPECUÁRIA DO PARANÁ - ADAPAR / Unidade Local de Sanidade Agropecuária - ULSA de Toledo	
	AGÊNCIA DE DEFESA AGROPECUÁRIA DO PARANÁ - ADAPAR / Gerência de Saúde Animal / Fiscal de Defesa Agropecuária Médico Veterinário Rafael Gonçalves Dias	
Universities and education institutes	Universidade Tecnologia Federal do Paraná - Campus Toledo / Engenharia de Bioprocessos e Biotecnologia	It is believed that the participation of education and research institutions throughout the project is important to develop partnerships and help in the search for sustainable technological innovations.
	UNIOESTE (Universidade Estadual do Oeste do Paraná) / Profa. Soraia Palacio	
	UNIOESTE (Universidade Estadual do Oeste do Paraná) /Direção geral	
	Unioeste Cascavel (Universidade Estadual do Oeste do Paraná) / Profa. Dra. Monica Sarolli	

Stakeholder Classification	Stakeholder	Justification
	UNIPAR (Universidade Paranaense) / Direção geral UNIPAR (Universidade Paranaense) / Prof. Daniel "Faculdade Assis Gurgacz / Coordenação Agronegócio" "Pontifícia Universidade Católica do Paraná / Campus Toledo / Diretor: Pedro Guena Espinha"	
NGOs	BIOPARK Sindicato rural Sindicato dos Trabalhadores nas Indústrias de Alimentação de Toledo Sindicato dos Trabalhadores Rurais de Toledo Associação Regional de Suinocultores do Oeste	NGOs are entities focused on the population's objectives, whether social, environmental or economic, without ties to public governmental entities. Thus, they bring a different point of view to the activit, and communication with these entities brings transparency to the project. In addition, they are key agents for the development of partnerships to strengthen the project activity and enhance socio-environmental co-benefits.
Workers from CIBiogás	Juliana Somer - Gestora do projeto Rafael Hernando de Aguiar Gonzalez - Diretor presidente Felipe Souza Marques - diretor de desenvolvimento tecnológico Michelli Fregnani - diretora administrativa financeiro Rafael Rick Niklevicz - Engenheiro ambiental Luiz Henrique Palma Ross - Engenheiro Eletricista Geovani Geraldi - Analista	Workers at the Toledo Bioenergy Center are interested parties as they will be responsible for building and managing the plant.

Stakeholder Classification	Stakeholder	Justification
	Paulo Henrique Lima - Técnico Franciele Natividade Luiz - Coordenadora de laboratório	
Farmers	Flademir Lorenzoni João Valdir Gregório Eliane Terra Edilson Lauri Berndt Rene Royer Renato Henker/Maicon Quaiatto Elene Maria Wenzel Seibold Elmo Schuster João Ideno Tremea Juraci Bugs Luiz Carlos Lorenzoni Raul Aroldo Jarabiza Ricardo Antonio Paetzoldt Renato Rambo	Rural producers involved in the project will be directly impacted by the increase in the environmental quality of their properties, support in the management of pig waste and an increase in their income from the generation of carbon credits

As required in VCS standard 4.4 item 3.16.15, the management teams involved in the project have expertise and prior experience implementing land management and carbon projects with community engagement at the project scale. Information on project team is further detailed as part of the Non-permanence Risk Analysis.

As required in VCS standard 4.4, item 3.16.17, for the “Local Stakeholder Consultation”, a comprehensive project summary will be actively presented to the communities and other stakeholders in Portuguese in the field, by project agents. In both consultation modalities, the project proponent will communicate in a didactic way:

i) the project design and implementation, including the results of monitoring;

ii) the risks, costs and benefits the project may bring to local stakeholders;

III) the process of VCS Program validation and verification and the validation/verification body’s site visit.

The project proponent understands that stakeholders want and need to be involved in project design, implementation, monitoring, and evaluation throughout the project life cycle. Thus, in compliance with VCS Standard 4.4 (item 3.16.18), a communication channel will be established for interested parties to continuously express their concerns and resolve any conflicts and complaints that may arise during the planning, implementation and monitoring of the project. The main communication channel will be the project's own e-mail.

This communication channel is expected to be a mechanism to ensure that the project proponent and all other entities involved in the design and implementation of the project are not involved in or colluding in any form of discrimination or harassment in relation to the project. All complaints will be available to interested parties and auditors.

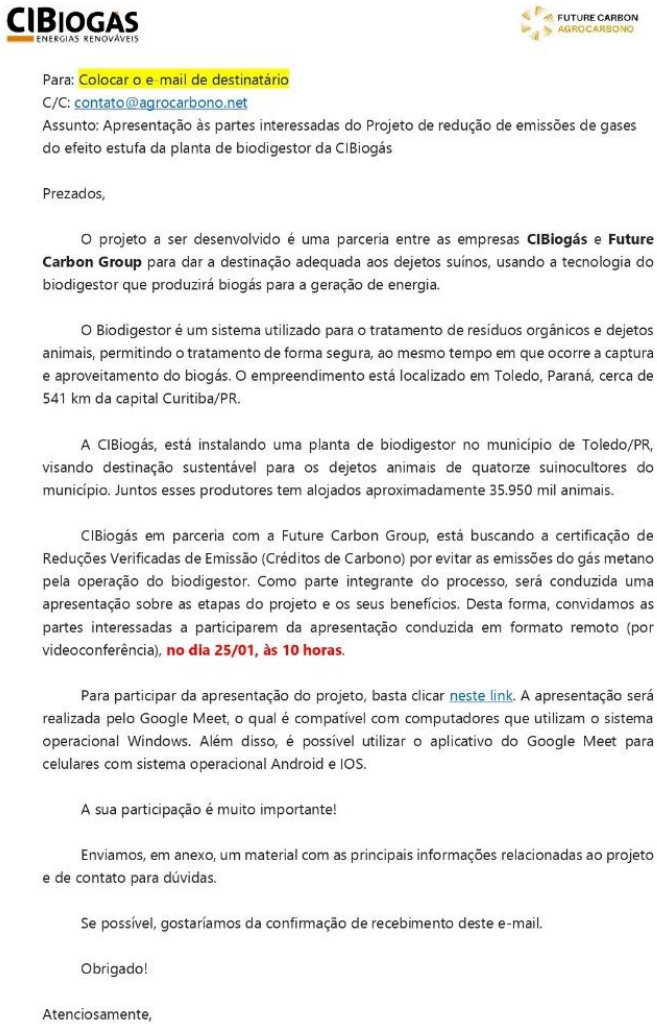
The process for receiving, hearing, responding to and attempting to resolve grievances will be performed within a reasonable time period. This Feedback and Grievance Redress Procedure has three stages (VCS Standard 4.3; item 3.16.18):

The Stakeholder Consultation was split into two events: an online meeting to take place on January 25, 2023 and a face-to-face consultation to be held during the site visit in April.

An explanatory e-mail and a letter were sent, briefly presenting the project and inviting stakeholders to the remote consultation.

Future Carbon Group's contact information will be made available at the beginning and end of the meeting, where communication can be carried out by letter, email, or telephone.

Figure 2. Invitation letter sent for the online consultation.



CIBIOGAS ENERGIAS RENOVÁVEIS

FUTURE CARBON AGROCARBONO

Para: Colocar o e-mail de destinatário
C/C: contato@agrocarbono.net
Assunto: Apresentação às partes interessadas do Projeto de redução de emissões de gases do efeito estufa da planta de biodigestor da CIBiogás

Prezados,

O projeto a ser desenvolvido é uma parceria entre as empresas **CIBiogás** e **Future Carbon Group** para dar a destinação adequada aos dejetos suínos, usando a tecnologia do biodigestor que produzirá biogás para a geração de energia.

O Biodigestor é um sistema utilizado para o tratamento de resíduos orgânicos e dejetos animais, permitindo o tratamento de forma segura, ao mesmo tempo em que ocorre a captura e aproveitamento do biogás. O empreendimento está localizado em Toledo, Paraná, cerca de 541 km da capital Curitiba/PR.

A CIBiogás, está instalando uma planta de biodigestor no município de Toledo/PR, visando destinação sustentável para os dejetos animais de quatorze suinocultores do município. Juntos esses produtores tem alojados aproximadamente 35.950 mil animais.

CIBiogás em parceria com a Future Carbon Group, está buscando a certificação de Reduções Verificadas de Emissão (Créditos de Carbono) por evitar as emissões do gás metano pela operação do biodigestor. Como parte integrante do processo, será conduzida uma apresentação sobre as etapas do projeto e os seus benefícios. Desta forma, convidamos as partes interessadas a participarem da apresentação conduzida em formato remoto (por videoconferência), **no dia 25/01, às 10 horas**.

Para participar da apresentação do projeto, basta clicar neste link. A apresentação será realizada pelo Google Meet, o qual é compatível com computadores que utilizam o sistema operacional Windows. Além disso, é possível utilizar o aplicativo do Google Meet para celulares com sistema operacional Android e IOS.

A sua participação é muito importante!

Enviamos, em anexo, um material com as principais informações relacionadas ao projeto e de contato para dúvidas.

Se possível, gostaríamos da confirmação de recebimento deste e-mail.

Obrigado!

Atenciosamente,

The on-site consultation with interested parties (local communities) will take place on the premises of Toledo Bioenergy Center. The meeting will have a simplified presentation about the project, a map will be used to explain where all the project activities and their repercussions are and/or will be located, exposing the risks and benefits arising from the project activities.

A permanent communication channel will be created with local stakeholders to receive any comments or suggestions about this project. E-mails, phone numbers and addresses will be available in a folder should they wish to contact project proponents. It is important to note that the same contact information provided is also part of the grievance mechanism, where all comments will be received and the results will be documented and stored in a digital format.

2.3 Environmental Impact

Animal waste is considered a serious environmental concern in the project region. The environmental impacts of the project activity are considered positive, as it improves the activity's waste treatment practices beyond the requirements of environmental agencies.

The project proposes major improvements in the management of animal manure. This will result not only in reduced GHG emissions, but also in other environmental and social benefits such as:

Contribution to local environmental sustainability:

- Reduction of the risk of groundwater contamination due to the correct handling of animal waste. The proposed project is constructed in such a way as to avoid manure leaks or uncontrolled disposal. Guidance on compost disposal has been provided to farmers to avoid uncontrolled compost disposal.

- Elimination of odors from open anaerobic lagoons.

- Reduction of pathogenic vectors associated with animal waste.

- Improvement of the quality of animal manure as fertilizer. The proposed project results in a more efficient treatment of animal manure. The organic fraction and water content of the manure are significantly reduced due to improved aerobic digestion when compared to the baseline AWMS. Improved manure treatment reduces its polluting potential and improves its quality as a soil fertilizer.

Contribution to working conditions

- Improvement of working conditions for farm employees, due to the reduction of odors and pathogenic vectors. The presence of odors and pathogenic vectors is unpleasant and can pose health risks to farm personnel and the local community. The AWMS design significantly reduced or eliminated these issues.

Contribution to income distribution:

- Improved quality of manure to be used as fertilizer. Local farmers consider animal manure an important source of income. The use of animal manure as fertilizer reduces or eliminates the need to purchase industrial fertilizers for these farmers.

- Increase in producers' income from the generation of carbon credits.

Contribution to electricity generation

The generation of electricity by the Toledo Bioenergy Center generates an additional reduction in GHG emissions, as it will supply energy to the grid, replacing thermoelectric plants connected to the National Interconnected System

All of the above benefits are in line with the farmer's objectives of improving the quality of his operation and acting positively in the community. According to project participants, the project is an opportunity to adopt sustainable practices and guide future swine farms in confinement.

2.4 Public Comments

No comments were received during the public comment period as the project is not at this stage as of the date of submission of this specification.

2.5 AFOLU-Specific Safeguards

Not applicable. This is not an AFOLU project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The methodology applied to the project is small scale CDM methodology:

- AMS-III.D Methane recovery in animal manure management systems (version 21.0)[6];
- AMS-I.D. – "Grid connected renewable electricity generation", version 18.0[7].

3.2 Applicability of Methodology

AMS-III.D 'Methane Recovery in Animals manage the management system'' Version 21.0 applies to project activities involving the replacement or modification of anaerobic animal management systems on livestock farms to achieve methane recovery and destruction by flaring/combustion or profitable use of the recovered methane. It also covers the handling of the management collected in several farms in a centralized plant.

The proposed project activity consists of replacing the anaerobic treatment with a biodigester, or similar technologies, which collects animal manure from one or several farms and direct it to a treatment plant, where methane is recovered and combusted and/or used for electricity generation.

The methodology is applicable under the following conditions:

[6] Methodology available at: https://cdm.unfccc.int/methodologies/DB/H9DVSB24O7GEZQYLYNWUX23YS6G4RC.

[7] Methodology available at: https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK.

Applicability Conditions	Future Carbon methane capture Grouped Project	Instance 1 – CIBiogás Project Activity
The AMS-III.D methodology requires that the anima population on the farm be managed under confined conditions prior to the project.	All farms to be part of the grouped project will previously have a history of handling livestock in confined conditions.	All 14 farms keep pigs in confinement
Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries).	All instance to be included in the grouped project must prove that manure or streams obtained after treatment are not discharged into natural water resources.	Manure from swine farmers participating in the project was contained in anaerobic ponds and was not directed to natural water resources. After treatment, manure was applied to crops or pasture for fertilization.
The average annual temperature of the baseline site where the anaerobic manure treatment facility is located is greater than 5°C.	The average annual temperature of the location of each instance will be evaluated to assess whether they will be able to participate in the grouped project.	The average annual temperature in the city of Toledo-PR is above 5°C.
In the baseline scenario, the manure retention time in the anaerobic treatment system is greater than one month, and if anaerobic lagoons are used in the baseline, their depths are at least 1 meter.	The baseline animal waste management treatment will be assessed to determine the retention time of manure and the depth of the anaerobic lagoon in order to meet the applicability condition.	The farms that are part of the project have a manure retention time in the anaerobic treatment system of more than one month and the depth of the anaerobic lagoon is at least 1 meter.
No methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario.	No instances to be part of the grouped project will in the baseline scenario recover and destroy methane.	None of the farmers participating in the first instance perform recovery and destruction of methane.

Applicability Conditions	Future Carbon methane capture Grouped Project	Instance 1 – CIBiogás Project Activity
The residual waste from the animal manure management system shall be handled aerobically, otherwise the related emissions shall be taken into account as per relevant procedures of "AMS-III.AO Methane recovery through controlled anaerobic digestion". In the case of soil application, proper conditions and procedures (not resulting in methane emissions) must be ensured.	For new instances joining the grouped project, it will be observed whether the residual waste from the animal manure management system is treated aerobically and in the case of soil application, conditions and procedures (which do not result in methane emissions) must be ensured.	Residues from the animal manure management system are treated aerobically and applied to the soil under conditions and procedures that do not result in methane emissions.
Technical measures should be used (including a flare for requirements) to ensure that all biogas produced by the digester is used or flared.	It will be checked for new instance joining the project if technical measures are used (including a flare to requirements) to ensure that all biogas produced by the digester is used or flared.	Technical measures are used by CIBiogás to ensure that all the biogas produced by the digester is used or flared.
The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester.	It will be checked for new instances joining the project if the storage time of the manure after removal from the animal stables, including transport, will not exceed 45 days before being fed into the anaerobic digester.	The storage time of the manure after removal from the Toledo farmers' animal confinements, including transport, does not exceed 45 days before reaching the biodigester of the CIbiogás biogas plant.

The AMS-I.D "Grid Connected Renewable Electricity generation" comprises renewable energy generation units such as photovoltaic, hydroelectric, tidal/wave, wind, geothermal and renewable biomass:

(a) Supply of electricity to a national or regional grid; or

(b) Supply of electricity to an identifying consumer facility via the national/regional grid under a contractual agreement, such as running.

The project activity of the Centro de Bioenergy de Toledo instance uses the biogas collected from the anaerobic digester to generate electricity. Thus, the project complies with item 4(a) and item 1 of Table 1 in the AMS-I.D. Appendix, Version 18.0. The methodology is applicable under the following conditions:

Applicability Conditions	Future Carbon methane capture Grouped Project	Instance 1 – CIBiogás Project Activity
Install a Greenfield plant.	The new plants to join the grouped project must be implemented as a Greenfield Power Plant.	The proposed project activity is implemented as a Greenfield Power Plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity. Hence, the project complies with this condition.

3.3 Project Boundary

According to methodology AMS-III.D., version 21.0, the project boundary includes the physical, geographical site(s) of:

a. The livestock;

b. Animal manure management systems (including centralized manure treatment plant where applicable);

c. Facilities which recover and flare/combust or use methane

Source		Gas	Included?	Justification/Explanation
Baseline	Direct emissions from the manure treatment processes	CO_2	No	Excluded for simplification. This emission source is assumed to be very small.
		CH_4	Yes	The major source of emissions in the baseline.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
		Other	-	-
	Emissions from	CO_2	Yes	Electricity is consumed from the grid in the baseline scenario.

Source		Gas	Included?	Justification/Explanation
	electricity consumption / generation	CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
		Other	-	-
Project	Direct emissions from the manure treatment processes	CO_2	No	CO_2 emissions from the decomposition of organic waste are not accounted.
		CH_4	Yes	The emissions from the leakage of biogas are accounted for.
		N_2O	No	The minor emissions source in the baseline are accounted for
		Other	-	-
	Emissions from manure / waste residue transportation	CO_2	Yes	It is an important emission source. Hence, they are accounted for
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
		Other	-	-
	Emissions from the use of electricity for the operation of the installed facilities	CO_2	Yes	The emissions from the energy consumption of the biogas plant are relevant
		CH_4	No	There is no emission of this gas
		N_2O	No	There is no emission of this gas
		Other	-	-

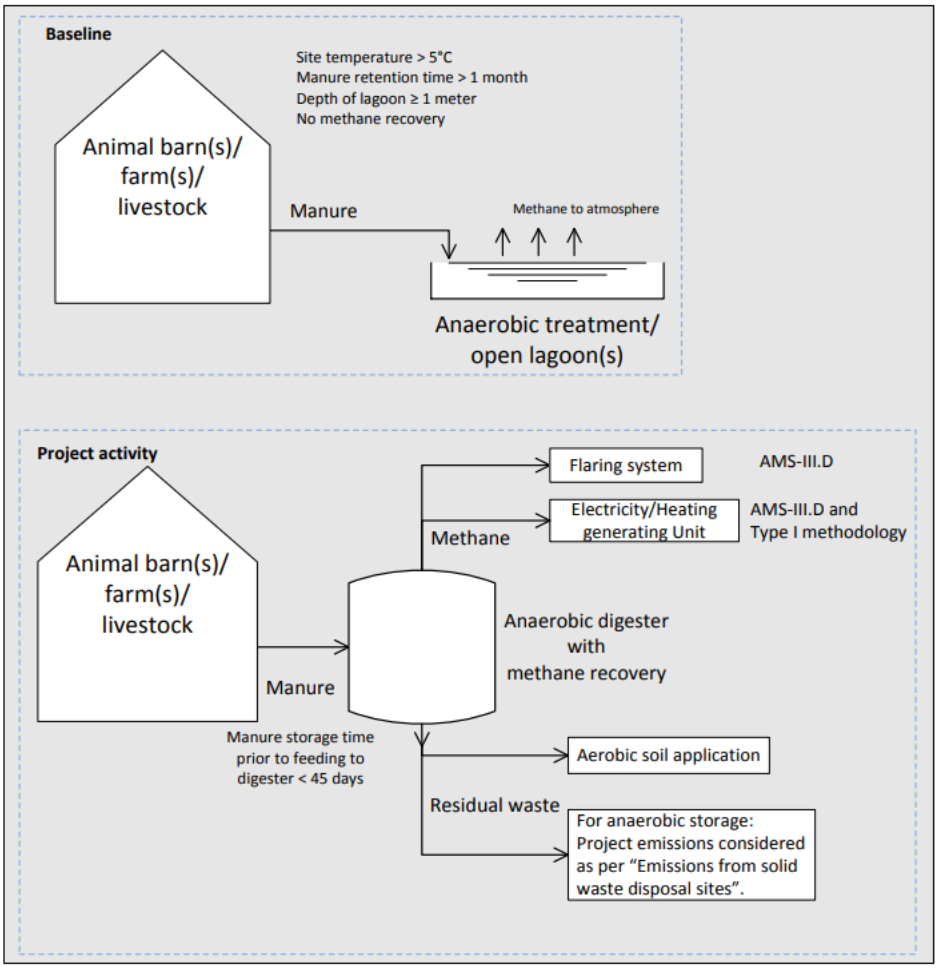


Figure 3. Representation of the project boundary (AMS-III.D, version 21.0)

3.4 Baseline Scenario

As per para. 17 of AMS-III.D, the baseline scenario is the situation where, in the absence of the project activity, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere.

Hence, the baseline scenario of the project is the animal manure waste being left to decay in anaerobic manure management system (uncovered open lagoon) at the animal confinement farms and methane being emitted to the atmosphere directly without any methane recovery and destruction facility.

3.5 Additionality

The section 3.13 of the VCS Standard v4.4 clearly states that "Additionality must be demonstrated and used in accordance with the requirements established in the methodology applied to the project". Paragraph 15 of the approved methodology of AMS-III.D., version 21.0,

applied to the proposed project activity, states that “project activities can demonstrate additionality by demonstrating that there are no regulations in the host country, applicable to the project site, that require the collection and destruction of methane from livestock manure. If so, they are not required to apply the 'Guidelines on the demonstration of additionality for small-scale projects activities'".

As noted above, there are no legal regulations in Brazil that require the collection and destruction of methane from livestock manure. Therefore, it is not necessary to apply the ‘Guidelines in demonstrating the additionality of small-scale project activities”. Thus, the Type III component of the proposed project activity, such as methane recovery from animal manure, should be considered additional.

In addition, paragraph 16 of AMS-III.D., version 21.0. clarifies that “this additionality condition also applies to the activities of the Greenfield project. Furthermore, for project activities applying this methodology in combination with a Type I methodology, which has an energy component whose installed capacity is less than 5 MW, this additionality procedure demo also applies to this component”.

Within the boundaries of the Type III component of the proposed project activity, the project captures and uses biogas from animal management in anaerobic digesters to generate electricity with biogas engines/units with a total installed capacity, less than 5 MW. Therefore, in accordance with paragraph 16 of AMS-III.D., version 21.0, it is not necessary to apply the 'Guidelines on the demonstration of additionality of small-scale project activities” to the Type I component of the proposed project activity, which is grid-connected renewable electricity generation.

3.6 Methodology Deviations

Not applicable.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

According to methodology AMS-III.D, version 21.0, paragraph 17, the baseline scenario is the situation where, in the absence of the project activity, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere. To calculate the baseline emissions, the project proponents propose to utilize the Option 17 (a):

Using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the most recent IPCC Tier 2 approach. For this calculation, information about the characteristics of the manure and of the management systems in the baseline is required. Manure characteristics include the amount of volatile solids (VS) produced by the livestock and the maximum amount of methane that can be potentially produced from that manure (Bo).

The baseline emissions are calculated by Equation X below:

$$BE_y = GWP_{CH4} * D_{CH4} * UF_b * \sum_{j,LT} MCF_j * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j}$$

Equation 1

Where:

BEy Baseline emissions in year y (tCO_2e).

GWPCH4 Global Warming Potential (GWP) of CH_4 (28).

DCH4 CH4 density (0.00067 t/m^3 at room temperature (20 °C) and 1 atm pressure)

LT Index for all types of livestock.

j Index for animal manure management system.

MCF j Annual methane conversion factor (MCF) for the baseline animal manure management system j.

B0,LT Maximum methane producing potential of the volatile solid generated for animal type LT (m^3 CH_4 /kg dm).

NLT,y Annual average number of animals of type LT in year y (numbers).

VSLT,y Volatile solids for livestock LT entering the animal manure management system in year y (on a dry matter weight basis, kg dm/animal/year).

MS%Bl,j Fraction of manure handled in baseline animal manure management system j.

UFb Model correction factor to account for model uncertainties (0.94).

The value of VSLT,y is adjusted according to the average animal weight of project activity, by means of Equation 3, considering the default value of IPCC (VSdefault):

$$VS_{LT,y} = \left(\frac{W_{site}}{W_{default}} \right) * VS_{default} * nd_y$$

Equation 2

Where:

Wsite Average animal weight of a defined livestock population at the project site (kg).

Wdefault Default average animal weight of a defined population, this data is sourced from 2006 IPCC (kg).

VSdefault Default value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population (kg dm/animal/day).

ndy Number of days in year y where the animal manure management system is operational.

The average number of animals (NLT,y) is calculated by Equation 4:

$$N_{LT,y} = N_{da,y} * \left(\frac{N_{p,y}}{365} \right)$$

Equation 3

Nday Number of days animal is alive in the farm in the year y (numbers).

Np,y Number of animals produced annually of type LT for the year y (numbers).

Baseline emissions, according to the AMS-I.D methodology, version 18.0, paragraph 22, only include CO_2 emissions from electricity generation in plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected plants. Baseline emissions were calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,y}$$

Where:

BEy = Baseline emissions in year y (t CO2)

$EGPJ,y$ = Quantity of net electricity generation that is produced and fed into

the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EFgrid,y$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh)

The calculation of $EG_{PJ,y}$ for greenfield plants is described below, as per paragraph 26 of the AMS-I.D methodology:

$$EG_{PJ,y} = EG_{PJ,facility,y}$$

Where:

$EGPJ,facility,y$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

For the calculation, national data from the Brazilian Ministry of Science, Technology and Innovation (MCTI) was used. To this end, the average build margin and operating margin values for the year 2021 were applied, since data for 2022 is not yet available. As required by document "Tool to calculate the emission factor for an electricity system" Version 07.0, all projects, except for wind and solar, must attribute a proportion of 0.5 to the build margin value and 0.5 to the operating margin value.

4.2 Project Emissions

Per paragraph 20 of methodology AMS-III.D version 21, project emissions consist of: physical leakage of biogas in manure management systems, which includes production, collection and transport of biogas to the point of flaring/combustion or use lucrative; emissions from flaring or combustion of the gas stream; CO_2 emissions from the use of fossil fuels or electricity for the operation of all installed facilities; CO_2 emissions from incremental transport distances; emissions from manure storage before it is fed into the anaerobic digester.

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y}$$

Equation 4

Where:

PEy = Project emissions in year y (t CO_2e)

$PEPL,y$ = Emissions due to physical leakage of biogas in year y (t CO_2e)

$PEflare,y$ = Emissions from flaring or combustion of the biogas stream in the year y (tCO_2e).

$PEpower,y$ = Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year y (t CO_2e)

$PEtransp,y$ = Emissions from incremental transportation in the year y (t CO_2e), as per relevant paragraph in AMS-III.AO

$PEstorage,y$ = Emissions from the storage of manure (t CO_2e)

The project emissions due to physical leakage of biogas from the animal manure management systems used to produce, collect and transport the biogas to the point of flaring or gainful use are estimated as 10% of the maximum methane producing potential of the manure fed into the management systems implemented by the project activity. If the option in paragraph 17(a) is chosen, it is determined as:

$$PE_{PL,y} = 0.10 \times GWP_{CH4} \times D_{CH4} \times \sum_{i,LT} B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{i,y}$$

Equation 5

Where:

$MS\%i,y$ = Fraction of manure handled in system i in year y.

The recovered biogas is used to produce electricity and thus the methane destruction efficiency can be considered as 100%, as determined in paragraph 22. The project emissions from electricity and fossil fuel consumption are determined by following the methodological tool "Project and leakage emissions from anaerobic digesters" (as determined in paragraph 23) and the Project emissions due to handling storage are not accounted for because the manure storage time, including transport, before reaching the anaerobic digester is less than 24 hours and the

dry matter content of the manure when removed from the animal confinement is greater than 20% (as determined in paragraph 24).

4.3 Leakage

According to paragraph 26 of AMS-III.D, version 21, leakage emissions shall be determined by following the relevant procedure in the methodological tool "Project and leakage emissions from anaerobic digesters[8]". As per paragraph 25 of the referred tool, leakage emissions are determined as:

$$LEAD,y = LEstorage,y + LEcomp,y$$

Equation 6

Where,

$LEAD,y$	Leakage emissions associated with the anaerobic digester in year y (tCO_{2e})
$LEstorage,y$	Leakage emissions associated with storage of digestate in year y (tCO_{2e})
$LEcomp,y$	Leakage emissions associated with composting digestate in year y (tCO_{2e})

Leakage emissions are not considered to occur on Instance 1 (Cibiogás), since the digestate shall not be stored anaerobically nor composted, but applied to the soil as fertilizer, upon delivery to each farmer.

I addition, paragraph 42 of AMS-I.D determines leakage emissions should be assessed according to the General guidance on leakage in biomass project activities. However, this grouped project is not expected to involve the use or diversion of biomass.

The occurrence of leakage emissions shall be assessed and accounted for when applicable for other instances included in the grouped project, following the procedures indicated on the applied methodologies and methodological tools.

[8] Tool available at: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-14-v1.pdf/history_view.

4.4 Net GHG Emission Reductions and Removals

According to the methodology AMS-III.F., version 12.0, the emission reductions achieved by the project activity will be determined ex post through direct measurement of the amount of methane fuelled, flared or gainfully used. The emission reductions achieved in any year are the lowest value of the following:

$$ER_{y,ex\ post} = min\left[\left(BE_{y,ex\ post} - PE_{y,ex\ post}\right), \left(MD_y - PE_{power,y,ex\ post}\right)\right]$$

Equation 7

Where:

$ERy,ex\ post$	Emission reductions achieved by the project activity based on monitored values for year *y* (t CO2e)
$BEy,ex\ post$	Baseline emissions calculated using equation 1 (for projects using option in paragraph 17(a)) using ex post monitored values of *NLT,y* and if applicable *VSLT,y.* For projects using option in paragraph 17(b), the ex post monitored values for *Qmanure,j,LT,y* and *SVSj,LT,y* are used
$PEy,ex\ post$	Project emissions calculated using equation 6 using ex post monitored values of *NLT,y,MS% i,y, MS% l, All, Qres waste,y* and if applicable *VSLT,y*
MDy	Methane captured and destroyed or used gainfully by the project activity in year *y* (t CO2e)
$PEpower,y,ex\ post$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in the year *y* (t CO2e)

For the ex ante emissions reductions, the calculations were performed as follows:

$$ERy = BEy - PEy - Ley$$

Equation 8

Where:

ERy = Emissions reductions in the year y (tCO_{2e})

BEy = Baseline emissions in the year y (tCO_{2e})

PEy = Project emissions in the year y (tCO_{2e})

LEy = Leakage in the year y (tCO_{2e})

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2023 (01/03/2023 to 31/12/2023)	12,761	12,761	0	11,393
2024	15,204	15,204	0	13,258
2025	15,204	15,204	0	13,258
2026	15,204	15,204	0	13,258
2027	15,204	15,204	0	13,258
2028	15,204	15,204	0	13,258
2029	15,204	15,204	0	13,258
2030 (01/01/2022 to 28/02/2029)	2,459	2,459	0	2,144
Total	27,965	3,314	0	93,085

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	GWP_{CH4}
Data unit	tCO_2e/tCH_4
Description	Global Warming Potential of CH_4
Source of data	IPCC Fifth Assessment Report (https://www.ipcc.ch/report/ar5/wg1/) and Table 2 of the VCS Standard, version 4.3 (https://verra.org/wp-content/uploads/2022/06/VCS-Standard_v4.3.pdf).
Value applied	28
Justification of choice of data or description of	As per Section 3.14.4 of the VCS Standard, version 4.3, for GHG emission reductions occurring on or after 1 January 2021, all ex-ante estimates and ex-post calculations shall be converted to

measurement methods and procedures applied	CO_{2e} using GWP values from the IPCC Fifth Assessment Report (AR5).
Purpose of Data	This parameter is used to convert methane emissions to tCO_{2e}.
Comments	-

Data / Parameter	D_{CH4}
Data unit	t/m^3
Description	Density of CH_4
Source of data	Methodology AMS-III.D., version 21.0
Value applied	0.00067 at room temperature (20°C) and 1 atm pressure
Justification of choice of data or description of measurement methods and procedures applied	Value proposed by the methodology.
Purpose of Data	This parameter is used to convert estimated methane emissions from cubic meters to tonnes
Comments	-

Data / Parameter	UF_b
Data unit	Fraction
Description	Correction factor to account for model uncertainties.
Source of data	Methodology AMS-III.D., version 21.0
Value applied	0.94
Justification of choice of data or description of measurement methods and procedures applied	Value proposed by the methodology.
Purpose of Data	Correction factor to account for model uncertainties on the calculation of emission reductions.
Comments	-

Data / Parameter	MCF_j
Data unit	Fraction
Description	Annual methane conversion factor for the baseline animal manure management system j.
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, chapter 10, table 10.17.
Value applied	Uncovered anaerobic lagoons:77%
Justification of choice of data or description of measurement methods and procedures applied	The value of methane conversion factor of 77% for anaerobic lagoons was determined according to the Table 10.17 considering the annual average temperature at the region where project is being developed of 19ºC (Figure 2).
Purpose of Data	This parameter is used to calculate baseline methane emissions from the treatment of animal manure in anaerobic treatment systems
Comments	-

Data / Parameter	$B_{0,LT}$
Data unit	m^3 CH_4/kg dm
Description	Maximum methane producing potential of the volatile solid generated for animal type LT.
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, chapter 10, table 10.A-7 and 10A-8.
Value applied	0.29 for market swine and 0.45 for breeding swine. Values for Latin America are used for market swine and for Western Europe are used for breeding swine, since farrowing farms comply with all conditions of paragraph 18 (d) of AMS-III.D, version 21.0.
Justification of choice of data or description of measurement methods and procedures applied	Value taken from the source recommended by the applied methodology.
Purpose of Data	This parameter is used calculate baseline emissions by determining potential methane emissions from the amount of volatile solids generated for each animal type
Comments	Compliance with all conditions described in paragraph 18 (d) of AMS-III.D version 21.0 is found in both Farrowing farms included

	in the project. Hence, the use of default values from developed countries is allowed.

Data / Parameter	$MS_{\%BL,j}$
Data unit	%
Description	Fraction of manure handled in baseline animal manure management system j
Source of data	Project proponent.
Value applied	100%
Justification of choice of data or description of measurement methods and procedures applied	All waste was sent to the baseline treatment system (anaerobic lagoons) prior to the project initiation in the Brownfield farms. This is considered the baseline scenario for Greenfield farms, since it is the common practice in the region.
Purpose of Data	This parameter is used calculate baseline emissions by determining the fraction of manure that is handled on each treatment system considered
Comments	

5.2 Data and Parameters Monitored

Data / Parameter	$VS_{LT,y}$
Data unit	kg dm/animal/year
Description	Volatile solids for livestock LT entering the animal manure management system in year y.
Source of data	- IPCC default value from: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 chapter 10 table 10 A-4 to 10 A-9;
Description of measurement methods and procedures to be applied	- Wsite: Farmers, based on documents provides by the integrators, State Agencies or internal documents.
Frequency of monitoring/recording	Annually

Value applied	259,17
Monitoring equipment	No monitoring equipment is used. Since this is a default value from IPCC, it is not possible to quantify the accuracy. However, the correction of this parameter with W_{site} will ensure values are consistent to the project situation.
QA/QC procedures to be applied	This parameter shall be calculated with monitored data on nd_y and W_{site}. QA/QC procedures for these parameters are described on Pages 54 and 55.
Purpose of data	This parameter is used to calculate baseline methane emissions from animal manure treatment.
Calculation method	Calculated through Equation 3 of the VCS PD, considering the average animal weight at the project site (W_{site}), the default average animal weight ($W_{default}$) according to 2006 IPCC, the default value of volatile solid excretion rate ($VS_{default}$) also according to 2006 IPCC and the number of days the system is operational during year y (nd_y).
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	$N_{da,y}$
Data unit	Days
Description	Number of days animal is alive in the farm in the year y
Source of data	Project proponent
Description of measurement methods and procedures to be applied	Market swine: this parameter will be monitored using internal registries from farmers or third parties (integrators, State Agencies, etc) regarding input and output data of the animals in each farm. Breeding swine: the value considered to this parameter will be 365 days per year, once the animals stay in the farm during the whole year.
Frequency of monitoring/recording	Periodic records provided by integrators for each batch.
Value applied	Values applied for the calculation of ex-ante animal data, using 116.

Monitoring equipment	No monitoring equipment is used. This parameter is usually based on third party information, such as documents from integrators and State Agencies. Therefore, although it is not feasible to quantify accuracy, a high level of accuracy is expected..
QA/QC procedures to be applied	Control forms and registration documents provided by the third parties (integrators, State Agencies, etc) are considered reliable sources, once data are used for financial purposes. Future Carbon Group S. A. will keep a database with the information provided for each farm.
Purpose of data	This parameter is used to calculate baseline methane emissions from animal manure treatment
Calculation method	Calculated based in the difference of the date of input and output of the animals in each farm.
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	$N_{p,y}$
Data unit	Number
Description	Number of animals produced annually of type LT for the year y
Source of data	Project proponent
Description of measurement methods and procedures to be applied	Market swine: this parameter will be monitored using internal registries from farmers or third parties (integrators, State Agencies, etc) regarding input and output data of the animals in each farm. Breeding swine: this parameter will be monitored using internal registries from farmers. The number of animals produced is considered the annual average.
Frequency of monitoring/recording	Periodic records provided by integrators for each batch.
Value applied	Values applied for the calculation of ex-ante animal data.
Monitoring equipment	No monitoring equipment is used. This parameter is usually based on third party information, such as documents from integrators and State Agencies. Therefore, although it is not

	feasible to quantify accuracy, a high level of accuracy is expected.
QA/QC procedures to be applied	Control forms and registration documents provided by the third parties (integrators, State Agencies, etc) are considered reliable sources, once data are used for financial purposes. Future Carbon Group S. A. will keep a database with the information provided for each farm.
Purpose of data	This parameter is used to calculate baseline methane emissions from animal manure treatment.
Calculation method	The total number of animals produced is provided in the Section 4.1 of the VCS PD.
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	W_{site}
Data unit	kg
Description	Average animal weight of a defined livestock population at the project site (kg)
Source of data	Project proponent
Description of measurement methods and procedures to be applied	The average animal weight by type applied for project activity will be obtained from the following sources (in a order of preference): 1. Third party information (such as documents from integrators or State Agricultural agencies) 2. Onsite measurements 3. Other farms included in the Project that have similar production conditions 4. Conservative default values given the project conditions.
Frequency of monitoring/recording	Integrators provide documents for each batch, as described above in section 3.6. Thus, animal weight controls do not follow an annual schedule; instead, they are based on each batch period.
Value applied	Values applied for the calculation of ex-ante animal data.

Monitoring equipment	No monitoring equipment is used. This parameter is usually based on third party information, such as documents from integrators and State Agencies. Therefore, although it is not feasible to quantify accuracy, a high level of accuracy is expected.
QA/QC procedures to be applied	Control forms and registration documents provided by the third parties (integrators, State Agencies, etc) are considered reliable sources, once data are used for financial purposes. Future Carbon Group S. A. will keep a database with the information provided for each farm.
Purpose of data	This parameter is used to calculate baseline methane emissions from animal manure treatment.
Calculation method	Calculated based in the difference of the animal weight at the date of input and output of the animals in each farm.
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	$BG_{burnt,y}$
Data unit	m^3
Description	Biogas volume in year y
Source of data	Project proponent
Description of measurement methods and procedures to be applied	The amount of biogas recovered and fed, flared or profitably used will be used for monitoring flowmeters or determined indirectly from the energy generated on biogas generators, following procedures provided on AMS-III.D, version 21.
Frequency of monitoring/recording	Annually
Value applied	This parameter is usually based on information collected by the flow meter
Monitoring equipment	Monitoring flowmeters
QA/QC procedures to be applied	The equipment will be maintained according to the manufacturer's specifications and calibrations will be performed. CIBiogás will

	carry out quality control through periodic measurements.
Purpose of data	This parameter is used to calculate the amount of biogas recovered and fed, flared or profitably used will
Calculation method	Data will be directly measured using flow meters. Data will be aggregated monthly and annually.
Comments	Data will be electronically archived for the duration of the crediting period plus two years

Data / Parameter	w_{CH4}
Data unit	%
Description	Methane content in biogas in the year y
Source of data	Project proponent
Description of measurement methods and procedures to be applied	The fraction of methane in the biogas will be measured with a continuous analyser. Alternatively, a default value shall be applied, as defined on AMS-III.D.
Frequency of monitoring/recording	Periodical measurements
Value applied	Values applied for the calculation of ex-ante animal data.
Monitoring equipment	Monitoring flowmeters
QA/QC procedures to be applied	The equipment will be maintained according to the manufacturer's specifications and calibrations will be performed. CIBiogás will carry out quality control through periodic measurements
Purpose of data	Guarantee the CH_4 content in the biogas
Calculation method	Measured with a continuous analyser, values are recorded with the same frequency as the flow.
Comments	Data will be electronically archived for the duration of the crediting period plus two years.

Data / Parameter	T
Data unit	°C
Description	Temperature of the biogas at the flow measurement site
Source of data	Project proponent
Description of measurement methods and procedures to be applied	The temperature of the biogas will be measured with a continuous analyser, where applicable.
Frequency of monitoring/recording	To be measured at the same time as the methane content in the biogas is measured
Value applied	Values applied for the calculation of ex-post animal data.
Monitoring equipment	Monitoring flowmeters
QA/QC procedures to be applied	The equipment will be maintained according to the manufacturer's specifications and calibrations will be performed. CIBiogás will carry out quality control through periodic measurements
Purpose of data	Ensure that the biogas temperature complies with the manufacturer's specifications
Calculation method	Direct measurement, where applicable
Comments	Data will be electronically archived for the duration of the crediting period plus two years.

Data / Parameter	P
Data unit	Pa
Description	The pressure of the gas is required to determine the density of the methane combusted.
Source of data	Project proponent
Description of measurement methods and procedures to be applied	The pressure of the biogas will be measured with a continuous analyser, where applicable
Frequency of monitoring/recording	Shall be measured at the same time when methane content in biogas is measured
Value applied	Values applied for the calculation of ex-ante animal data.

Monitoring equipment	Monitoring flowmeters
QA/QC procedures to be applied	The equipment will be maintained according to the manufacturer's specifications and calibrations will be performed. CIBiogás will carry out quality control through periodic measurements
Purpose of data	Ensure that the biogas pressure complies with the manufacturer's specifications
Calculation method	Direct measurement
Comments	Data will be electronically archived for the duration of the crediting period plus two years.

Data / Parameter	FE
Data unit	%
Description	The flare efficiency
Source of data	Project proponent
Description of measurement methods and procedures to be applied	Measuring the accuracy of the flare in burning CH_4
Frequency of monitoring/recording	Periodical measurements
Value applied	Values applied for the calculation of ex-ante animal data.
Monitoring equipment	Monitoring flowmeters
QA/QC procedures to be applied	The equipment will be maintained according to the manufacturer's specifications and calibrations will be performed. CIBiogás will carry out quality control through periodic measurements
Purpose of data	The CH_4 will be used to generate energy, thus ensuring its destruction. When there is a need to trigger the flare, it will be calibrated according to the manufacturer's specifications.
Calculation method	Will be calculated according to Tool 06 "Project emissions from flaring Version 04.0"
Comments	Data will be electronically archived for the duration of the crediting period plus two years.

Data / Parameter	$Q_{manure,LT,y}$
Data unit	%
Description	Tonnes-dm/year
Source of data	Project proponent
Description of measurement methods and procedures to be applied	The weight of the manure will be measured directly or, alternatively, the volume of the manure can be measured together with the density determined from a representative sample. The amount of animals handled from different farms and different types of animals will be recorded separately for cross-checking.
Frequency of monitoring/recording	Annually, based on daily measurement and monthly aggregation
Value applied	Values applied for the calculation of ex-ante.
Monitoring equipment	Direct measurements use scales to weigh the amount of waste that will enter the biodigester. The indirect will be carried out by the density and volume of the waste.
QA/QC procedures to be applied	The measurements will be carried out in the collection of manure and before feeding the biodigester. A cross check will be done to determine the exact amount of manure. We will always adopt conservative data.
Purpose of data	Used in Baseline Emissions AMS-III.D calculations
Calculation method	Volume and density measured whenever manure is collected or in a representative sample.
Comments	Data will be electronically archived for the duration of the crediting period plus two years.

Data / Parameter	$SVS_{j,LT,y}$
Data unit	tonnes VS/tonnes--dm
Description	Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y
Source of data	Project proponent
Description of measurement methods and procedures to be applied	If animal manure is treated in a centralized plant, as the case in paragraph 17(b), testing shall be performed according to the guideline in annex 2 of AM0073. It can be on sample basis by following the “Standard for sampling and surveys for CDM project

	activities and programme of activities“, with a maximum margin of error of 10% at a 90% confidence level
Frequency of monitoring/recording	Periodical measurements
Value applied	Values applied for the calculation of ex-ante.
Monitoring equipment	Analysis carried out in the laboratory
QA/QC procedures to be applied	ClBiogás will carry out quality control through periodic measurements
Purpose of data	Total Solids: Residue remaining after water is removed from waste material by evaporation; dry matter.
Calculation method	According to the guideline in annex 2 of AM0073
Comments	Data will be electronically archived for the duration of the crediting period plus two years.

Data / Parameter	$MS\%_{i,y}$
Data unit	%
Description	Fraction of manure handled in system *i* in project activity in year *y*
Source of data	Project proponent
Description of measurement methods and procedures to be applied	If animal manure is treated in different treatment systems manure weight delivered to each system shall be directly measured or alternatively manure volume can be measured together with the density determined from representative sample (90/10 precision). The quantity of animal manure from different farms and different animal types shall be recorded separately for cross-check. Recording of the baseline animal manure management system where the animal manure would have been treated anaerobically is also required.
Frequency of monitoring/recording	Annually, based on daily measurement and monthly aggregation
Value applied	According to the measurements
Monitoring equipment	Adjustment of the entry and exit lots of animals on the farms.
QA/QC procedures to be applied	This parameter will be monitored using internal registries from farmers or third parties (integrators, State Agencies, etc) regarding input and output data of the animals in each farm.

Purpose of data	Calculate the volume of waste entering the biodigester. This calculation will be used in the baseline emissions
Calculation method	According to the guideline in AMs-III.D.
Comments	Data will be electronically archived for the duration of the crediting period plus two years.

Data / Parameter	AL_l
Data unit	Days
Description	Annual average interval between manure collection and delivery for treatment at a given storage device *l*
Source of data	Project proponent
Description of measurement methods and procedures to be applied	It is to be used to calculate possible project emissions due the storage of animal manure, as per paragraph 25, AMS-III.D.
Frequency of monitoring/recording	Annually, based on monthly records
Value applied	According to the weights
Monitoring equipment	Monitoring flowmeters
QA/QC procedures to be applied	This parameter will be monitored using internal registries from farmers or third parties (integrators, State Agencies, etc) regarding input and output data of the animals in each farm.
Purpose of data	This parameter is used to calculate project emissions due to the transport of waste.
Calculation method	Global Positioning System
Comments	Data will be electronically archived for the duration of the crediting period plus two years.

Data / Parameter	n_{dy}
Data unit	Days
Description	Number of days in year y where the animal manure management system is operational.
Source of data	Project proponent

Description of measurement methods and procedures to be applied	Number of days that the animal manure management system was operational
Frequency of monitoring/recording	Number of days that the animal manure management system was operational
Value applied	365
Monitoring equipment	No equipment is used to monitor this parameter. Plant owners will keep records of the operational status of the Bioenergy plant to determine this parameter.
QA/QC procedures to be applied	Different sources of information from plant owners will be used to confirm and crosscheck this parameter.
Purpose of data	This parameter is used to calculate baseline methane emissions from animal manure treatment. It is also used to determine the quantity of manure treated in the year y
Calculation method	Counting days in the years where monitoring data indicates the manure management system was operational.
Comments	Data will be electronically archived for the duration of the crediting period plus two years.

Data / Parameter	$MS\%_l$
Data unit	%
Description	Fraction of volatile solids handled by storage device *l*
Source of data	Project proponent
Description of measurement methods and procedures to be applied	It is to be used to calculate possible project emissions due the storage of animal manure, as per paragraph 25, AMS-III.D.
Frequency of monitoring/recording	Monthly
Value applied	According to measurements
Monitoring equipment	Monitoring flowmeters

QA/QC procedures to be applied	This parameter will be monitored using internal registries from farmers or third parties (integrators, State Agencies, etc) regarding input and output data of the animals in each farm
Purpose of data	This parameter is used to calculate baseline methane emissions from animal manure treatment
Calculation method	Counting days in the years where monitoring data indicates the manure management system was operational on each farm
Comments	Data will be electronically archived for the duration of the crediting period plus two years.

Data / Parameter	$B_{0,LT}$
Data unit	m^3 CH_4/kg dm
Description	Maximum methane producing potential of the volatile solid generated for animal type *LT*
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, chapter 10, table 10.A-7 and 10A-8.
Description of measurement methods and procedures to be applied	Only when developed country values are to be used in the project, in such a case relevant parameters specified in the paragraph 18(d) shall be monitored/documented
Frequency of monitoring/recording	Annually
Value applied	0.29 for market swine and 0.45 for breeding swine. Values for Latin America are used for market swine and for Western Europe are used for breeding swine, since farrowing farms comply with all conditions of paragraph 18 (d) of AMS-III.D, version 21.0.
Monitoring equipment	According to measurements
QA/QC procedures to be applied	This parameter will be monitored using internal registries from farmers or third parties (integrators, State Agencies, etc) regarding input and output data of the animals in each farm
Purpose of data	This parameter is used to calculate baseline methane emissions from animal manure treatment.
Calculation method	Value taken from the source recommended by the applied methodology.

Comments	Data will be electronically archived for the duration of the crediting period plus two years.

5.3 Monitoring Plan

The monitoring plan presented in this PD assures that real, measurable, long-term GHG emission reductions can be monitored, recorded and reported. It is a crucial procedure to determine the ultimate emission reductions achieved by the project. This monitoring plan will be implemented by the project proponent during the project operation. The details of the monitoring plan are specified the figure as follows:

Figure 04. First instance monitoring plan