Gold Standard
for the Global Goals

TEMPLATE

TRANSITION REQUEST FORM - PROJECT

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VERSION **1.0**

RELATED SUPPORT

- **TEMPLATE GUIDE Key Project Information & Project Design Document v.1.2**

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Summary:

The projects transitioning from **CDM or other Standards to Gold Standard for Global Goals (GS4GG)** shall submit the transition request form and PDD (this document). The **Transition Request Form** is also to be completed for projects that are already registered with GS4GG for CER labelling and seek to move to GSVER stream to issue Gold Standard VERs..

This document contains the following Sections

Section - Transition Request Form

TRF.1 ELIGIBILITY CHECK FOR TRANSITION
TRF.2 TRANSITION PROJECT INFORMATION
TRF.3 TRANSITION CHECKLIST

Key Project Information
Section - Project design document
0 – Description of project
0 - Application of approved Gold Standard Methodology (ies) and/or demonstration of SDG Contributions
0 – Duration and crediting period
0 – Summary of Safeguarding Principles and Gender Sensitive Assessment
0 – Outcome of Stakeholder Consultations
Appendix 1 – Safeguarding Principles Assessment (mandatory)
0 - Contact information of Project participants (mandatory)
0 - LUF Additional Information (project specific)
0 - Summary of Approved Design Changes (project specific)

The following table summarises how different sections of this document shall be filled to facilitate request for transition from other standard to GS4GG.

Section	Required for	How to complete the section
Transition Request Form		
TRF.1 Eligibility check for transition	All projects	Answer the assessment questions and provide supporting information as needed
TRF.2 Transition project information	All projects	Provide project information pertaining to the standard the project is transitioning from (e.g., CDM)
TFR.3 Transition checklist	All projects	Answer the assessment questions and provide supporting in the section in the PDD section as needed
Project Design Document		
Key project information	All projects	Include project details pertaining to GS4GG
Section A to E	All projects	Provide information as needed. Any section/subsections - that requires information/justification or additional information as per transition checklist, AND - that involves update/revision to the information provided for registration with other standards. In such cases, the project shall copy and paste the information from registered PDD (other standard) and mark the additional information in track changes.

SECTION – TRANSITION REQUEST FORM

TRF.1 ELIGIBILITY CHECK FOR TRANSITION

To be completed for all projects seeking transition to GS4GG from other standards.

Requirement	To be completed by project developer
The project must have a crediting period start date with CDM/other standard on or **after 01 January 2016**	Is the project crediting period start date **after** 01 January 2016? ☐ Yes ☒ No (go to questions below)
The project that has a crediting period start date with CDM/other standard **before 01 January 2016** shall demonstrate the risk of discontinuation without carbon revenue.	Due to the very low energy prices in Brazil, and the impossibility of issuance of carbon credits under the currently registered mechanism CDM, the project is at risk of being discontinued. In Brazil most of the electricity is generated in Hydro plants, thus strongly dependent on rainfall that has been abundant in the last years. Currently the price of settlement of differences (PLD) is around 12 USD per MWh. The PLD is the reference for contracts, especially in the free market, where consumers can choose its supplier. This scenario, as well as the growth of installed solar and wind power, created an oversupply that drove down future prices until 2030, according to current predictions. In some cases, such as power generation from LFG, the income from electricity sales is not sufficient to maintain the operation of the project. Thus, the possibility of carbon revenues is essential for maintaining project operation.
The project that has a crediting period start date with CDM/other standard **before 01 January 2016** shall demonstrate how the project has been operational in the absence of carbon revenue, if carbon credits have not been issued to the project in recent years.	*Credits have been issued under CDM in recent years.*

List of supporting documents	- *CDM CPA-DD document, which contains the Key Project Information;* - *Stakeholder Consultation Report, along with annexes as evidences;* - *Emission Reductions calculation spreadsheet.*

TRF.2 TRANSITION PROJECT INFORMATION

Project developer shall provide project information (in grey rows), pertaining to the standard, the project is transitioning from (e.g., CDM) in the table below.	
Name of the original standard	☒ **CDM** ☐ **Other** (Add the standard name here)
Project status with original standard	*The current status of project with CDM/other standard at the time of submission of this form.*
	☒ **Active** (registration status is valid) ☐ **Withdrawn** (deregistered) ☐ **Provisional** (awaiting guidance from the CMP at CMP 16, CDM PoA only)
CDM/ other standard reference ID	*Reference number/ID allocated to the project by CDM/other standard.*
	CDM 9063
Project reference weblink	*The weblink of the project page of CDM/other standard.*
	https://cdm.unfccc.int/Projects/DB/ICONTEC1356103076.51/view?cp=1
Title of Project	*The title of the project used for registration with CDM/other standard.*
	Macaúbas Landfill Gas Project
New title of Project (if applicable)	*The title of the project if it has been changed for registering with Gold Standard.*
Activity Scale	*Project scale registered with CDM/other standard.*
	Large Scale
Methodology used	*Methodology title and the version number applied for registration with CDM /other standard.*
	ACM0001: Large-scale Consolidated Methodology – "Flaring or use of landfill gas" (version 19.0)
Amount of reductions	*Average annual emission reductions (tCO_2eq/year).*
	445,100 tCO_2e
Registration date	*The project registration date with CDM/other standard.*
	31/07/2013
Type of crediting period	☒ renewable crediting period ☐ fixed crediting period
Crediting period	*The project registered crediting period start date and end date with CDM/other standard.*

	1st Start date: 31/07/2013 End date: 30/07/2020 2nd Start date: 31/07/2020 End date: 30/07/2027
Total Monitoring Periods issued	*The total period that has already been issued by CDM/other standard.* 1st Start date: 31/07/2013 End date: 02/03/2020 2nd Start date: 03/03/2020 End date: 30/07/2020 3rd Start date: 31/07/2020 End date: 31/12/2020
Latest monitoring period	*The latest monitoring period that has already been issued or submitted for issuance to CDM/other standard.* Start date: 31/07/2020 End date: 31/12/2020
	Issuance Status: ☒ Issued ☐ Awaiting issuance Date of Issuance, if issued.: 19/07/2021
Declaration	*Click on the tick box to confirm.* The Project Developer/Representative hereby acknowledges that project developer; ☐ Option 1 - has included information in this document that has not been validated/verified as part of CDM PDD **OR** ☒ Option 2 - has copied all validated information as it appears in the original and then used tracked changes to highlight any information that not been validated/or has changed - *Note if option 2 is selected the project developer shall fill all sections in the PDD template of this document.* The Project Developer/Representative hereby acknowledges that project developer; ☒ is aware that for a given vintage, a registered Gold Standard project can request the issuance of the emission reductions under only one standard/certification scheme. (applicable to all projects). ☒ is aware that all projects that transition to GS4GG shall demonstrate Ongoing Financial Need at the time of renewal of their crediting period following applicable GS4GG requirements. (applicable to all projects). ☒ confirms that the project developer/representative will make a declaration, in writing, in the monitoring report submitted to Gold Standard that (applicable to CDM PoA/CPAs) - project will/has not issue both a CER/other compliance units under Paris Agreement and a GSVER for the same vintage.

	- project developer agrees to comply with all future UNFCCC COP/CMP decisions[1] including adjustment of GWP values
Project Developer/ authorised signatory	*Name and designation of the project developer/authorised signatory* Vital Engenharia Ambiental S.A.

TRF.3 TRANSITION CHECKLIST

Project developer shall answer all assessment questions listed below and provide additional information/justification in the PDD section, where required. Please note that the checklist is based on the GHG Emissions Reductions and Sequestration Product Requirements.

The checklist also provides relevant requirements applicable to project transitioning to GS4GG for easy referencing. The PD shall refer to relevant GS4GG documents, as applicable, for further details. It is recommended that PD refers to Guidelines in the table below for more information on the requirements and flexibilities provided. This document (in word) shall be submitted to SustainCERT along with other required documents **for preliminary review** as listed below –

- Cover Letter
- Terms and Conditions
- Official Development Assistance declaration
- Stakeholder Consultation Report
- Project Design Document (PDD) final version (CDM/other standard)
- Validation report submitted to CDM/other standard
- Last Monitoring and Verification report submitted to CDM/other standard

[1] CDM clarification available on this topic as on date can be referred to here.

1| Transition pathway

1.1 |	**Option 1:** Is project seeking registration with GS4GG **to issue GSCERs** while maintaining the CDM registration? (Ref: GHG Product Requirements)	☐ Yes ☒ No
1.2 |	**Option 2:** Is project seeking registration with GS4GG **to issue GSVERs** only and/or conversion of **issued CERs to GSVERs**? (Ref: Annex B, GHG Product Requirements) *Note – for conversion of issued CERs to GSVERs, the project must be registered with GS4GG.*	☒ Yes ☐ No
1.3 |	**Option 3:** Is project seeking registration with GS4GG **to issue GSVERs only** and/or **conversion of emission reduction to GSVERs** issued by **standard other than CDM**? **(**Ref: Annex B, GHG Product Requirements**)**	☐ Yes ☒ No

Requirement:

All projects submitting request for transition on or after 1/1/2021 must demonstrate compliance with requirements stated in **Annex B,** GHG Product Requirements.

The project following ***option 1*** *above;*

- *may seek registration under GS4GG based on provisional CDM EB decision*
- *may seek issuance of GSVERs in exchange of provisional CERs based on CDM EB decision but must transfer issued CERs to the Gold Standard Swiss CDM Registry Account. If there are any implications for issued volume or project eligibility due to CMP decision regarding GWP, additionality or any other decision, the PD must address these issues, as applicable in consultation with SustainCERT/GS.*
- *A/R projects are not eligible for option 1.*

The project transitioning to GS4GG following ***option 2*** *above,*

- *may convert issued CERs to GSVERs*
- *are not required to deregister from CDM but shall not claim emission reductions under both GS4GG and CDM for the same vintage*
- *Eligible LUF project is required to deregister from CDM to issue GSVERs.*

The project transitioning to GS4GG following ***option 3*** *above,*

- *may convert issued emission reductions unit to GSVERs*
- *may issue GSVERs*
- *shall deregister project from other standard before registration with GS4GG*

Guidelines:

Project already undergoing design certification for CER labelling can continue with their existing process. SustainCERT shall be notified of the intention to switch to GSVER stream, at the earliest possible opportunity.

Project already certified for CER labelling can switch to GSVER stream by completing this form and notifying SustainCERT. Such project may leave the PDD section blank as this information has been captured in GS4GG PDD version submitted earlier.

2| Transition approval procedure

2.1 |	Option 1 - Is the project undergoing a preliminary review **by sustainCERT,** validation **by VVB** and design review by **SustainCERT**?	☒ Yes ☐ No
2.2 |	Option 2 - Is the project undergoing a **combined preliminary review,**	☐ Yes

	validation, and design review by **SustainCERT**? (restrictions apply, see 5.3 below)	☒ No
2.3 |	Option 3- Is the project undergoing preliminary review **by SustainCERT**, combined **validation & verification by VVB**, followed by combined design and performance review by SustainCERT?	☐ Yes ☒ No

Requirement:
The project certification under GS4GG involves following key steps. Refer to Section 5. Project cycle Principles and Requirements for details.

Preliminary review *- Preliminary Review is conducted once at the time of first submission to Gold Standard. It involves desk review of the Key Project Information and Draft Project Design Document by SustainCERT.*

Design certification (validation + design review) *- Design certification involves validation by VVB and design review by SustainCERT. With successful design certification the Project will obtain 'Certified design' status that is equivalent to registration under CDM and other standard.*

Performance certification (verification + performance review) *- Performance certification involves verification by VVB and performance review by SustainCERT. The positive conclusion of the Performance Review period shall result in Gold Standard 'Certified Project status' and Project can issue GSVERs. The project may opt for combined Design Certification, conducting both the first Verification and Performance Review under GS4GG at the same time.*

To minimise disruption and keep the transition review time and costs minimum, the projects are provided with flexibilities as summarised in the table below;

Certification outcome	Certification stage	Option 1 Normal certification pathway	Option 2* Combined Preliminary review + Validation + Design review	Option 3 Combined validation + verification followed by combined design + performance review
Listing	Preliminary review	SustainCERT	SustainCERT	SustainCERT
Certified Design = Registration	Validation	VVB		VVB
	Design review	SustainCERT		SustainCERT
Certified project = Issuance	Verification	VVB	VVB	VVB
	Performance review	SustainCERT	SustainCERT	SustainCERT
Comments		Project shall go through preliminary review by SustainCERT (4 weeks) Design review (minimum 4 weeks) is conducted after Validation by VVB and is concluded when all CARs/CLs are successfully closed.	Project may combine preliminary review with validation and design review. All these steps can be combined and completed by SustainCERT. VVB shall complete the verification.	Project shall go through preliminary review by SustainCERT (4 weeks) Project Developers may combine Design Certification with first Verification and Performance Review. VVB may combine site visits and VVB submits positive Validation and Verification Reports at the same time.

	Performance review (minimum 3 weeks) is conducted after Verification by VVB and is concluded when all CARs/CLs are successfully closed.	Performance review (minimum 3 weeks) is conducted after verification by VVB and is concluded when all CARs/CLs are successfully closed	Concurrent Design Review and Performance Review (minimum 6 weeks) is conducted after submission of validation and verification reports by VVB and is concluded when all CARs/CLs are successfully closed.

For option 1, a validation site visit by VVB is not required as long as the VVB conducted a site visit as part of validation/verification in last three years (from time of first submission for preliminary review) and new/updated information can be audited based on desk review and/or using remote audit approaches.

For Option 2, SustainCERT conducts project design elements desk based audit and approve project transition, without VVB's opinion. ***Note that this option will involve additional review fee levied by SustainCERT. The project developer shall confirm the applicable fee and timelines with SustainCERT (help@sustain-cert.com) before submitting the request for transition.***

If transition project is applying a new/latest version of the methodology which requires full audit but VVB, option 2 cannot be applied.

3| Project Eligibility

3.1 | Is the project eligible project type under Gold Standard for the Global Goals?	☒ Yes ☐ No

Requirement: *The transitioning project shall be one of the eligible project types for issuance of Gold Standard VERs (Ref: GHG Product Requirements).*

Guidelines: *Typical eligible project types are Renewable Energy Supply, End-Use Energy Efficiency Improvement, Waste Handling & Disposal, Land Use and Forests.*

- *Afforestation/Reforestation project registered with CDM/other standard may transition to GS4GG for issuance of GSVERs only but are not eligible for labelling of issued emission reduction units.*
- *RE projects shall refer to Renewable Energy Activity Requirements for eligibility check.*
- *RE projects for example - · Hydropower · biomass resources · landfill gas and biogas from agro-processing, wastewater and other residues · Waste Heat/Gas recovery · Fossil co-generation · Waste incineration and gasification · Waste handling and disposal are required to demonstrate compliance with the specific eligibility requirements. Refer to Annex – A of Renewable Energy Activity Requirements for further details.*
- *Community Services Activities projects for example - Hydropower · biomass resources · landfill gas and biogas from agro-processing, wastewater and other residues · Waste Heat/Gas recovery · Fossil co-generation · Waste incineration and gasification · Waste handling and disposal · Relighting · End-use fossil switching are required to demonstrate compliance with the specific eligibility requirements. Refer to Annex – A of Community Services Activity Requirements for further details.*

4| Compliance with relevant Activity Requirements

4.1 | Does the project conform to the relevant Activity Requirements (CSA/RE /LUF)**?**	☒ Yes ☐ No

4.2 |	Does any specific eligibility criteria/requirement stipulated in Annex A of CSA/RE requirements apply to the project? (see section 2.0 for LUF)	☒ Yes ☐ No
4.3 |	Does specific eligibility criteria/requirement stipulated in Annex A of CSA/RE requirements that apply to the project, lead to any change in the registered PDD? If Yes, please provide a full explanation in section A.1.1. below.	☐ Yes ☒ No

Requirement:
(Ref: Section 4.1.1 of GHG Product Requirements)
Projects shall conform to the relevant Activity Requirements and Gold Standard Approved Methodologies, including eligible CDM Methodologies.

RE rule update / RE PoA rule update:
Grid connected Renewable Energy projects seeking to transition from another carbon crediting scheme to GS4GG or labelling of emission reductions under GS4GG are exempted from eligibility requirements listed in para 2.1.3 of the RE Activity Requirements. This exemption is only allowed to projects that started the first crediting period with the original carbon crediting scheme from 01/01/2016 or later but before 24/01/2020. (Ref: Section 2.1.1 and 2.1.2 of RU 2020 AR –RE V1.2)

Specific Renewable Energy Activity requirements (refer to Annex A): Hydropower, biomass resources, landfill gas and biogas from agro-processing, wastewater and other residues, Waste Heat/Gas recovery, Fossil co-generation, Waste incineration and gasification, Waste handling and disposal.

Specific Community Service Activity requirements (refer to Annex A): Hydropower, biomass resources, landfill gas and biogas from agro-processing, wastewater and other residues, Waste Heat/Gas recovery, Fossil co-generation, Waste incineration and gasification, Waste handling and disposal, Relighting, End-use fossil switching.

5| Applicability of the methodology/tool version

5.1 |	Does the project apply an eligible GS methodology? Refer to list of the eligible methodologies **here**.	☒ Yes ☐ No
5.2 |	Does the project apply the version of the methodology and applicable tools **applied for CDM/other standard registration or renewal**?	☒ Yes ☐ No
5.3 |	Does the project apply the latest version of the methodology and applicable tools **available at the time of first submission of this form**? If Yes, please provide a full explanation in section B below. And note that the project cannot opt for option 2 mentioned transition approval procedure.	☒ Yes ☐ No

Requirement: (Ref: Annex B of GHG Product Requirements)

Transition project shall
a. conform to the relevant Activity Requirements and Gold Standard Approved Methodologies, including eligible CDM Methodologies.
b. also meet the additional GS4GG methodology eligibility requirements, where applicable. Refer to CDM Methodologies for Gold Standard Eligibility Requirements.

Transition project shall apply the version of GS approved CDM methodology or methodology tool for transition to GS4GG as follows;
a. version applied at the time of registration/renewal of crediting period with other standard, OR
b. version available at the time of first submission (preliminary review) this form.

6| Demonstration of additionality

6.1 |	Are you aware that the transitioning project will be required to demonstrate Ongoing Financial Need as per the relevant GS rules and requirements available at the time of renewal of crediting period? (Refer to para 4.1.51 – 4.1.53 of Principles & Requirements.)	☒ Yes ☐ No

Requirement:

- *The CDM and JI project are not required to carry out additional assessment for demonstration of additionality over and above what has been done for registration/determination with the CDM unless the project falls into a category that is deemed non-additional in an applicable Gold Standard Activity Requirement. In such cases the relevant Activity Requirement shall take precedence.* ***Ref: Annex B GHG Product Requirements.***
- *Transition projects registered with standards other than CDM are required to undergo additionality revalidation to re-establish the validity of the underlying assumptions applied in the demonstration of additionality at the time of registration with the other standard.*
- *The projects seeking combined transition and renewal of crediting period with GS4GG are not required to demonstrate OFN at the time of transition but must demonstrate OFN at the time of Crediting Period renewal after transitioning to GS4GG.*

7| Sustainable Development Assessment

7.1 |	Does the project positively contribute towards **minimum three Sustainable Development Goals (SDGs) -** SDG13 (mandatory) + two other SDGs?	☒ Yes ☐ No
7.2 |	Have you identified the monitoring parameters linked with selected SDGs and corresponding SDG targets? For example – the monitoring parameter Amount of GHGs emissions avoided or sequestered is linked with SDG 13. Climate action, SDG target 13.2 Integrate climate change measures into national policies, strategies and planning.	☒ Yes ☐ No

Fill section B.6. Sustainable Development Goals (SDG) outcomes and B.7 Monitoring plan, below for SDGs monitoring parameters not covered in registered PDD with other standards.

Fill Table 1 – Estimated Sustainable Development Contributions below.

Requirement*:*
The transitioning project shall demonstrate a clear, direct contribution to sustainable development, defined as making demonstrable, positive impacts on at least three Sustainable Development Goals (SDGs), one of which must be SDG 13 (Ref: Section 4.(c) of Principles and Requirements)

Refer to Annex B, GHG Product Requirements for further guidelines for transition projects.

Guidelines:
Selected SDG impacts must not result from a one-off from design/construction/distribution/ start-up or decommissioning of the project.

You may refer to /use the SDG impact Tool (under consultation currently) to identify the relevant monitoring indicator, SDGs and corresponding SDG targets and design monitoring plan for identified indicators.

8| Start date and duration of the crediting period

8.1 |	Has the crediting period of the transitioning project registered with other carbon standard/certification scheme changed and/or extended?	☐ Yes ☒ No
8.2 |	Is the total duration of the crediting period (i.e. including period that had been issued under the host standard) less than/equal to the maximum crediting period allowed under relevant GS4GG activity requirements?	☒ Yes ☐ No

Complete the section C.2.2 Total length of crediting period below.

Requirement:

- *The crediting period of the transitioning project/PoA/CPA registered with other standards or certification schemes cannot be changed/extended.*
- *Maximum crediting period allowed under GS4GG are as*
  CSA – 15 Yrs, RE – 15 Yrs, LUF 30 – 50 Yrs, AGR – 10 Yrs, if not defined in activity requirement or applicable methodology – 10 Yrs.
- *The start date of the GS crediting period shall be same as the start date of the CDM crediting period. (Annex B, GHG Product Requirements)*
- *For a transitioning project, PoA/CPA, the total duration of the crediting period, including the period that has been claimed under the host standard, shall not exceed the maximum crediting period allowed under relevant GS4GG activity requirements.*
  If a given project transitioning to GS4GG, was registered under Standard X with -
  - *fixed crediting period (10 years): The total crediting period (Standard X + GS4GG) must remain 10 years. The project can only claim remaining years of its 10-year crediting period after transitioning to GS4GG.*
  - *renewable crediting period (7*3 year): The total crediting period (Standard X + GS4GG) must be equal to that allowed under relevant GS4GG activity requirements. The project can only claim remaining years of the maximum allowed crediting period after transitioning to GS4GG. For example; the maximum crediting period allowed for renewable energy project is 15 years. A renewable energy project that has already claimed 5 years under Standard X can only claim remaining 10 years of the total 15 years of its allowed crediting period after transitioning to GS4GG*
- *For a transitioning project, the start date of the Gold Standard Crediting Period starts with crediting period start date with other standard or maximum two years before the date of first submission (submission for preliminary review), whichever occurs later. (Ref: Annex B, GHG Product Requirements)*

9| Safeguarding Principles Assessment

9.1 |	Does the project conform to the Gold Standard Safeguarding Principles and Requirements?	☒ Yes ☐ No
9.2 |	Is there any risk and/or likely adverse outcomes of the project?	☐ Yes ☒ No
9.3 |	If answer is yes for Q **Erro! Fonte de referência não encontrada.Erro! Fonte de referência não encontrada.**, can the project achieve requirements with regards to the relevant principle through design, management or risk mitigation?	☐ Yes ☐ No
9.4 |	If answer is yes for Q **Erro! Fonte de referência não encontrada.Erro! Fonte de referência não encontrada.**, have the Mitigation Measures	☐ Yes ☐ No

added to the Monitoring Plan (if required)?	

Complete the Annex 1 and section D. Summary of Safeguarding Principles below.

***Requirement**: The transitioning project shall conform to the Gold Standard Safeguarding Principles and Requirements. (Ref: Section 4.1.19 of GS4GG Principles and Requirements)*

***Guidelines:** The detailed Safeguarding Principles and Requirements checklist is available in Annex 1 of this document.*

10| Stakeholder Consultation Requirements

10.1 | Has the project conducted a Stakeholder Consultation in accordance with the requirements of Gold Standard Stakeholder Consultation & Engagement Requirements? The answer to Q 10.1 is "No", if any of the questions below is answered as "No". The project should take the question(s) into account and address the gap when conducting supplementary stakeholder consultation to comply with GS4GG requirements. Please answer the below question with regards to the stakeholder consultation conducted to comply with CDM/other standard requirements?	☒ Yes ☐ No
10.2 | Did you conduct the stakeholder consultation before the project start date?	☐ Yes ☒ No
10.3 | Did you discuss identified direct positive and negative impacts of the projects with stakeholders?	☒ Yes ☐ No
10.4 | Does the invited stakeholder covers all stakeholder groups (a to g) listed in paragraph 3.1.1. of STAKEHOLDER CONSULTATION AND ENGAGEMENT REQUIREMENTS?	☒ Yes ☐ No
10.5 | Did the invitation methods solicit input from women and marginalised groups?	☒ Yes ☐ No
10.6 | Were the stakeholders invited at least 30 days before the stakeholder meeting?	☒ Yes ☐ No
10.7 | Did a local language version of the non-technical summary with information required as per paragraph 5.1.1. of STAKEHOLDER CONSULTATION AND ENGAGEMENT REQUIREMENTS, shared with stakeholders?	☒ Yes ☐ No
10.8 | Was a physical meeting conducted?	☒ Yes ☐ No
10.9 | Was a gender lens applied to assessing comments? (for example, if only men provided comments on household device project, was this taken into consideration when assessing the relevance of the comment?)	☒ Yes ☐ No
10.10 | Were any serious, reasonable and proportional concerns raised and taken into account and satisfactorily addressed?	☒ Yes ☐ No
10.11 | Were any points that warrant 'Mitigation measures' marked as such and monitoring plan has been designed and included in the PDD?	☒ Yes ☐ No
10.12 | Is the mandatory Continuous Input / Grievance Expression Process	☒ Yes

	Book's location clearly stated (and therefore usable)?	☐ No
10.13	Does PDD include a summary report of the comments received from local stakeholders?	☒ Yes ☐ No

Complete the section E. Summary of Local Stakeholder Consultation below.

Requirement: *Ref: Section 4.1.25 of GS Principles and Requirements.*

Guidelines: *Project that conducted a stakeholder consultation meeting to comply with CDM/other standard requirements, should conduct, at minimum,*

- *one round of consultation for identified gaps i.e., gaps due to differences in stakeholder consultation requirements of GS4GG and CDM/other standard. For instance, if original consultations only involve one physical meeting, CME/PD should conduct a stakeholder feedback round covering all the identified gaps. The additional stakeholder consultations may involve a physical meeting or stakeholder feedback round, as necessary.*

If COVID interim measures are applicable (currently till 30/06/2021), the physical meeting and stakeholder feedback round may be postponed, and a draft SCR shall be mandatorily submitted to cover the consultation activities carried out till date.

KEY PROJECT INFORMATION

GS ID of Project	GS12670
Title of Project	Macaúbas Landfill Gas Project
Time of First Submission Date	13/03/2024
Date of Design Certification	N/A
Version number of the PDD	1.1
Completion date of version	02/05/2024
Project Developer	Vital Engenharia Ambiental S.A.
Project Representative	Neiber Rodrigues da Silva
Project Participants and any communities involved	Vital Engenharia Ambiental S.A.
Host Country (ies)	Brazil
Activity Requirements applied	☐ Community Services Activities ☒ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Scale of the project activity	☐ Micro scale ☐ Small Scale ☒ Large Scale
Other Requirements applied	-
Methodology (ies) applied and version number	ACM0001: "Flaring or use of landfill gas" (version 19.0)
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☒ Renewable Energy Label ☐ N/A
Project Cycle:	☐ Regular ☒ Retroactive

Table 2 – Estimated Sustainable Development Contributions

Sustainable Development Goals Targeted	SDG Impact (defined in B.6.)	Estimated Annual Average	Units or Products
13 - Climate Action (mandatory)	Amount of GHGs emissions avoided or sequestered	509,733	tCO_2e per year
7 - Affordable and Clean Energy	Total electricity produced: Renewable	78,698	MWh of renewable energy per year
8 - Decent work and Economic Growth	Total number of jobs	10	Jobs
4 – Quality education	Total number of people provided skill development training	19	Persons trained per year

SECTION A. DESCRIPTION OF PROJECT

A.1 Purpose and general description of project

>>

The proposed project activity has the objective to capture, flare and generate electricity through the use of landfill gas (LFG)[2] produced in anaerobic conditions into the landfill called "Central de Tratamento de Resíduos Macaúbas" (hereinafter referred to as CTR Macaúbas) located in the municipality of Sabará in the state of Minas Gerais, Brazil.

The project activity will result in greenhouse gas (GHG) emission reduction from the CTR Macaúbas through two ways:

- Burning CH_4 in flares and/or group generators;
- The amount of electricity generated in the project activity will be dispatched to the Brazilian national grid, avoiding the dispatch of an equal amount of energy produced by fossil-fuelled thermal plants to that grid. The initiative avoids CO_2 emissions and contributes to the regional and national sustainable development.

Prior to the implementation of the project activity the scenario for LFG destruction is the partial release to atmosphere through the exiting LFG passive capture system and partial LFG combustion in open flares. Regarding the electricity generation, the baseline scenario is the generation in existing and/or new grid-connected power plants.

The baseline scenario is the scenario existing prior to the implementation of the project activity.

The estimate of:

- Annual average is 509,733tCO_2e;

[2] The gas is generated by the decomposition of waste in a solid waste disposal sites (SWDS). LFG is mainly composed of methane, carbon dioxide and small fractions of ammonia and hydrogen sulphide.

- Total GHG emission reduction is 2,548,663 tCO_2e.

The project activity will be to capture and to flare the LFG and to generate electricity through the implementation of a power generation plant using LFG. The installed generation capacity will be expected to change during the lifetime of the project, totalizing at the end 9.982 MW.

The project will be to construct an efficient capture, collection and flaring system to burn CH_4 (a greenhouse gas), and this will reduce odours and adverse environmental impacts. Moreover, it will install generators that will combust the LFG to produce electricity, using part of the electricity for self-consumption and the other part will be exported to the grid. The flares will be kept in operation due to LFG excess, periods when electricity will not be produced or other operational considerations. The LFG power plant will be expected to install approximately 9.982 MW upon project completion.

The LFG capture and collection systems and flaring station will consist on a LFG pipeline grid and a flaring station, equipped with flares, centrifugal blowers, and all other supporting mechanical and electrical subsystems and appurtenances necessary to run the system. The power generation facility will be comprised of LFG engine generator sets of high-performance standards. The engine generator sets will be the primary equipment to combust the collected LFG once they are installed. A fraction of the collected LFG will be diverted to flares, which will be used to combust any gas in excess of the fuel demand for the engines, as well as a contingency backup.

In order to guarantee an efficient LFG capture and maximum quality, compaction and sanitary coverage of waste are carried out daily as well as connection of vertical drains. When operationally feasible, LFG is captured from the drains near to the waste discharge front and the quality of LFG flow is monitored. Also, continuous adjustments are carried out for the collection drains and the field is monitoring by specialized consultants.

The landfill began its operation in November 2005, receiving solid waste (type Class II-A Inert and Class II-B Non-inert)[3], according to License of Operation nº 145, dated of 30/05/2011 valid up to 30/05/2017. The License Operation was issued by COPAM (environmental agency of Minas Gerais State) and all requirements established by COPAM were fulfilling, including technical report and environmental constraints. Since the landfill has already initiated its operational licensing renewal process, a declaration nº 0035998/2019 issued by Environmental and Sustainable Development Secretary from Minas Gerais Government State on 22/01/2019, states that License of Operation nº 145 validity is postponed until the moment the operational license renewal.

For the electricity generation plant, a simplified environmental license was issued by SEMAD (environmental and sustainable development secretary of Minas Gerais State) on 14/10/2019[4] and valid until 14/10/2029.

CTR Macaúbas also counts on a code of ethics an implemented compliance system and policies.

Contribution of the Project Activity to Sustainable Development:

The project will make a strong contribution to sustainable development in Brazil. In addition to reducing emissions of GHGs and generating clean electricity, the Project will provide other sustainable development benefits as follows:

a) Contribution to the environment:

Electrical generation in the project will displace electricity generated by fossil fuel-fired power plants.

[3] According to definition of the Brazilian Association of Technical Norms (ABNT NBR 10004) http://www.aslaa.com.br/legislacoes/NBR%20n%2010004-2004.pdf

[4] Source SEMAD : http://sistemas.meioambiente.mg.gov.br/licenciamento/uploads/FNSahoUQUXQhJCvcL0T1A4kkR4RMx_WP9.pdf

b) Contribution to the improvement of working conditions and employment creation:

During the operational phase, which will take place 24 hours/day, 7 days/week, there will be new jobs created locally for duties related to construction, operations and maintenance, landscaping, plumbing, monitoring and security personnel. These people will be fully trained by CTR Macaúbas on their duties and tasks. Local manpower will be used in the project implementation, which entails installation of vertical wells, horizontal collection system and assembly and operation of equipment such as blowers, flares, and group-generators.

c) Contribution to income generation:

In addition to the local jobs created during its implementation and operation, the project will pay taxes

A.1.1. Eligibility of the project under Gold Standard

As per applicable GS rules and definitions, the GS project activity which encompasses flaring of LFG and utilization/generation of electricity from renewable energy source (LFG generated from decomposition of MSW disposed at the CTR Macaúbas landfill) represents a pre-identified "GHG Emissions Reduction & Sequestration" and "Renewable energy" project type and it meets the eligibility criteria of the GS4GG "Principles and requirements".

The GS project activity is not registered under any other voluntary or compliance schemes other than its registry as a CDM project activity.

While being hosted in Brazil, the GS project activity is not located in a host country, region, locality or state that has an emission reduction cap enforced or has the possibility to trade emissions that include the scope of the proposed project. There is no regional or national GHG emission reduction cap enforced in Brazil. Furthermore, there is no domestic regional or national GHG emission trading scheme implemented in Brazil either.

While the GS project activity represents the only project-based initiative implemented in the municipality of Sabará, within the State of Minas Gerais, that promotes GHG emission reductions due to destruction/utilization of landfill gas (there are no other Gold Standard or other voluntary or compliance standard program of a similar nature implemented or planned to be implemented nearby the GS project activity), there are no potential for double counting of impacts.

The following requirement of the "GS4GG Renewable Energy Activity Requirements" is also applicable to the GS project activity:

> "*Methane recovery project activities shall be eligible for emission reductions from both methane avoidance (including from the flared biogas fraction) and non-renewable fuel substitution as long as evidence is provided on time for validation to demonstrate that the system was designed in a way to at least make use of some of the biogas recovered for the delivery of energy services (e.g., electricity, heat)*."

Since as per the project design, collected LFG is to be primarily used as gaseous fuel for electricity generation, such requirement is thus fully met. Additionally, as further demonstrated in Section B.4, the GS project activity is regarded as under full compliance with applicable Host Country's legal, environmental, ecological and social regulations.

A.1.2. Legal ownership of products generated by the project and legal rights to alter use of resources required to service the project

>>

While being the registered owner of all project-related infrastructure of the GS project activity and while having been granted with all applicable permits and authorizations for the operation of both the GS project activity and the CTR Macaúbas landfill, the project developer Vital Engenharia Ambiental S.A. has full and uncontested legal ownership of all products that are generated under Gold Standard Certification.

A.2 Location of project

>>

Host Party:

Brazil

Region/State/Province:

Minas Gerais

City/Town/Community:

Sabará

Physical/Geographical location:

CTR Macaúbas is located at Rodovia MG-05, Km 8, 1-Parte, Sabará (city), Minas Gerais (State), Brazil.

Geo-coordinates: Latitude: 19° 51′ 23″ S and Longitude: 43° 50′ 40″ W

Decimal coordinates: Latitude: -19.856389° Longitude: -43.844444°

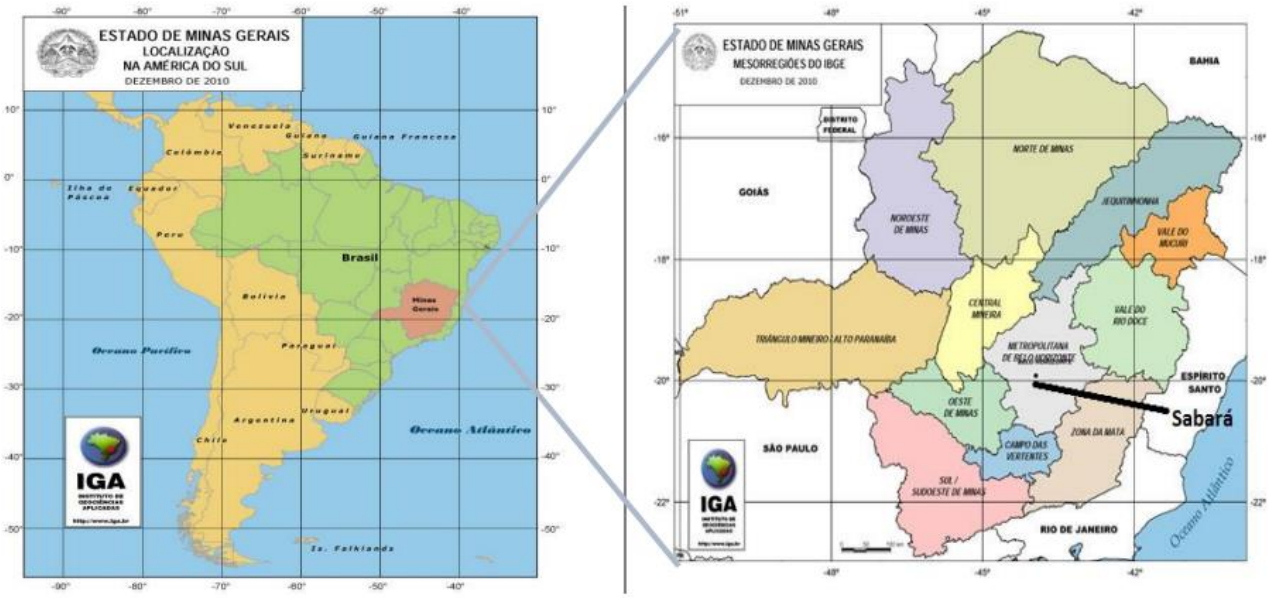

Figure 1 - Geographical position of Sabará city, inside of Minas Gerais State in Brazil (Source: Minas Gerais State website)

Figure 2 – CTR Macaúbas Landfill (Source: CTR Macaúbas)

A.3 Technologies and/or measures

>>

The landfill is operated under anaerobic conditions adopting the following conditions:

- Landfill surface every day covered;
- Mechanical compacting;
- Leveling of the waste.

In the proposed project activity, the used technology will be the improvement of biogas collection and flare produced in the landfill, through the installation of an active recovery system composed for:

- Collection system;
- Biogas transport pipe system;
- Gas suction and flare system (located in the Biogas Station).
- A power generation plant will also be installed.

<u>Collection system</u>

The biogas collection infrastructure of landfill is based in vertical drains. Those elements will be connected to a collection pipe that will accomplish the transport of gas to control stations (manifolds), used to control the drains loss of load.

Figure 3 – Collection system (manifolds)

(Source: CTR Macaúbas)

CTR Macaúbas intends to install and improve drains directly in the landfill. A covering layer will be installed around the drains to avoid the exhaust gases.

The top of the existing and new vertical drains will be equipped with headstocks. This element is important because it makes the connection between the drain and pipe collection. The headstocks are made of HDPE or similar ø 200 mm to 1 m in length. In the body of the head, a derivation of HDPE or similar ø 50 to 200 mm will be installed and attached to a butterfly valve which is connected to a hose ø 70 mm to 300 mm of HDPE or similar, which is finally connected to the tubing of collection.

Figure 4 - Example of collection system (well head)

(Source: CTR Macaúbas)

The collection pipe will be built using HDPE or similar. The sizing of the piping was done considering the maximum production of landfill gas that can reach. Activities will be intense welding tubing to connect each station of the adjustment. The pipe will be covered with materials that do not pose any possibility of damage to the material.

Removers of condensate will be provided to drain humidity from the LFG. These removers are constructed at points of lower elevation of the tubing and collection stations, located before the adjustment. The condensate removed will be returned to the landfill, through pumps installed at the base of the removers.

All drains will be connected to the adjustment of station located around the landfill, through the collection pipes. The basic functions of the stations will promote the systematic control and monitoring of the characteristics of biogas extracted. Each station will have an adjustment of additional condensate remover, valves and regulating valves-drawer.

Transport System

The transmission pipeline is the last step of the collecting system. It transports the collected LFG to the flare. The transmission pipeline might be connected to all gas regulation stations around the landfill.

Figure 5 - Transport system (Source: CTR Macaúbas)

Blower System

The blower system is responsible to give negative pressure to the landfill, blowing the gas to the pipeline. The dimensioning of the blowers will depend on flow of the landfill gas which may range between 4,000 to 7,000 Nm^3/h per each blower and the installed capacity around 75 kW for each equipment.

In order to preserve the operation of the blowers, a dewatering system is installed to remove the condensate. This equipment is a single knock-out dewatering component.

Figure 6 - Example of blower system (Source: CTR Macaúbas)

Flare System

The destruction of the methane content in the LFG collected will be made via enclosed flares, in order to assure higher methane destruction (enclosed flare).

The flare operational flow may range between 2,000 to 10,000 Nm^3/h depending on the manufacturer and design that will be chosen in the purchasing moment. The standard combustion temperature is around 850º C.

Basically, the flare is constructed using refractory material, a gas inlet, dampers to control the air inlet, an ignition spark, flame viewer and points to sample collection, as presented in the pictures below:

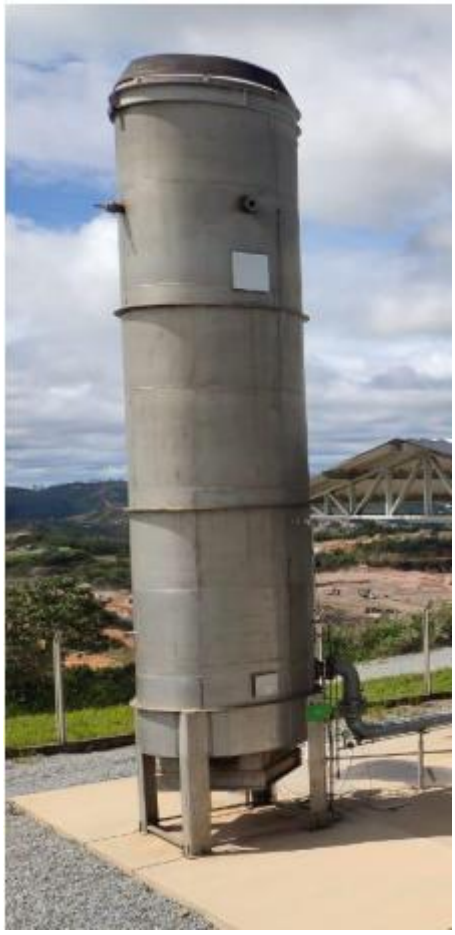

Figure 7 - Detail of flare system (enclosed flare)

(Source: CTR Macaúbas)

Biogas Station

The collection of gas within the landfill will be made by applying a pressure differential in each drain. The depressurization system shall be composed of a group of centrifugal multi-stage blowers, connected in parallel with the central collector. The depressurization of the system will depend on the pressure of operation of flares. In addition, the biogas station will have the following:

- Safety valve on/off;
- Remover of condensate;
- Gas analyzer;
- Meter flow.

Figure 8 - Example of a flare system (Source: CTR Macaúbas)

The biogas station will have, even a system of destruction of methane through flares. This system will be composed initially by 1 enclosure flare and can get others units, according to the generation of gas. The flare is constructed in a vertical cylindrical combustion chamber, where the biogas is flared at a constant temperature, controlled by the admission of air, and with a minimum residence time.

Power generation

The power generation system will be comprised of around 9.982 MW. The electricity generated by the project will be supplied to the grid.

This kind of technology is still not widely applied in Brazil. The publication named "Reducing the uncertainty of methane recovered (R) in greenhouse gas inventories from

waste sector and of adjustment factor (AF) in landfill gas projects under the Clean Development Mechanism[5] ” states that:

> “…all of Brazilian landfills with collection and destruction system (active system) are implemented projects under the CDM…”.

Additionally, the PP carried out a survey in order to verify the existence of any landfill with LFG collection and destruction active system not register as a CDM Project. The result of this survey concludes that there is no similar project activities developed without CDM benefits.

Very few landfills have already installed equipment for flaring and combustion LFG. Therefore, the company will need engineers and other specialists with experience in this area to advice the company while implementing the project. These professionals will also train local operators and engineers on operations and maintenance of the facilities.

The installed capacity by generator group may vary between 1.426 to 1.5 MW. This range has been considered based on technical specifications of main manufacturers in the market. The project activity considered 1.426 MW the installed capacity per generator group, considering the 7 generator groups installed within the project activity.

[5] Source: MAGALHÃES, G.HC.; ALVES, J.W.S.; SANTO FILHO. F.; COSTA, R.M.; KELSON. M. Reducing the uncertainty of methane recovered (R) in greenhouse gas inventories from waste sector and of adjustment factor (AF) in landfill gas projects under the clean development mechanism (2010). Page 174. (http://ghg.org.ua/fileadmin/user_upload/book/Proceedengs_UncWork.pdf), accessed on 25/06/2012.

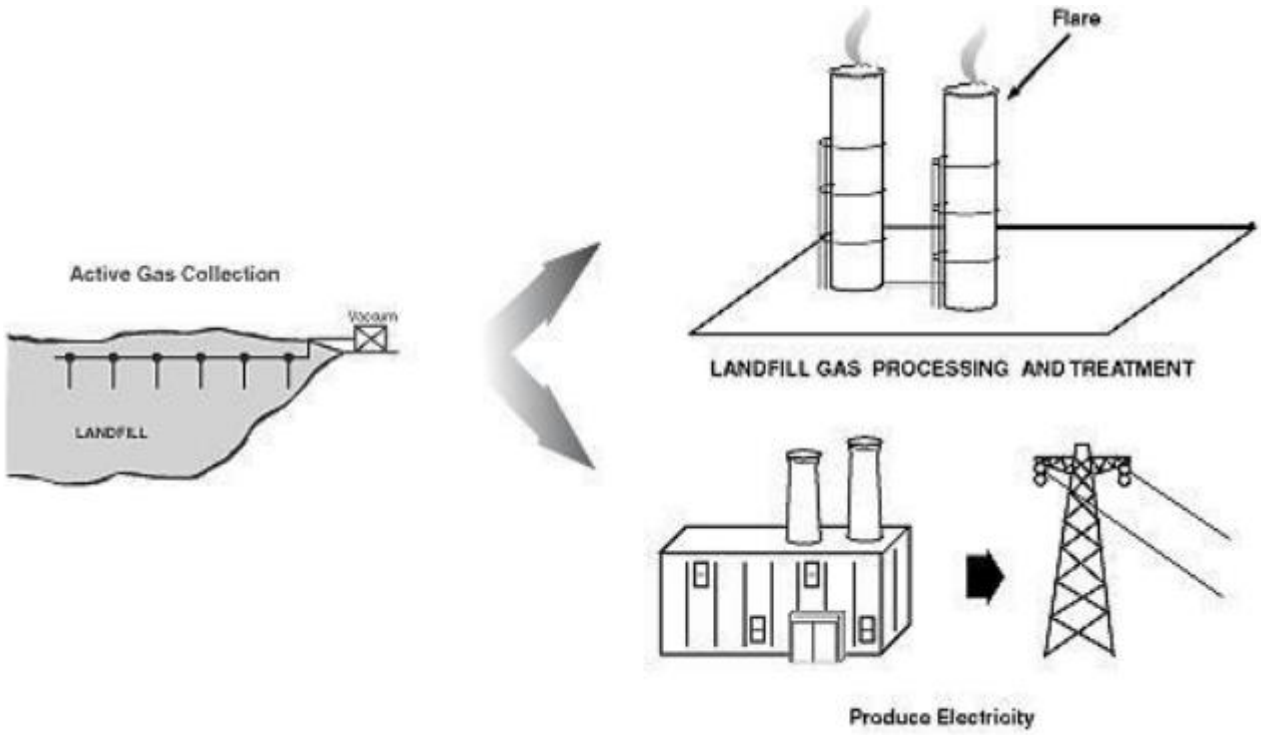

Figure 9 – Power generation diagram

The estimated number of group generators and the expected output is shown on the table below:

Year	Number of engines installed (unit)	Installed capacity (MW)*	Net electricity generated in the plant (MWh)
2020	7	9.982	32,898
2021	7	9.982	78,698
2022	7	9.982	78,698
2023	7	9.982	78,698
2024	7	9.982	78,698
2025	7	9.982	78,698

*The installed capacity for each group generator is 1.426MW.

The lifetime of the equipment is 25 years and it was based on "Tool to determine the remaining lifetime of equipment – Option (c) Default Values" (Electric Generators, air cooled)[6]. The equipment that will be installed in the project site will be all new.

The only equipment in operation under the existing scenario prior to the implementation of the project activity are the vertical drains which venting the LFG through passive LFG capture system. For active capture system, these exiting vertical drains will be improved to increase the LFG capture efficiency, according to described above.

The baseline scenario is the same scenario of the scenario exiting prior to the implementation of the project activity.

The load factor is 90% based on manufacturer's specification[7].

Technology will have to come from the Europe and USA. Hence, technology transfer will occur from countries with strict environmental legislative requirements and environmentally sound technologies.

The technology for biogas collection, flaring and power generation can be considered state of art in the Brazilian sanitation context, because all equipment involved has the highest level of development, and the technology used to combust LFG to produce electricity is not a usual business practice in Brazil, as demonstrated in Section B.5.

The monitoring equipment and their location in the systems along with the balance of the system are presented below:

[6] The lifetime of the equipment is also supported by the International Energy Agency (IEA) World energy model – Methodology and assumptions, page 13.

[7] The document was made available to DOE in validation visit.

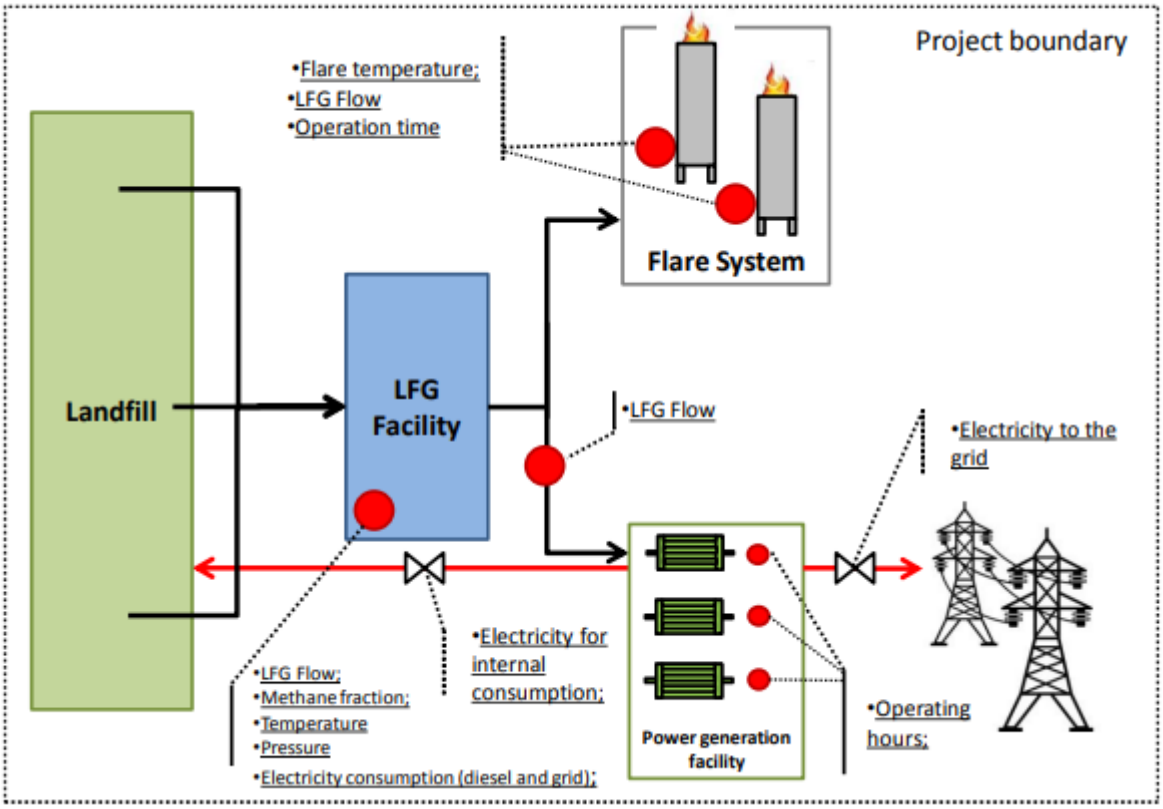

Figure 10 - Technologies and measures of the project activity

A.4 Scale of the project

>>

Large scale, using the large-scale Consolidated Methodology ACM0001: "Flaring or use of landfill gas" (Version 19.0).

A.5 Funding sources of project

>>

There is no public funding involved in the Project Activity.

SECTION B. APPLICATION OF APPROVED GOLD STANDARD METHODOLOGY (IES) AND/OR DEMONSTRATION OF SDG CONTRIBUTIONS

B.1. Reference of approved methodology (ies)

>>

- Large-scale Consolidated Methodology ACM0001: "Flaring or use of landfill gas" (Version 19.0)[8];
- TOOL02 Methodological tool: "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 07.0)[9];
- TOOL03 Methodological tool: "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 03.0)[10];
- TOOL04 Methodological tool: "Emissions from solid waste disposal sites" (Version 08.0)[11];
- TOOL05 Methodological tool: "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0)[12];
- TOOL06 Methodological tool: "Project emissions from flaring" (Version 03.0)[13];
- TOOL07 Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0)[14];
- TOOL08 Methodological tool: "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 03.0)[15];
- TOOL09 Methodological tool: "Determining the baseline efficiency of thermal or electric energy generation systems" (Version 02.0)[16];
- TOOL10 Methodological Tool: "Tool to determine the remaining lifetime of equipment" (Version 01)[17];
- TOOL11 Methodological Tool: "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (Version 03.0.1)[18];
- TOOL12 Methodological tool: "Project and leakage emissions from transportation of freight" (Version 01.1.0)[19];

[8] https://cdm.unfccc.int/methodologies/DB/JPYB4DYQUXQPZLBDVPHA87479EMY9M
[9] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v7.0.pdf
[10] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf
[11] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf
[12] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf
[13] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v3.0.pdf
[14] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf
[15] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v3.0.pdf
[16] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-09-v2.0.pdf
[17] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf
[18] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf
[19] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf

- TOOL32 Methodological tool: "Positive lists of technologies" (Version 02.0)[20]

B.2. Applicability of methodology (ies)

>>

The methodology ACM0001 is applicable for project activities that comprise one of the following scenarios:

- The captured gas is flared; and/or
- The captured gas is used to produce energy and/or use to supply consumers (e.g. electricity/thermal energy);

<u>The methodology ACM0001: "Flaring or use of landfill gas" is applicable to project activities which:</u>

"...

(a) Install a new LFG capture system in an existing or new (Greenfield) SWDS where no LFG capture system was or would have been installed prior to the implementation of the project activity; or

(b) Make an investment into an existing LFG capture system to increase the recovery rate or change the use of the captured LFG, provided that:

(i) The captured LFG was vented or flared and not used prior to the implementation of the project activity; and

(ii) In the case of an existing active LFG capture system for which the amount of LFG cannot be collected separately from the project system after the implementation of the project activity and its efficiency is not impacted on by the project system: historical data on the amount of LFG capture and flared is available;

[20] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-32-v2.0.pdf

(c) Flare the LFG and/or use the captured LFG in any (combination) of the following ways:

(i) Generating electricity;

(ii) Generating heat in a boiler, air heater or kiln (brick firing only) or glass melting furnace;[21] and/or

(iii) Supplying the LFG to consumers through a natural gas distribution network;

(iv) Supplying compressed/liquefied LFG to consumers using trucks;[22]

(v) Supplying the LFG to consumers through a dedicated pipeline;

(d) Do not reduce the amount of organic waste that would be recycled in the absence of the project activity.

Justification: - Part 1

The methodology **is applicable** because it will be made an investment into an existing LFG capture system to increase the recovery rate (collection efficiency) and change the use of the captured LFG (also electricity generation). The captured LFG was only vented and partially flared in open flares and not used prior to the implementation of the project activity.

In the project activity, the LFG will be flared and will generate electricity.

Moreover, the amount of organic waste will be the same in the project activity as well as in the absence of the project activity. A declaration letter issued by the PP has been made available to the DOE.

"...

[21] For claiming emission reductions for other heat generation equipment (including other products in kilns), project participants may submit a revision to this methodology.
[22] In case other means of transportation are used a revision to this methodology may be requested.

The methodology is only applicable if the application of the procedure to identify the baseline scenario confirms that the most plausible baseline scenario is:

- *(a) Atmospheric release of the LFG or capture of LFG and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons; and*
- *(b) In the case that the LFG is used in the project activity for generating electricity and/or generating heat in a boiler, air heater, glass melting furnace or kiln:*
  - *(i) For electricity generation: that electricity would be generated in the grid or in captive fossil fuel fired power plants; and/or*
  - *(ii) For heat generation: that heat would be generated using fossil fuels in equipment located within the project boundary;*
- *(c) In the case of LFG supplied to the end-user(s) through natural gas distribution network, trucks or the dedicated pipeline, the baseline scenario is assumed to be displacement of natural gas.*
- *(d) In the case of LFG from a Greenfield SWDS, the identified baseline scenario is atmospheric release of the LFG or capture of LFG in a managed SWDS and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons.*

This methodology is not applicable:

- *(a) In combination with other approved methodologies. For instance, ACM0001 cannot be used to claim emission reductions for the displacement of fossil fuels in a kiln or glass melting furnace, where the purpose of the CDM project activity is to implement energy efficiency measures at a kiln or glass melting furnace;*
- *(b) If the management of the SWDS in the project activity is deliberately changed during the crediting in order to increase*

methane generation compared to the situation prior to the implementation of the project activity.

…"

Justification: - Part 2

According to Section B.4 and B.5, the methodology is applicable because:

- The most plausible baseline scenario is released the LFG to atmosphere from the SWDS, and;
- The electricity would be generated in the grid.

Moreover, there is neither a combination with other approved methodologies nor change in management of the landfill due to the project activity (e.g. addition of liquids, pre-treating waste or changing the shape of the landfill to increase the Methane Correction Factor).

The tool "Emissions from solid waste disposal sites" is **applicable** to the project activity because the CDM project activity mitigates methane emissions from a specific existing SWDS (Application A).

The tool to calculate "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" is **applicable** to the project activity following one out of the three scenarios below applied to the sources of electricity consumption:

- Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer;
- Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or
- Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity

to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid.

As for the monitoring of the amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated:

a) Scenario I: Electricity is supplied to the grid;
b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or
c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.

Justification:
The tool is applicable according to Scenario A and Scenario B stated above since the project activity includes electricity consumption from the grid when electricity generated by the LFG power plant is not operational.

Also, Scenario I is applicable since the project activity includes electricity generation to the grid.

The tool "Project emissions from flaring" is **applicable** to the project activity since the project activity uses enclosed and/or open flares and project participant documents the same in the PDD including the type of flare used in the project activity. Tool is applicable to the flaring of flammable greenhouse gases where:

- Methane is the component with the highest concentration in the flammable residual gas; and
- The source of the residual gas is coal mine methane or a gas from a biogenic source (e.g. biogas, landfill gas or wastewater treatment gas).
- The flares used in the project site operate according to the specifications provided by the manufacturer.

Justification:

Since methane is the component with the highest concentration in the flammable residual gas from waste anaerobic degradation generating LFG and flares used in the project site operate according to the specifications provided by the manufacturer, the tool is available

The "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is **applicable** to the project activity because the applicable methodology (ACM0001) demands measuring flow and composition of residual and exhaust gases for the determination of baseline and project emissions.

The "Tool to determining the baseline efficiency of thermal or electric energy generation systems" is **not applicable** to the project activity since there is no thermal or electric energy generation in the baseline scenario. Also, the project activity does not involve the improvement of the energy efficiency through retrofits or replacement of the existing system by a new system.

The "Tool to determine the remaining lifetime of equipment" is **not applicable** since the project activity do not involve the replacement of existing equipment with new equipment or retrofit of existing equipment as part of energy efficiency improvement activities. LFG use equipment was not in operation prior to the implementation of the project activity.

The "Project and leakage emissions from transportation of freight" is **not applicable** since the project activity do not involve the transportation of freight.

The "Tool to calculate the emission factor for an electricity system" is **applicable** since the project activity demands electricity that is provided by the grid. This tool is also referred to in the "Tool to calculate project and/or leakage emissions from electricity consumption and monitoring of electricity generation" for the purpose of calculating project and leakage emissions in case where a project activity consumes electricity from the grid or results in increase of consumption of electricity from the grid outside the project boundary.

The methodological tool "Determining the baseline efficiency of thermal or electric energy generation systems" is **not applicable** to the project activity since there is no

thermal or electric energy generation in the baseline scenario. Also, the project activity does not involve the improvement of the energy efficiency through retrofits or replacement of the existing system by a new system.

The methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" is **not applicable** since demonstration of additionality is not applicable/required for the registered CDM project activity. Simplified procedure to identify the baseline scenario and demonstrate additionality of ACM0001 has been used.

The methodological tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" is **not applicable** due to the absence of fossil fuel consumption by the project activity.

The "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" is **applicable** to the project activity since it is required to assess the continued validity of the baseline at the renewal of a crediting period.

The "Positive lists of technologies" is **applicable** since the project activity encompasses an electricity generation facility with a nameplate capacity inferior to 10 MW as well as the flaring of the LFG generated at the landfill.

B.3. Project boundary

>> Leave this section blank if there is no change in registered PDD.

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Source 1	CO_2		
		CH_4		
		N_2O		
		…		
	Source 2	CO_2		
		CH_4		
		N_2O		
		…		
	…	…		
		…		

		…
Project scenario	Source 1	CO_2
		CH_4
		N_2O
		…
	Source 2	CO_2
		CH_4
		N_2O
		…
	…	…
		…
		…

B.4. Establishment and description of baseline scenario

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The methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period", has been used to assess the continued validity of the baseline considering the renewal of the crediting period.

The stepwise procedure of the "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period are as follows:

Step 1: Assess the validity of the current baseline for the next crediting period

In order to assess the continued validity of the baseline, changes in the relevant national and/or sectorial regulations between the crediting periods have to be examined at the renewal of the crediting period. If at the start of the project activity, the project activity was not mandated by regulations, but at the time of renewal of the crediting period regulations are in place that enforce the practice or norms or technologies that are used by the project activity, the new regulation (formulated after the registration of the project activity) has to be examined to determine if it applies to existing project or not.

The baseline scenario does not have to be updated for the second crediting period as no new regulations requiring capture and combustion or use of LFG are in place.

The "Procedures for the renewal of the crediting period of a registered CDM project activity" approved by the CDM Executive Board require assessing the impact of new relevant national and/or sectorial policies and circumstances on the baseline.

Prior to the implementation of the project activity the landfill gas was released to atmosphere and electricity was generated in existing and/or new grid-connected power plants, other than the project activity power plant.

Thus the baseline remains the same as defined in the 1st crediting period and required regulations.

The validity of the current baseline is assessed using the following Sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectorial policies

At the start of the project activity in 2004, the Brazilian legislation did not require landfills to capture and/or flare and/or use the LFG. After the registration of the project activity in 29/09/2011, the project participant, in order to assess if the current baseline complies with all relevant mandatory national and/or sectorial policies which have come into effect after the submission of the project activity for validation, has verified that the current baseline complies with all applicable laws and regulations.

Brazil's New National Solid Waste Policy (NSWP),[23] ratified by the President on 02/08/2010 after 19 years under discussion. The NSWP does not request the LFG capture and/or flare and there is not forecast to approve any regulation or policy in the

[23] http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/l12305.htm

next years with this requirement. The laws and regulations applicable for the electricity generation component are law 8987/95 and law 9074/95[24].

By analysing the LFG electricity generation plant operational license N° 1231079/2016, issued in 26/10/2016 and valid up to 26/10/2020 it is possible to notice that LFG use is permitted by legislation. Also, there is an authorization issued by the National Electricity Agency (ANEEL) permitting the electricity generation at the landfill.

Since in the baseline scenario the collection system was not implemented, there was no electricity consumption from the grid or fossil fuel sources.

Step 1.2: Assess the impact of circumstances

There is no impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

This sub-step is not applicable since the baseline scenario of the project activity is the business as usual (BAU) scenario (passive venting system).
Also, in the baseline scenario, electricity is being generated in existing and/or new grid-connected power plants, other than the project activity power plant.

Step 1.4: Assessment of the validity of the data and parameters

According to the "Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period", where any data and parameter

[24] http://www.aneel.gov.br/area.cfm?idArea=43

used and not monitored during the crediting period are not valid anymore they should be updated following the Step 2 as follows:

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The baseline emissions for the second crediting period have been updated, without reassessing the baseline scenario, based on the latest approved version of the methodology ACM0001. This update was applied in the context of the sectorial policies and circumstances that are applicable at the time of requesting for renewal of the crediting period, which has not changed as to affect the project.

Step 2.2: Update the data and parameters

All parameters regarding the grid emission factor calculation have been updated for the 2nd crediting period ($EF_{grid,OM,y}$ is ex post monitored, $EF_{grid,BM,y}$ is ex-ante monitored and thus $EF_{grid,CM,y}$ is ex post monitored). Another parameter has been updated for the current crediting period under the GS , as follows:

- GWP_{CH4} – Global warming potential of CH_4 is selected as 28 tCO_2e/tCH_4.

Realistic and credible alternatives to the project activity that can be part of the baseline scenario are defined through the following sub-steps:

The baseline scenario for the project activity is identified using step 1 of the 'Combined tool to identify the baseline scenario and demonstrate additionality", as agreed in ACM0001 "Flaring or use of landfill gas".

B.5. Demonstration of additionality

Specify the methodology, activity requirement or product requirement that establishes deemed additionality for the	It is crucial to consider that the simplified procedure to identify the baseline scenario and demonstrate additionality of ACM0001

proposed project (including the version number and the specific paragraph, if applicable).	remains being considered for the crediting period for the project activity. According to TOOL32 Methodological tool: "Positive lists of technologies", the additionality of the project activities and PoAs is demonstrated as follows: "The project activities and PoAs at new or existing landfills (greenfield or brownfield) are deemed automatically additional, if it is demonstrated that prior to the implementation of the project activities and PoAs the landfill gas (LFG) was only vented and/or flared (in the case of brownfield projects) or would have been only vented and/or flared (in the case of greenfield projects) but not utilized for energy generation, and that under the project activities and PoAs any of the following conditions are met: (a) The LFG is used to generate electricity in one or several power plants with a total nameplate capacity that equals or is below 10 MW; (b) The LFG is used to generate heat for internal or external consumption; (c) The LFG is flared."
Describe how the proposed project meets the criteria for deemed additionality.	Taking into account simplified procedure to identify the baseline scenario and demonstrate additionality of ACM0001, the project activity is thus automatically/directly assumed as additional since types a) and c) mentioned above applies for this project activity.

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B.5.1 Prior Consideration

>>

Not applicable.

B.5.2 Ongoing Financial Need

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Not necessary under the GS4GG requirements on CDM transitioning projects that do not require the demonstration of financial additionality, as per the document "Guide to completing the PDD",

"(..)

> *This information need only be included at Design Certification Renewal and only for those projects that are required to demonstrate financial additionality."*

B.6. Sustainable Development Goals (SDG) outcomes

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Relevant Target/Indicator for each of the three SDGs

Sustainable Development Goals Targeted	Most relevant SDG Target	SDG Impact Indicator (Proposed or SDG Indicator)
13 Climate Action (mandatory)		

B.6.1 Explanation of methodological choices/approaches for estimating the SDG Impact

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The baseline emission was calculated according to the following formula:

$$BE_y = BE_{CH4,y} + BE_{EC,y} + BE_{HG,y} + BE_{NG,y}$$

Where:

BE_y = Baseline emissions in year *y* (t CO_2e/yr)

$BE_{CH4,y}$ = Baseline emissions of methane from the SWDS in year *y* (tCO_2/yr)

$BE_{EC,y}$ = Baseline emissions associated with electricity generation in year y (t CO_2/yr)

$BE_{HG,y}$ = Baseline emissions associated with heat generation in year y (tCO_2/yr)

$BE_{NG,y}$ = Baseline emissions associated with natural gas use in year y (t CO_2/yr)

As the project flares LFG and generate electricity, the $BE_{HG,y}$= 0 and $BE_{NG,y}$ = 0.

Therefore, $BE_y = BE_{CH4,y} + BE_{EC,y}$

Step (A): Baseline emissions of methane from the SWDS ($BE_{CH4,y}$)

$$BE_{CH4} = \left(\left(1 - OX_{top_layer}\right) \times F_{CH4,PJ,y} - F_{CH,BL,y}\right) \times GWP_{CH4}$$

Where:

$BE_{CH4,y}$ = Baseline emissions of methane from the SWDS in year *y* (tCO_2e/yr)

OX_{top_layer} = Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline (dimensionless)

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (t CH_4/yr)

$F_{CH4,BL,y}$ = Amount of methane in the LFG that would be flared in the baseline in year *y* (t CH_4/yr)

GWP_{CH4} = Global warming potential of CH_4 (t CO_2e/t CH_4)

Step A.1: Ex-post determination of $F_{CH4,PJ,y}$

During the crediting period, the $F_{CH4,PJ,y}$ will be determined as follows:

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,HG,y} + F_{CH4,NG,y}$$

Where:

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (tCH_4/yr)

$F_{CH4,flared,y}$ = Amount of methane in the LFG which is destroyed by flaring in year *y* (t CH_4/yr)

$F_{CH4,EL,y}$ = Amount of methane in the LFG which is used for electricity generation in year *y* (t CH_4/yr)

$F_{CH4,HG,y}$ = Amount of methane in the LFG which is used for heat generation in year *y* (t CH_4/yr)

$F_{CH4,NG,y}$ = Amount of methane in the LFG which is sent to the natural gas distribution network and/or dedicated pipeline and/or to the trucks in year *y* (tCH_4/yr)

As the project flares LFG, generate electricity, the $F_{CH4,HG,y}$ = 0 and $F_{CH4,NG,y}$. = 0. Thus, the equation is:

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y}$$

$F_{CH4,EL,y}$ are determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" and monitoring the working hours of the power plant(s), boiler(s), air heater(s), glass melting furnace(s) and kiln(s), so that no emission reduction are claimed for methane destruction during nonworking hours. This is taken into account by monitoring the hours that the equipment utilizing the LFG is operating in year *y* ($Op_{j,h,y}$).

The following requirements apply:

(c) As per the gaseous stream tool, if the LFG is used for multiple purposes (e.g. flaring or energy generation), and all methane destruction devices are verified to be operational (e.g. by means of flame detectors records, energy generated), a single flow meter may be used to record the flow into multiple destruction devices. The destruction efficiency of the least efficient among the destruction devices shall be used as the destruction efficiency for all destruction devices monitored by this flow meter. If there are any periods for which one or more destruction devices are not operational, paragraph 5 (a) and (b) of the Appendix of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" tool shall be followed;

(d) CH_4 is the greenhouse gas for which the mass flow should be determined;

(e) The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations (3) or (17) in the tool);

(f) The mass flow should be calculated on an hourly basis for each hour *h* in year *y*;

(g) The mass flow calculated for hour h is 0 if the equipment is not working in hour h ($Op_{j,h}$=not working), the hourly values are then summed to a yearly unit basis.

The amount of methane destroyed by flaring (FCH4,flared,y) will be determined as follows:

$$F_{CH4,flared,y} = F_{CH4,sent_flare,y} - \frac{PE_{flare,y}}{GWP_{CH4}}$$

Where:

$F_{CH4,flared,y}$	=	Amount of methane in the LFG which is destroyed by flaring in year *y* (t CH_4/yr)
$F_{CH4,sent_flare,y}$	=	Amount of methane in the LFG which is sent to the flare in year *y* (t CH_4/yr)
PEflare,y	=	Project emissions from flaring of the residual gas stream in year *y* (t CO_2e/yr)
GWPCH4	=	Global warming potential of CH4 (t CO_2e/t CH_4)

$F_{CH4,sent_flare,y}$ will be determined directly using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", applying the requirements described below. The tool shall be applied to the gaseous stream flowing in the LFG delivery pipeline to each flare.

According to "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" the following options will be considered for the present project activity:

- Option A (Volume flow in dry basis and volumetric fraction in dry basis) when the temperature of the gaseous stream is less than 60oC (333.15 K) at the flow measurement point

  And

- Option B (Volume flow in wet basis and volumetric fraction in dry basis) when the temperature of the gaseous stream is higher than 60oC (333.15 K) at the flow measurement point.

Option A

Flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. The demonstration will be made as following:

- Demonstrate that the temperature of the gaseous stream (T_t) is less than 60ºC (333.15 K) at the flow measurement point.

The mass flow of greenhouse gas *i* ($F_{i,t}$) is determined as follows:

$$F_{i,t} = V_{t,db} * v_{i,t,db} * \rho_{i,t}$$

With

$$\rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t}$$

Where:

$F_{i,t}$	=	Mass flow of greenhouse gas *i* in the gaseous stream in time interval *t* (kg gas/h)
$V_{t,db}$	=	Volumetric flow of the gaseous stream in time interval *t* on a dry basis (m^3 dry gas/h)
$v_{i,t,db}$	=	Volumetric fraction of greenhouse gas *i* in the gaseous stream in a time interval t on a dry basis (m^3 gas i/m^3 dry gas)
$\rho_{i,t}$	=	Density of greenhouse gas *i* in the gaseous stream in time interval *t* (kg gas i/m^3 gas *i*)
P_t	=	Absolute pressure of the gaseous stream in time interval *t* (Pa)
MM_i	=	Molecular mass of greenhouse gas *i* (kg/kmol)
R_u	=	Universal ideal gases constant (8,314 Pa.m3 /kmol.K)
T_t	=	Temperature of the gaseous stream in time interval *t* (K)

If it cannot be demonstrated that the gaseous stream is dry, then the flow measurement should be assumed to be on a wet basis and the option B should be applied instead.

Option B

The mass flow of greenhouse gas i (Fi,t) is determined using equations used to Option A. The volumetric flow of the gaseous stream in time interval t on a dry basis (Vt,db) is determined by converting the measured volumetric flow from wet basis to dry basis as follows:

$$V_{t,tb} = V_{t,wb}/(1 + v_{H2O,t,db})$$

Where:

$V_{t,db}$ = Volumetric flow of the gaseous stream in time interval *t* on a dry basis (m^3 dry gas/h)

$V_{t,wb}$ = Volumetric flow of the gaseous stream in time interval *t* on a wet basis (m^3 wet gas/h)

$v_{H2O,t,db}$ = Volumetric fraction of H2O in the gaseous stream in time interval *t* on a dry basis (m^3 H2O/m^3 dry gas)

The volumetric fraction of H_2O in time interval t on a dry basis ($v_{H2O,t,db}$) is estimated according to following equation.

$$v_{H2O,t,db} = \frac{m_{H2O,t,db} * MM_{t,db}}{MM_{H2O}}$$

Where:

$v_{H2O,t,db}$ = Volumetric fraction of H2O in the gaseous stream in time interval *t* on a dry basis (m^3 H_2O/m^3 dry gas)

$m_{H2O,t,db}$ = Absolute humidity in the gaseous stream in time interval *t* on a dry basis (kg H_2O/kg dry gas)

$MM_{t,db}$ = Molecular mass of the gaseous stream in time interval *t* on a dry basis (kg dry gas/kmol dry gas)

MM_{H2O} = Molecular mass of H_2O (kg H_2O/kmol H_2O)

The absolute humidity of the gaseous stream (mH2O,t,db) will be determined using Option 2 (simplified calculation without measurement of the moisture content):

Option 2: Simplified calculation without measurement of the moisture content

This option provides a simple and conservative approach to determine the absolute humidity by assuming the gaseous stream is dry or saturated depending on which is the conservative situation[25].

Concerning the project activity, the conservative situation will be to assume that the gaseous stream is saturated, then $m_{H2O,t,db}$ is assumed to equal the saturation absolute humidity (mH2O,t,db,sat) and calculated using the following equation.

$$m_{H2O,t,db,Sat} = \frac{p_{H2O,t,Sat} * MM_{H2O}}{(P_t - p_{H2O,t,Sat}) * MM_{t,db}}$$

Where:

$m_{H2O,t,db,sat}$	=	Saturation absolute humidity in time interval *t* on a dry basis (kg H_2O/kg dry gas)
$p_{H20,t,Sat}$	=	Saturation pressure of H_2O at temperature T_t in time interval *t* (Pa)
T_t	=	Temperature of the gaseous stream in time interval *t* (K)
P_t	=	Absolute pressure of the gaseous stream in time interval t (Pa)
MM_{H2O}	=	Molecular mass of H_2O (kg H_2O/kmol H_2O)
$MM_{t,db}$	=	Molecular mass of the gaseous stream in a time interval *t* on a dry basis (kg dry gas/kmol dry gas)

Parameter $MM_{t,db}$ is estimated using the following equation.

$$MM_{t,db} = \sum_k (v_{k,t,db} * MM_k)$$

Where:

$MM_{t,db}$	=	Molecular mass of the gaseous stream in time interval *t* on a dry basis (kg dry gas/kmol dry gas)
$v_{k,t,db}$	=	Volumetric fraction of gas k in the gaseous stream in time interval *t* on a dry basis (m^3 gas k/m^3 dry gas)

[25] An assumption that the gaseous stream is saturated is conservative for the situation that the mass flow of greenhouse gas i is underestimated (applicable for calculating baseline emissions). Conversely, an assumption that the gas stream is dry is conservative for the situation that the greenhouse gas i is overestimated (applicable for calculating project emissions).

MM_k = Molecular mass of gas *k* (kg/kmol)

k = All gases, except H_2O, contained in the gaseous stream (e.g. N_2 and CH_4,). See available simplification below

The determination of the molecular mass of the gaseous stream ($MM_{t,db}$) requires measuring the volumetric fraction of all gases (k) in the gaseous stream. However, as a simplification, in the case of the project activity, the volumetric fraction of the methane that is a greenhouse gas and considered in the emission reduction calculation in the underlying methodology must be monitored and the difference to 100% may be considered as pure nitrogen. The simplification is not acceptable if it is differently specified in the underlying methodology.

$PE_{flare,y}$ shall be determined using the methodological tool "Project emissions from flaring". If LFG is flared through more than one flare, then $PE_{flare,y}$ is the sum of the emissions for each flare determined separately.

Enclosed flare(s) will be installed in the project activity.

To determine the project emissions from flaring gases was used the tool "Project emissions from flaring". The project emissions calculation procedure is given in the following steps:

STEP 1: Determination of the methane mass flow of the residual gas;
STEP 2: Determination of the flare efficiency;
STEP 3: Calculation of project emissions from flaring.

Step 1: Determination of the methane mass flow in the residual gas

The "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" shall be used to determine the following parameter:

Parameter	SI Unit	Description
$F_{CH4,m}$	kg	Mass flow of methane in the residual gaseous stream in minute m

The following requirements apply:

- The gaseous stream tool shall be applied to the residual gas;
- The flow of the gaseous stream shall be measured continuously;
- CH4 is the greenhouse gas *i* for which the mass flow should be determined;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 and 17 in the tool); and
- The time interval t for which mass flow should be calculated is every minute m

$F_{CH4,m}$, which is measured as the mass flow during minute m, shall then be used to determine the mass of methane in kilograms fed to the flare in minute m (FCH4,RG,m). $F_{CH4,m}$ shall be determined on a dry basis.

The option chosen for the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" by the project participant is option A. However, during the project operational monitoring, If not demonstrated that the temperature of the gaseous stream (T_t) is less than 60ºC (dry basis), then the flow measurement should be assumed to be on a wet basis and the option B should be applied instead.

Step 2: Determination of flare efficiency

Enclosed flare

In the case of enclosed flares, project participants may choose between the following two options to determine the flare efficiency for minute *m* ($\eta_{flare,m}$).

Option A: Apply a default value for flare efficiency.

Option B: Measure the flare efficiency.

The project participant has chosen Option A.

Option A: Default value

The flare efficiency for the minute m ($n_{flare,m}$) is 90% when the following two conditions are met to demonstrate that the flare is operating:

(1) The temperature of the flare ($T_{EG.m}$) and the flow rate of the residual gas to the flare ($F_{RG,m}$) is within the manufacturer's specification for the flare ($SPEC_{flare}$) in minute m; and

(2) The flame is detected in minute m ($Flame_m$).

Otherwise $n_{flare,m}$ is 0%.

For enclosed flares that are defined as low height flares, the flare efficiency shall be adjusted, as a conservative approach, by subtracting 10 percentile points. For example, the default value applied shall be 80%, rather than 90%.

Step 3: Calculation of project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions for each minute *m* in year *y*, based on the methane mass flow in the residual gas ($F_{CH4,RG,m}$) and the flare efficiency ($\eta_{flare,m}$), as follows:

$$PE_{flare\,y} = GWP_{CH4} \times \sum_{m=1}^{525600} F_{CH4,RG,m} \times \left(1 - \eta_{flare\,m}\right) \times 10^{-3}$$

Where:

$PE_{flare,y}$	=	Project emissions from flaring of the residual gas in year y (tCO_2e)
GWP_{CH4}	=	Global warming potential of methane valid for the commitment period (tCO_2e/tCH_4)
$F_{CH4,RG,m}$	=	Mass flow of methane in the residual gas in the minute *m* (kg)
$\eta_{flare,m}$	=	Flare efficiency in minute m

Table 2 - Parameters used in the Tool "Project emissions from flaring"

Parameter	Description	Value	Unit
P_{ref}	Atmospheric pressure at reference conditions	101,325	Pa
R_u	Universal ideal gas constant	8,314	$Pa.m^3/kmol.K$
T_{ref}	Temperature at reference conditions	273.15	K

GWP_{CH4}	Global warming potential of methane valid for the commitment period	28[26]	tCO_2/tCH_4
$\rho_{CH4,n}$	Density of methane at reference conditions	0.716	Kg/m^3

Step A.1.1: *Ex-ante* estimation of $F_{CH4,PJ,y}$

An *ex ante* estimate of $F_{CH4,PJ,y}$ is required to estimate baseline emission of methane from the SWDS in order to estimate the emission reductions of the proposed project activity in the CDM-PDD. It is determined as follows:

$$F_{CH4,PJ,y} = \eta_{PJ} \times BE_{CH4,SWDS,y} / GWP_{CH4}$$

Where:

$F_{CH4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (tCH_4/yr)
$BE_{CH4,SWDS,y}$	=	Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* (tCO_2e/yr)
η_{PJ}	=	Efficiency of the LFG capture system that will be installed in the project activity
GWP_{CH4}	=	Global warming potential of CH4 (tCO_2e/tCH_4)

$BE_{CH4,SWDS,y}$ is determined using the methodological tool "Emissions from solid waste disposal sites". The calculation of $BE_{CH4,SWDS,y}$ according the tool is:

$$BE_{CH4,SWDS,y} = \varphi_y \cdot (1 - f_y) \cdot GWP_{CH4} \cdot (1 - OX) \cdot \frac{16}{12} \cdot F \cdot DOC_{f,y} \cdot MCF_y \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot (1 - e^{-k_j})$$

Where:

[26] Default value of 28 from IPCC. Shall be updated according to any future COP/MOP decisions.

$BE_{CH4,SWDS,y}$	=	Baseline, project or leakage methane emissions occurring in year y generated from waste disposal at a SWDS during a time period ending in year y (t CO_2e / yr)
X	=	Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y).
Y	=	Year of the crediting period for which methane emissions are calculated (y is a consecutive period of 12 months)
$DOC_{f,y}$	=	Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year y (weight fraction)
$W_{j,x}$	=	Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x (t)
φ_y	=	Model correction factor to account for model uncertainties for year y
f_y	=	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
GWP_{CH4}	=	Global Warming Potential of methane
OX	=	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
F	=	Fraction of methane in the SWDS gas (volume fraction)
MCF_y	=	Methane correction factor for year *y*
DOC_j	=	Fraction of degradable organic carbon in the waste type *j* (weight fraction)
k_j	=	Decay rate for the waste type *j* (1 / yr)
J	=	Type of residual waste or types of waste in the MSW

According to ACM0001 methodology, the parameter f_y in the methodological tool "Emissions from solid waste disposal sites" shall be assigned a value of 0 (zero) because the amount of LFG that would have been captured and destroyed is already accounted for in equation 2 of this methodology. Also, according to ACM0001 methodology, the parameter X begins with the year that the SWDS started receiving wastes. For this reason, the parameter f_y and X will not be monitored.

Step A.2: Determination of $F_{CH4,BL,y}$

In the baseline there are no regulatory or contractual requirements, or to address safety and odour concerns to capture and destroy LFG. Thus, the case of the project activity for determining methane captured and destroyed in the baseline is **Case 3** because there is existing LFG capture system (passive system), however there is no requirement to destroy methane. In this case:

$$F_{CH4,BL,y} = F_{CH4,BL,sys,y} = F_{CH4,sent_flare,y}$$

Where:

$F_{CH4,BL,sys,y}$	=	Amount of methane in the LFG that would be flared in the baseline in year y for the case of an existing LFG capture system (t CH_4/yr)
$F_{CH4,sent_flare,y}$	=	Amount of methane in the LFG which is sent to the flare in year *y* (t CH_4/yr)

The amount of methane captured with the existing system will be monitored along with the amount captured under the project activity and there is no historic data on the amount of methane that was captured in the year prior to the implementation of the project activity. Thus, the situation to determine $F_{CH4,BL,y}$ is:

If there is no monitored or historic data on the amount of methane that was captured in the year prior to the implementation of the project situation, then:

$F_{CH4,BL,sys,y} = 20\% \times F_{CH4,PJ,y}$; or

$F_{CH4,BL,y} = 20\% \times F_{CH4,PJ,y}$

Step (B): Baseline emissions associated with electricity generation ($BE_{EC,y}$)

The baseline emissions associated with electricity generation in year y ($BE_{EC,y}$) shall be calculated using the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation".

$$BE_{EC,y} = \sum_{k} EC_{BL,k,y} \times EF_{EL,k,y} \times (1 + TDL_{k,y})$$

Where:

$BE_{EC,y}$	=	Baseline emissions from electricity generation in year *y* (tCO_2/yr)
$EC_{BL,k,y} = EG_{PJ,y}$	=	Net amount of electricity *y* generated using LFG in year (MWh/yr)
$EF_{EL,k,y}$[27]	=	Emission factor for electricity generation for source *k* in year *y* (tCO_2/MWh)
$TDL_{k,y}$	=	Average technical transmission and distribution losses for providing electricity to source *k* in year *y*.

Emission Factor calculation

The project emissions derived from fossil fuels used for electricity consumption from grid connected power plants are estimated and guided using the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation". For the determination of the emission factor for electricity generation ($EF_{EL,j/k/l,y}$), the scenario A "Electricity consumption from the grid" was used. The combined margin emission factor was calculated by the "Tool to calculate the emission factor for an electricity system", as follows:

Step 1. Identify the relevant electric power system

For the purpose of determining the electricity emission factors, a project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without signification transmission constraints.

The Brazilian DNA published an official delineation of the project electricity system in Brazil, considering a national interconnected system.[28]

[27] According to the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", $EF_{EL,k,y} = EF_{grid,CM,y}$
[28] DNA Resolution n°8 was published on 26/05/2008 on http://www.mctic.gov.br/mctic/export/sites/institucional/ciencia/SEPED/clima/arquivos/legislacao_cimgc/Resolucao-n-8-de-26-de-maio-de-2008.pdf, accessed on 16/03/2020.

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional)

Option I: Only grid power plants are included in the calculation.

The Brazilian DNA is responsible for calculating the emission factors and it is not included in calculation the off-grid power plants.

Step 3. Select a method to determined the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

a) Simple OM, or
b) Simple adjusted OM, or
c) Dispatch data analysis OM, or
d) Average OM.

The Brazilian DNA is responsible for calculating the OM emission factor in Brazil. It uses the method c) Dispatch data analysis OM.

For the dispatch data analysis OM, it is necessary to use the year in which the project activity displaces grid electricity and to update the emission factor annually during monitoring.

Step 4. Calculate the operating margin emission factor according to the selected method

The dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) is determined based on the power units that are actually dispatched at the margin during each hour h where the project is displacing electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM-DD,y}$. The emission factor is calculated as follows:

$$EF_{grid,OM-DD,y} = \frac{\sum_h EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$

Where:

$EF_{grid,OM-DD,y}$	=	Dispatch data analysis operating margin CO2 emission factor in year *y* (tCO_2/MWh)
$EG_{PJ,h}$	=	Electricity displaced by the project activity in hour *h* m of year *y* (MWh)
$EF_{EL,DD,h}$	=	CO_2 emission factor for power units in the top of the dispatch order in hour h in year *y* (tCO_2/MWh)
$E_{GPJ,y}$	=	Total electricity displaced by the project activity in year *y* (MWh)
h	=	hours in year y in which the project activity is displacing grid electricity
y	=	Year in which the project activity is displacing grid electricity

The $EF_{grid,OM,2022}$ is displayed on the Brazilian DNA website, for the year 2022

$EF_{grid,OM,2022}$ = 0.4068 tCO_2/MWH

Step 5. Calculate the build margin (BM) emission factor

The Brazilian DNA is responsible for calculating the BM emission factor in Brazil.

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor *ex-ante* based on the most recent information available on units already built for sample group m at the time of CDMPDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor should be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The *Option 2* was chosen for the proposed project.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO2 emission factor in year *y* (t CO_2/MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (t CO_2/MWh)
m	=	Power units included in the build margin
y	=	Most recent historical year for which electricity generation data is available

The $EF_{grid,BM}$ is displayed on the Brazilian DNA website, for the year 2022.

$EF_{grid,BM}$,2022[29] = 0.0270 tCO_2/MWh

[29] According to STEP 5, option 1 of Tool to calculate the emission factor for an electricity system

Step 6. Calculate the combined margin emissions factor

The option a) weighted average CM was used to calculate the combined margin (CM).

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

The default weights are as follows: w_{OM} = 0.25 and w_{BM} = 0.75, fixed for the second crediting period. That gives:

$$EF_{2022} = (0.3754 \times 0.25) + (0.0270 \times 0.75) = 0.1141\ tCO_2/MWh$$ [30]

The build margin CO_2 emission factors will be ex-ante. Therefore, the combined margin CO_2 emission factor will be ex-post.

Project emissions:

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{DT,y} + PE_{SP,y}$$

Where:

PE_y	=	Project emissions in year *y* (t CO_2/yr)
$PE_{EC,y}$	=	Emissions from consumption of electricity due to the project activity in year *y* (t CO_2/yr)
$PE_{FC,y}$	=	Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year *y* (t CO_2/yr)
$PE_{DT,y}$	=	Emissions from the distribution of compressed/liquefied LFG using trucks, in year y (t CO_2/yr)

[30] The source of the data is from Brazilian DNA. The link is http://www.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/emissao_despacho.html, accessed on 23/03/2020.

$PE_{SP,y}$ = Emissions from the supply of LFG to consumers through a dedicated pipeline, in year *y* (t CO_2/yr)

The parameter $PE_{DT,y}$, $PE_{FC,y}$ and $PE_{SP,y}$ are not used in the calculation of project emissions since there is no distribution of compressed/liquefied LFG using trucks, no supply of LFG to consumers through a dedicated pipeline as well as no project emission from consumption of fossil fuels due to the project activity, for purpose other than electricity generation in the project activity. Then, $PE_{DT,y}$, $PE_{FC,y}$ and $PE_{SP,y}$ = 0.

Calculation of $PE_{EC,y}$ – project emission from consumption of electricity

According to "*Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation*", the project emission from consumption of electricity will be from following source:

- $PE_{EC1,y}$ - Grid (Brazilian interconnected electric system);

Thus,

$$PE_{EC,y} = PE_{EC1,y}$$

$PE_{EC1,y}$ - Project emission from electricity consumption from the grid

As electricity will be consumed from the grid, the option A1 of the scenario A was chosen, as follows:

> *Option A1: Calculate the combined margin emission factor of the applicable electricity system, using the procedures of the "Tool to calculate the emission factor for an electricity system" ($EF_{EL,j/k/l,y} = EF_{grid,CM,y}$).*

Thus, the project emission is calculated as following:

$$PE_{EC1,y} = EC_{PJ1,y} \times EF_{grid,CM,y} \times (1+TDL_y)$$

Where:

$EC_{PJ1,y}$ = quantity of electricity consumed from the grid by the project activity during the year y (MWh);

$EF_{grid,CM,y}$ = the emission factor for the grid in year y (tCO_2/MWh);

TDL_y = average technical transmission and distribution losses in the grid in year y for the voltage level at which electricity is obtained from the grid at the project site.

Leakage:

In accordance with the ACM0001, no leakage effects need to be accounted.

Emission Reduction

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y,$$

Where:

ER_y = Emission reductions in year y (tCO_2e/yr);

BE_y = Baseline emissions in year y (tCO_2e/yr);

PE_y = Project emissions in year y (tCO_2e/yr);

B.6.2 Data and parameters fixed ex ante

SDG13

Data/parameter	$EF_{grid,BM,y}$
Unit	tCO^2/MWh
Description	Build margin emission factor of the Brazilian grid
Source of data	Calculations based on parameters described above.
Value(s) applied	0.0270

Choice of data or Measurement methods and procedures	The build margin emission factor has been defined by the Brazilian DNA
Purpose of data	(b) Calculation of project emissions or actual net GHG removals by sinks;
Additional comment	All data and parameters to determine the grid electricity emission factor, as required by the "Tool to calculate the emission factor for an electricity system", were included in the monitoring plan. For more details, see Annex 3

Data/parameter	OX_{top_layer}
Unit	Dimensionless
Description	Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
Source of data	Consistent with how oxidation is accounted for in the methodological tool "Emissions from solid waste disposal sites"
Value(s) applied	0.1
Choice of data or Measurement methods and procedures	Default value used, according to ACM0001
Purpose of data	Calculation of baseline emission
Additional comment	Applicable to Step A

Data/parameter	GWP_{CH4}
Unit	t CO_2e/t CH_4
Description	Global warming potential of CH_4

Source of data	Default value used, according to IPCC Fourth Assessment Report (AR4)[31] and IPCC Fifth Assessment Report (AR5)[32]
Value(s) applied	28 Updated for the 2nd commitment period according to COP/MOP decisions
Choice of data or Measurement methods and procedures	Default value used, according to IPCC Fourth Assessment Report: Climate Change 2007, item 2.10.2: Direct Global Warming Potentials, Table 2.14
Purpose of data	Calculation of baseline emission
Additional comment	In opposite of the CDM-PDD registered on 31/07/2013 using GWP of 21, it has been updated to 28.

Data/parameter	Waste composition
Unit	%
Description	Waste composition
Source of data	landfill internal studies
Value(s) applied	

Composition of waste	
A) Wood and wood products	0.38%
B) Pulp, paper and cardboard (other than sludge)	11.72%
C) Food, food waste, beverages and tobacco (other than sludge)	52.23%
D) Textiles	0.77%

[31] IPCC Fourth Assessment Report: Climate Change 2007, item 2.10.2: Direct Global Warming Potentials, Table 2.14, available at: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html , accessed on 23/03/2018 and in accordance with EB69, Annex 3 and decision 4/CMP.7, available at: http://cdm.unfccc.int/Reference/Standards/meth/reg_stan02.pdf , accessed on 23/03/2018

[32]Available online: https://www.ipcc.ch/assessment-report/ar5/

	E) Garden, yard and park waste	0.00%
	F) Glass, plastic, metal, other inert waste	34.90%
	TOTAL	**100.00%**
Choice of data or Measurement methods and procedures	Internal Report	
Purpose of data	Calculation of baseline emission	
Additional comment	Used for projection of methane avoidance	

Data/parameter	R_u
Unit	$Pa.m^3$ /kmol.K
Description	Universal ideal gas constant
Source of data	Methodological tool "Project emissions from flaring"
Value(s) applied	8,314
Choice of data or Measurement methods and procedures	Default value used, according to Methodological tool "Project emissions from flaring", table 1: Constants used in equations
Purpose of data	Calculation of baseline emission
Additional comment	-

Data/parameter	$SPEC_{flare}$
Unit	Temperature - °C Flow rate - Nm^3/h Maintenance schedule - number of days
Description	Manufacturer's flare specifications for temperature, flow rate and maintenance schedule
Source of data	Flare Manufacturer

Value(s) applied	According to "Choice of data or Measurement methods and procedures" below
Choice of data or Measurement methods and procedures	**Enclosed flares** There is no control of minimum and maximum temperatures, only the detection of the flame. The methods and procedures will be manufacturer manual/recommendation. According to manufacturer manual/recommendation. Flare model: 2500 HT Minimum flare temperature: 850 ºC Maximum flare temperature: 1200 ºC Minimum and maximum inlet flow rate: Minimum flow: 500 Nm³/h * --- Maximum flow: 2,500 Nm³/h Maximum duration in days between maintenance events: 7 days[33]
Purpose of data	Calculation of project emissions
Additional comment	

Data/parameter	η_{PJ}
Unit	Dimensionless

[33] The maximum duration in days between maintenance events has been chosen considering preventive maintenance program which defines the frequency for checking flare equipment situation every week.

Description	Efficiency of the LFG capture system installed in the project activity
Source of data	Feasibility study
Value(s) applied	65%
Choice of data or Measurement methods and procedures	Based on the active LFG capture system to be installed, according to technical specifications from the equipment provider.
Purpose of data	Calculation of baseline emission
Additional comment	-

Data/parameter	$\varphi_{default}$
Unit	-
Description	Default value for the model correction factor to account for model uncertainties
Source of data	Tool "Emissions from solid waste disposal sites"
Value(s) applied	0.75
Choice of data or Measurement methods and procedures	According to "Emissions from solid waste disposal sites", the Application A was used because the landfill is an existing solid waste disposal site and in the project activity the methane emissions are being mitigated by capturing and flaring the methane (ACM0001).
Purpose of data	Calculation of baseline emission
Additional comment	-

Data/parameter	OX
Unit	-

Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data	Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.1
Choice of data or Measurement methods and procedures	Default value used according to "Emissions from solid waste disposal sites"
Purpose of data	Calculation of baseline emission
Additional comment	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO_2. The oxidation factor represents the proportion of methane that is oxidized to CO_2.This should be distinguished from the methane correction factor (MCF) which is to account for the situation that ambient air might intrude into the SWDS and prevent methane from being formed in the upper layer of SWDS.

Data/parameter	F
Unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	Default value used according to "Emissions from solid waste disposal sites"
Purpose of data	Calculation of baseline emission

Additional comment	Upon biodegradation, organic material is converted to a mixture of methane and carbon dioxide

Data/parameter	$DOC_{f,default}$
Unit	Weight fraction
Description	Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	The default value was used for type Application A). according to "Emissions from solid waste disposal sites"
Purpose of data	Calculation of baseline emission
Additional comment	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS. This default value can be used for Application A.

Data/parameter	f_y
Unit	-
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data	Select the maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured
Value(s) applied	0

Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emission
Additional comment	According to ACM0001 methodology, the parameter f_y in the methodological tool "Emissions from solid waste disposal sites" shall be assigned a value of 0 (zero) because the amount of LFG that would have been captured and destroyed is already accounted for in equation 2 of this methodology. Also, according to ACM0001 methodology, the parameter X begins with the year that the SWDS started receiving wastes (2010). For this reason, the parameter f_y and X will not be monitored.

Data/parameter	$MCF_{default}$
Unit	-
Description	Methane correction factor
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value(s) applied	1.0
Choice of data or Measurement methods and procedures	The project activity is an anaerobic managed solid waste disposal sites with controlled placement of waste (i.e. waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and is include: (i) cover material; (ii) mechanical compacting and (iii) leveling of the waste;
Purpose of data	Calculation of baseline emission
Additional comment	-

Data/parameter	DOC_j
Unit	-

Description	Fraction of degradable organic carbon in the waste type j (weight fraction)
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value(s) applied	
Choice of data or Measurement methods and procedures	IPCC default value for anaerobic managed solid waste disposal site is applied.
Purpose of data	Calculation of baseline emission
Additional comment	-

Waste type j	DOCj (% wet waste)
Wood and wood products	43
Pulp, paper and cardboard (other than sludge)	40
Food, food waste, beverages and tobacco (other than sludge)	15
Textiles	24
Garden, yard and park waste	20
Glass, plastic, metal, other inert waste	0%

Data/parameter	Kj
Unit	-
Description	Decay rate the waste type j
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Value(s) applied	

Waste type j	Tropical (MAT > 20 °C)

		Wet (MAP > 1,000 mm)
Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.07
	Wood, wood products and straw	0.035
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.17
Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.40

Choice of data or Measurement methods and procedures	IPCC default value for anaerobic managed solid waste disposal site is applied.
Purpose of data	Calculation of baseline emission
Additional comment	The mean annual temperature (MAT) is 21.1ºC and the mean annual precipitation (MAP) 1,490 mm. Source: INMET - Instituto Nacional de Meteorologia (http://www.bdclima.cnpm.embrapa.br)

Data/parameter	MM_i
Unit	kg/kmol
Description	Molecular mass of greenhouse gas i
Source of data	Tool to determine the mass flow of a greenhouse gas in a gaseous stream
Value(s) applied	

Compound	Structure	Molecular mass (kg/kmol)
Carbon dioxide	CO_2	44.01
Methane	CH_4	16.04
Nitrous oxide	N_2O	44.02
Sulfur hexafluride	SF_6	146.06
Perfluoromethane	CF_4	88.00
Perfluoroethane	C_2F_6	138.01
Perfluoropropane	C_3F_8	188.02
Perfluorobutane	C_4F_{10}	238.03
Perfluorocyclobutane	c-$C4F_8$	200.03
Perfluoropentane	C_5F_{12}	288.03
Perfluorohexane	C_6F_{14}	338.04

Choice of data or Measurement methods and procedures	According to "Tool to determine the mass flow of a greenhouse gas in a gaseous stream"
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/parameter	MM_k
Unit	kg/kmol
Description	Molecular mass of gas *k*
Source of data	
Value(s) applied	

Compound	Structure	Molecular mass (kg/kmol)
Nitrogen	N_2	28.01
Oxygen	O_2	32.00

	Carbon monoxide	CO	28.01
	Hydrogen	H_2	2.02
	Nitric oxide	NO	30.01
	Nitrogen dioxide	NO_2	46.01
	Sulfur dioxide	SO_2	64.06
Choice of data or Measurement methods and procedures	According to "Tool to determine the mass flow of a greenhouse gas in a gaseous stream"		
Purpose of data	Calculation of baseline emissions		
Additional comment	-		

Data/parameter	MM_{H2O}
Unit	kg/kmol
Description	Molecular mass of water
Source of data	Tool to determine the mass flow of a greenhouse gas in a gaseous stream
Value(s) applied	18.0152
Choice of data or Measurement methods and procedures	According to "Tool to determine the mass flow of a greenhouse gas in a gaseous stream"
Purpose of data	Calculation of baseline emissions
Additional comment	-

B.6.3 Ex ante estimation of SDG Impact

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The emission reductions derived from the displacement of fossil fuels used for electricity generation from other sources are estimated for the Brazilian Interconnected System

and guided by "Tool to calculate baseline, project and/or leakage emissions from electricity consumption. The combined margin emission factor" was calculated by the "Tool to calculate the emission factor for an electricity system", as follows:

Step 1. Identify the relevant electric power system

For the purpose of determining the electricity emission factors, a project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without signification transmission constraints.

The Brazilian DNA published an official delineation of the project electricity system in Brazil, considering a national interconnected system.[34]

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional)

Option I: Only grid power plants are included in the calculation. The Brazilian DNA is responsible for calculating the emission factors and it is not included in calculation the off-grid power plants.

Step 3. Select a method to determined the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

a) Simple OM, or
b) Simple adjusted OM, or
c) Dispatch data analysis OM, or

[34] DNA Resolution n.8 was published on 26/05/2008 on http://www.mct.gov.br/index.php/content/view/14797.html, accessed on 10/02/2015.

d) Average OM.

The Brazilian DNA is responsible for calculating the OM emission factor in Brazil. It uses the method c) Dispatch data analysis OM.

For the dispatch data analysis OM, it is necessary to use the year in which the project activity displaces grid electricity and to update the emission factor annually during monitoring.

Step 4. Calculate the operating margin emission factor according to the selected method

The dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) is determined based on the power units that are actually dispatched at the margin during each hour h where the project is displacing electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM-DD,y}$.

The emission factor is calculated as follows:

$$EF_{grid,OM-DD,y} = \frac{\sum_{h} EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$

Where:

$EF_{grid,OM-DD,y}$	=	Dispatch data analysis operating margin CO2 emission factor in year *y* (tCO_2/MWh)
$EG_{PJ,h}$	=	Electricity displaced by the project activity in hour *h* m of year *y* (MWh)
$EF_{EL,DD,h}$	=	CO_2 emission factor for power units in the top of the dispatch order in hour h in year y (tCO_2/MWh)
$EG_{PJ,y}$	=	Total electricity displaced by the project activity in year *y* (MWh)
h	=	hours in year y in which the project activity is displacing grid electricity
y	=	Year in which the project activity is displacing grid electricity

The $EF_{grid,OM,2022}$ is displayed on the Brazilian DNA website, for the year 2022

$EF_{grid,OM,2022}$ = 0.4068 tCO^2/MWh

Step 5. Calculate the build margin (BM) emission factor

The Brazilian DNA is responsible for calculating the BM emission factor in Brazil. In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor should be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The *Option 2* was chosen for the proposed project.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year *y* (t CO_2/MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year *y* (MWh)
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (t CO_2/MWh)
m	=	Power units included in the build margin
y	=	Most recent historical year for which electricity generation data is available

The $EF_{grid,BM}$ is displayed on the Brazilian DNA website, for the year 2022.

$EF_{grid,BM,2022}$[35] = 0.0270 tCO_2/MWh

Step 6. Calculate the combined margin emissions factor

The option a) weighted average CM was used to calculate the combined margin (CM).

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$$

The default weights are as follows: w_{OM} = 0.25 and w_{BM} = 0.75, fixed for the second crediting period. That gives:

$$EF_{2022} = (0.3754 \times 0.25) + (0.0270 \times 0.75) = 0.1141\ tCO_2/MWh$$[36]

[35] According to STEP 5, option 1 of Tool to calculate the emission factor for an electricity system
[36] The source of the data is from Brazilian DNA. The link ishttps://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/dados-e-ferramentas/fatores-de-emissao, accessed on18/12/2023.

The build margin CO_2 emission factors will be ex-ante.

The operating margin CO_2 emission factors will be ex-post.

Therefore, the combined margin CO_2 emission factor will be ex-post.

Emission reduction

Baseline emission calculation

The total of methane generation at the site has been estimated based on the waste tonnage of the landfill using the first order decay model presented in the "Emissions from solid waste disposal sites" and considering the following equation as mentioned previously.

Ex-ante estimation of $F_{CH4,PJ,y}$

The assumptions used to calculate $F_{CH4,PJ,y}$ are:

- Methane content in LFG = 50% (default value);
- LFG collection efficiency = 65%: (Based on technical specifications from the equipment provider for the active LFG capture system);
- Density of methane = 0.716 kg/m^3 (as per "*Tool to determine project emissions from flaring gases containing methane*").

The landfill gas collection and utilization system will capture only a portion of the generated landfill gas. Thus, an estimate of 65% LFG collection was applied to the estimate of LFG produced, under assumption that generated LFG is composed of 50% methane.

The ex-ante estimation of the $F_{CH4,PJ,y}$ is presented below:

$$F_{CH4,PJ,y} = \eta_{PJ} \times \frac{BE_{CH4,SWDS,y}}{GWP_{CH4}}$$

Where:

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the project activity in year y (tCH_4/yr)

$BE_{CH4,SWDS,y}$ = Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year y (tCO_2e/yr)

η_{PJ} = Efficiency of the LFG capture system that will be installed in the project activity

GWP_{CH4} = Global warming potential of CH_4 (tCO_2e/tCH_4)

The table below illustrates the ex-ante estimation of $F_{CH4,PJ,y}$ by the project activity during the crediting period.

Table 3 - Ex-ante estimation of $F_{CH4,PJ,y}$

Year	$F_{CH4,PJ,y}$ (tCH_4/yr)
From 31/07/2020	9,760
2021	24,140
2022	25,034
2023	25,846
2024	26,598
Until 30/07/2025	15,784

Determination of $F_{CH4,BL,y}$

$F_{CH4,BL,y} = 20\% \times F_{CH4,PJ,y}$

Table 4 - Ex-ante estimation of $F_{CH4,BL,y}$

Year	$F_{CH4,BL,y}$ (tCH_4/yr)
From 31/07/2020	1,952
2021	4,828
2022	5,007
2023	5,169
2024	5,320
Until 30/07/2025	3,157

Step (A): Baseline emissions of methane from the SWDS ($BE_{CH4,y}$)

The equation of the $BE_{CH4,y}$ is:

$$BE_{CH4} = \left(\left(1 - OX_{top_layer}\right) \times F_{CH4,PJ,y} - F_{CH,BL,y}\right) \times GWP_{CH4}$$

Where the OX_{top_layer} = 0.1 (default value) and $F_{CH4,PJ,y}$ and $F_{CH4,BL,y}$ are calculated above. The results are presented below:

Table 5 - Baseline emissions of methane from the SWDS ($BE_{CH4,y}$)

Year	$BE_{CH4,y}$ (tCO_2/year)
From 31/07/2020	191,291
2021	473,139
2022	490,666
2023	506,584
2024	521,316
Until 30/07/2025	309,363

Step (B): Baseline emissions associated with electricity generation ($BE_{EC,y}$)

The ex-ante calculation is:

$$BE_{EC,y} = EC_{BL,k,y} \times EF_{grid,CM,y} \times (1+TDL_y)$$

As explained above, the $EF_{grid,CM,y}$ = 0.1220 tCO_2/MWh

Table 6 - Baseline emissions associated with electricity generation ($BE_{EC,y}$)

Year	$EC_{BL,k,y}$ (MWh/yr)	($BE_{EC,y}$) (tCO_2/yr)
From 31/07/2020	33,204	4,989

2021	78,698	11,825
2022	78,698	11,825
2023	78,698	11,825
2024	78,698	11,825
Until 30/07/2025	45,494	6,836

The forecast installed capacity and electricity generated ($EC_{BL,k,y}$) by the project activity are present below:

Year	Number of engines	Installed capacity (MWe)	Electricity generation in the plant (MWh)
From 31/07/2020	7	9.982	33,204
2021	7	9.982	78,698
2022	7	9.982	78,698
2023	7	9.982	78,698
2024	7	9.982	78,698
Until 30/07/2025	7	9.982	45,494

Values extracted from ER spreadsheet

[1] The plant load factor is 90%.

The equation of the baseline emission calculation is:

$$BE_y = BE_{CH4,y} + BE_{EC,y}$$

The result is:

Table 7 - baseline emission calculation

Year	$BE_{CH4,y}$ (tCO_2/year)	($BE_{EC,y}$) (tCO_2/yr)	BE_y (tCO_2/yr)
From 31/07/2020	191,291	4,989	196,279
2021	473,139	11,825	484,963
2022	490,666	11,825	502,491
2023	506,584	11,825	518,408
2024	521,316	11,825	533,140

Until 30/07/2025	309,363	6,836	316,198

Project emissions

$$PE_y = PE_{EC} + PE_{FC,y}$$

Where:

PE_y	=	Project emissions in year y (tCO_2/yr)
$PE_{EC,y}$	=	Emissions from consumption of electricity due to the project activity in year y (tCO_2/yr)
$PE_{FC,y}$	=	Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year y (tCO_2/yr)

Calculation of PEEC,y – project emission from consumption of electricity

There are two emission project sources:

$PE_{EC1,y}$ - Grid (Brazilian interconnected electric system);

$$PE_{EC,y} = PE_{EC1,y}$$

$PE_{EC1,y}$ - Project emission from the grid

In the project activity, the electricity consumption from the grid is estimated around 3,742 MWh/year.

The option A1 of the "*Tool to calculate baseline, project and/or leakage emissions from electricity consumption*", states that a value of the combined margin emission factor ($EF_{grid,CM,y}$) may be used as the emission factor ($EF_{ELj/k/l,y}$). Therefore a value of 0.1220 tCO_2/MWh will be used.

Finally the technical transmission and distribution losses ($TD_{Lj,y}$) value has been assumed to be 26.3%, according to National Energy Balance -published on 2020 (data

basis 2019).[37] Table below summarizes the project emissions resulting from electrical consumption in the plant.

Table 8 – electricity consumption from the grid resulting dur to project activity

Year	Installed capacity (MWe)	$PE_{EC1,y}$ (tCO_2/year)
From 31/07/2020	1,579	238
2021	3,742	563
2022	3,742	563
2023	3,742	563
2024	3,742	563
Until 30/07/2025	2,163	326

Calculation of PEFC,y – project emission from consumption of fossil fuel

There is no project emission from consumption of heat.

Therefore, $PE_{FC,y} = 0$

Leakage:

In accordance with the ACM0001, no leakage effects need to be accounted.

Emission Reduction

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y,$$

[37] National Energy Balance published on 2020 – data basis 2019 (26.3% for 2019 is the most recent data). Source: https://www.epe.gov.br/sites-pt/publicacoes-dadosabertos/publicacoes/PublicacoesArquivos/publicacao-479/topico521/Relato%CC%81rio%20Si%CC%81ntese%20BEN%202020-ab%202019_Final.pdf

Where:

ER_y = Emission reductions in year y (tCO_2e/yr);

BE_y = Baseline emissions in year y (tCO_2e/yr);

PE_y = Project emissions in year y (tCO_2e/yr);

Year	BE_y (tCO_2/yr)	PE_y (tCO_2/yr)	ER_y (tCO_2/yr)
From 31/07/2020	196,279	238	196,041
2021	484,963	563	484,400
2022	502,491	563	501,928
2023	518,408	563	517,845
2024	533,140	563	532,577
Until 30/07/2025	316,198	326	315,872

B.6.4 Summary of ex ante estimates of each SDG Impact

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Year[38]	Baseline estimate	Project estimate	Net benefit
31/07/2020 to 31/12/2020	0	196,041	196,041
2021	0	484,400	484,400
2022	0	501,928	501,928
2023	0	517,845	517,845
2024	0	532,577	532,577
01/01/2025 30/07/2025	0	315,872	315,872
Total	**0**	**2,548,663**	**2,548,663**

[38] It is important to note that, while the project activity has already issued CERs under the CDM up to 31/12/2020, the project activity will only issue CERs under the GS for the period from 01/01/2021 onwards. Moreover, the requirement for retroactive issuance by considering a maximum of 2 years from date of request for preliminary review + time period between preliminary review and transition approval will also be taken into consideration.

Total number of crediting years	**5**		
Annual average over the crediting period	**0**	**509,733**	**509,733**

SDG 7

Year	Baseline estimate	Project estimate	Net benefit
2016	0		
2017	0		
2018	0		
2019	0		
2020	0		
2021	0		
Total	**0**		
Total number of crediting years	**5**		
Annual average over the crediting period	**0**		

SDG 8

SDG	Baseline estimate	Project estimate	Net benefit
SDG 8 - Sustained, inclusive and sustainable economic growth full and productive employment and decent work for all	10 jobs	Project will generate employment opportunities	Minimum of 10 jobs created.

SDG 4

SDG	Baseline estimate	Project estimate	Net benefit
SDG 4 - By 2030, substantially increase the number of youth	19 persons provided	Project will sponsor skilled	Minimum of 19 persons trained

and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship	development skills training	training opportunities and capacity building.	

B.7. Monitoring plan

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B.7.1 Data and parameters to be monitored

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SDG 13

Data / Parameter	Management of SWDS
Unit	-
Description	Management of SWDS
Source of data	Use different sources of data: • Original design of the landfill; • Technical specifications for the management of the SWDS; • Local or national regulations
Value(s) applied	-
Measurement methods and procedures	Project participants should refer to the original design of the landfill to ensure that any practice to increase methane generation have been occurring prior to the implementation of the project activity. Any change in the management of the SWDS after the implementation of the project activity should be justified by referring to technical or regulatory specifications
Monitoring frequency	Annually

QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$O_{pj,h}$
Unit	-
Description	Operation of the equipment that consumes the LFG
Source of data	Measurements by Project participant using a device integrated with the operational software at the landfill gas plant.
Value(s) applied	n/a
Measurement methods and procedures	For each equipment unit j using the LFG monitor that the plant is operating in hour h by the monitoring any one or more of the following three parameters: (a) Temperature. Determine the location for temperature measurements and minimum operational temperature based on manufacturer's specifications of the burning equipment. Document and justify the location and minimum threshold in the PDD; (b) Flame. Flame detection system is used to ensure that the equipment is in operation; (c) Products generated. Monitor the generation of steam for the case of boilers and air-heaters and glass for the case of glass melting furnances. This option is not applicable to brick kilns. Opj,h=0 when: (a) One of more temperature measurements are missing or below the minimum threshold in hour h (instantaneous measurements are made at least every minute); (b) Flame is not detected continuously in hour h (instantaneous measurements are made at least every minute); (c) No products are generated in the hour h.

	Otherwise, Opj,h=1
Monitoring frequency	Once per minute
QA/QC procedures	The calibration of this equipment is not applicable since it is a device integrated with the operational software at the landfill gas plant.
Purpose of data	(a) Calculation of baseline emissions or baseline net GHG removals by sinks;
Additional comment	-

Data / Parameter	$V_{t,wb}$
Unit	m^3 /h
Description	Volumetric flow of the gaseous stream in time interval t on a wet basis
Source of data	Measurements by Project participants using a flow meter
Value(s) applied	n/a
Measurement methods and procedures	The volumetric flow rate of the residual gas which is sent to each individual flare, LFG engines in the hour h will be measured by the installed flow meters with digital recordable electronic signal, according to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", the measurement option in the project activity will be: • Option (A) dry basis: when the temperature of gaseous stream is lower than 60 °C (333.15 K) at the flow measurement point; • Option (B) wet basis: when the temperature of gaseous stream is higher than 60 °C (333.15 K) at the flow measurement point;
Monitoring frequency	Continuous recorded and hourly aggregated
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. The calibration frequency of this monitoring equipment should be in accordance with manufacturer's specifications.

Purpose of data	(a) Calculation of baseline emissions or baseline net GHG removals by sinks;
Additional comment	This parameter will be monitored only in case Options B or C of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is applied for the determination of $F_{CH4,flared,y}$, $F_{CH4,EL,y}$ and $F_{CH4,NG,y}$

Data / Parameter	$V_{t,db}$
Unit	m^3 /h
Description	Volumetric flow of the gaseous stream in time interval t on a dry basis
Source of data	Measurements by Project participants using a flow meter(s)
Value(s) applied	n/a
Measurement methods and procedures	The volumetric flow rate of the residual gas which is sent to each individual flare, LFG engines in the hour h will be measured by the installed flow meters with digital recordable electronic signal, according to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", the measurement option in the project activity will be: • Option (A) dry basis: when the temperature of gaseous stream is lower than 60 °C (333.15 K) at the flow measurement point; • Option (B) wet basis: when the temperature of gaseous stream is higher than 60 °C (333.15 K) at the flow measurement point;
Monitoring frequency	Continuous recorded and hourly aggregated
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. The calibration frequency of this monitoring equipment should be in accordance with manufacturer's specifications.
Purpose of data	(a) Calculation of baseline emissions or baseline net GHG removals by sinks;
Additional comment	This parameter will be monitored only in case Option A of the "Tool to determine the mass flow of a greenhouse gas

	in a gaseous stream" is applied for the determination of $F_{CH4,flared,y}$, $F_{CH4,EL,y}$ and $F_{CH4,NG,y}$

Data / Parameter	$v_{i,t,db}$
Unit	m³ gas i/m³ dry gas
Description	Volumetric fraction of greenhouse gas i in a time interval t on a dry basis
Source of data	Measurements by Project participants using gas analyser
Value(s) applied	50%
Measurement methods and procedures	Continuous gas analyser operating in dry basis. Volumetric flow measurement should always refer to the actual pressure and temperature.
Monitoring frequency	Continuous recorded and hourly aggregated
QA/QC procedures	Calibration should include zero verification with an inert gas (e.g. N_2) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas). All calibration gases must have a certificate provided by the manufacturer and must be under their validity period.
Purpose of data	(a) Calculation of baseline emissions or baseline net GHG removals by sinks;
Additional comment	This parameter will be monitored in Options B and E and may be monitored in Options A and D of the tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is applied for the determination of $F_{CH4,flared,y}$, $F_{CH4,EL,y}$ and $F_{CH4,NG,y}$

Data / Parameter	$V_{i,t,wb}$
Unit	m³ gas i/m³ wet gas
Description	Volumetric fraction of greenhouse gas i in a time interval t on a wet basis
Source of data	Measurements by Project participants using gas analyser

Value(s) applied	50%
Measurement methods and procedures	Calculated based on the dry basis analysis plus water concentration measurement or continuous in-situ analysers if not specified in the underlying methodology
Monitoring frequency	Continuous recorded and hourly aggregated
QA/QC procedures	Calibration should include zero verification with an inert gas (e.g. N_2) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas). All calibration gases must have a certificate provided by the manufacturer and must be under their validity period.
Purpose of data	(a) Calculation of baseline emissions or baseline net GHG removals by sinks;
Additional comment	This parameter will be monitored in Options C and F and may be monitored in Options A and D of the tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is applied for the determination of $F_{CH4,flared,y}$, $F_{CH4,EL,y}$ and $F_{CH4,NG,y}$

Data / Parameter	T_t
Unit	K
Description	Temperature of the gaseous stream in time interval t
Source of data	Measurements by Project participant
Value(s) applied	n/a
Measurement methods and procedures	Instruments with recordable electronic signal (analogical or digital) are required. Examples include thermocouples, thermo resistance, etc.
Monitoring frequency	Continuous unless differently specified in the underlying methodology
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer`s specifications

Purpose of data	Calculation of baseline emissions.
Additional comment	Provided all parameters are converted to normal conditions during the monitoring process, this parameter may not be needed except for moisture content determination and therefore it should be metered only when performing such measurements (with same frequency). However, if the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted, this parameter must be monitored continuously to assure the applicability condition is met

Data / Parameter	P_t
Unit	Pa
Description	Pressure of the gaseous stream in time interval t
Source of data	Measured by the Project participant
Value(s) applied	n/a
Measurement methods and procedures	Instruments with recordable electronic signal (analogical or digital) are required. Examples include pressure transducers, etc.
Monitoring frequency	Continuous unless differently specified in the underlying methodology
QA/QC procedures	Periodic calibration against a primary device must be performed periodically and records of calibration procedures must be kept available as well as the primary device and its calibration certificate. Pressure transducers (either capacitive or resistive) must be calibrated monthly. In case the pressure meter is not a capacitive or resistive pressure transducer, the calibration frequency of this monitoring equipment should be according to the manufacturer's specifications.
Purpose of data	Calculation of baseline emissions.
Additional comment	Provided all parameters are converted to normal conditions during the monitoring process, this parameter may not be needed except for moisture content determination and therefore it should be metered only

	when performing such measurements (with same frequency)

Data / Parameter	$P_{H2O,t,Sat}$
Unit	Pa
Description	Saturation pressure of H_2O at temperature Tt in time interval *t*
Source of data	Provided by project participants
Value(s) applied	n/a
Measurement methods and procedures	This parameter is solely a function of the gaseous stream temperature Tt and can be found at reference [1] for a total pressure equal to 101,325 Pa
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comment	[1] Fundamentals of Classical Thermodynamics; Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke; 4º Edition 1994, John Wiley & Sons, Inc.

Data / Parameter	Status of biogas destruction device
Unit	-
Description	Operational status of biogas destruction devices
Source of data	Provided by project participants
Value(s) applied	n/a
Measurement methods and procedures	Monitoring and documenting may be undertaken by recording the energy production from methane captured or the operation of the flare by means of a flame detector to demonstrate the actual destruction of methane, unless a different method is specified in the underlying

	methodology/tool. Emission reductions will not accrue for periods in which the destruction device is not operational.
Monitoring frequency	Continuous
QA/QC procedures	-
Purpose of data	(a) Calculation of baseline emissions or baseline net GHG removals by sinks;
Additional comment	For Flame detector devices refer to the methodological tool "Project emissions from flaring"

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2 /MWh
Description	CO_2 emission factor of the Brazilian grid electricity during the year y
Source of data	Brazilian DNA
Value(s) applied	0.1220
Measurement methods and procedures	The emission factor is calculated ex-post, as the weighted average of the dispatch data analysis OM (Operating Margin) and the BM (Build margin), as described in B.6.3.
Monitoring frequency	Annual
QA/QC procedures	Apply procedures in the "Tool to calculate the emission factor for an electricity system"
Purpose of data	(b) Calculation of project emissions or actual net GHG removals by sinks;
Additional comment	All data and parameters to determine the grid electricity emission factor, as required by the "Tool to calculate the emission factor for an electricity system", were included in the monitoring plan. For more details, see Annex 3.

Data / Parameter	$EF_{grid,OM,y}$
Unit	tCO_2 /MWh
Description	Operating margin emission factor of the Brazilian grid
Source of data	Calculations based on parameters described above.
Value(s) applied	0.4068
Measurement methods and procedures	The operating margin emission factor is calculated ex-post, as described in B.6.3.
Monitoring frequency	Annual
QA/QC procedures	Apply procedures in the "Tool to calculate the emission factor for an electricity system"
Purpose of data	(b) Calculation of project emissions or actual net GHG removals by sinks;
Additional comment	All data and parameters to determine the grid electricity emission factor, as required by the "Tool to calculate the emission factor for an electricity system", were included in the monitoring plan. For more details, see Annex 3.

Data / Parameter	TDL_y
Unit	-
Description	Average technical transmission and distribution losses in the grid in year *y* for the voltage level at which electricity is obtained from the grid at the project site.
Source of data	National Energy Balance

Value(s) applied	23.2%[39]
Measurement methods and procedures	For (a): *TDLj/k/l,y* should be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed CDM project activity is connected to. The technical distribution losses should not contain other types of grid losses (e.g. commercial losses/theft). The distribution losses can either be calculated by the project participants or be based on references from utilities, network operators or other official documentation
Monitoring frequency	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years
QA/QC procedures	-
Purpose of data	(b) Calculation of project emissions or actual net GHG removals by sinks;
Additional comment	The data was based on National Energy Balance – published on 2020 (data basis 2019).[40]

Data / Parameter	$T_{EG,m}$
Unit	°C
Description	Temperature in the exhaust gas of the enclosed flare in minute m
Source of data	Measurements by project participants
Value(s) applied	-

[39] National Energy Balance published on 2022 data basis 2021 (23.23% for 2021 is the most recent data). Source: https://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-675/topico-631/BEN_S%C3%ADntese_2022_PT.pdf

[40] National Energy Balance published on 2022 data basis 2021 (23.2% for 2021 is the most recent data). Source: https://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-675/topico-631/BEN_S%C3%ADntese_2022_PT.pdf

Measurement methods and procedures	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. A temperature above 850 °C indicates that a significant amount of gases are still being burnt and that the flare is operating. Data will be recorded continuously and values will be averaged hourly or at a shorter time interval.
Monitoring frequency	Once per minute
QA/QC procedures	Thermocouples will be replaced or calibrated every year
Purpose of data	(b) Calculation of project emissions or actual net GHG removals by sinks;
Additional comment	-

Data / Parameter	$Flame_m$
Unit	Flame on or Flame off
Description	Flame detection of flare in the minute m
Source of data	Project Participant
Value(s) applied	-
Measurement methods and procedures	Measurements by project participants using a continuous Ultra Violet flame detector
Monitoring frequency	Once per minute. Detection of flame recorded as a minute that the flame was on, otherwise recorded as a minute that the flame was off
QA/QC procedures	Equipment shall be maintained and calibrated in accordance with manufacturer's recommendations
Purpose of data	Calculation of baseline and project emissions when the flame is on[41]
Additional comment	-

[41] When the flame is off, neither baseline nor project emissions occurs since the LFG is not combusted and instead released to the atmosphere.

Data / Parameter	$Maintenance_y$
Unit	Calendar dates
Description	Maintenance events completed in year y
Source of data	Project participants
Value(s) applied	-
Measurement methods and procedures	Record the date that maintenance events were completed in year y. Records of maintenance logs must include all aspects of the maintenance including the details of the person(s) undertaking the work, parts replaced, or needing to be replaced, source of replacement parts, serial numbers and calibration certificates
Monitoring frequency	Annual
QA/QC procedures	Records must be kept in a maintenance log for two years beyond the life of the flare
Purpose of data	Calculation of baseline and project emissions when the flame is on[42]
Additional comment	Monitoring of this parameter is required for the case of flares and the project participant selects Option B to determine flare efficiency. These dates are required so that they can be compared to the maintenance schedule to check that maintenance events were completed within the minimum time between maintenance events specified by the manufacturer ($SPEC_{,flare}$).

SDG 7

Data / Parameter	$EG_{PJ,y} = EC_{BL,k,y}$

[42] When the maintenance is being carried out, neither baseline nor project emissions occurs since the LFG is not combusted and released to the atmosphere.

Unit	MWh
Description	Amount of electricity generated using LFG by the project activity in year y
Source of data	Measured by the project participant
Value(s) applied	

Year	$EG_{PJ,y}$ (MWh/year)
From 31/07/2020	33,204
2021	78,698
2022	78,698
2023	78,698
2024	78,698
Until 30/07/2025	45,494

Measurement methods and procedures	Monitor net electricity generation by the project activity using LFG The data will be collected continuously using an electricity meter. The net amount of electricity will be directly measured. The data will be archived throughout the crediting period and two years thereafter.
Monitoring frequency	Continuously
QA/QC procedures	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double checked by the electricity distribution company.
Purpose of data	Calculation of baseline emissions.
Additional comment	This parameter is required for calculating baseline emissions associated with electricity generation ($BE_{EC,y}$) using the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"

Data / Parameter	$EC_{PJ1,y} = EG_{EC1,y}$
Unit	MWh/y

Description	Quantity of electricity consumed from the grid by the project activity during the year y
Source of data	Electricity meter
Value(s) applied	

Year	$EG_{PJ,y}$ (MWh/year)
From 31/07/2020	1,579
2021	3,742
2022	3,742
2023	3,742
2024	3,742
Until 30/07/2025	2,163

Measurement methods and procedures	Continuously measured by electricity meters for the grid electricity consumption as per the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" and methodology ACM0001.
Monitoring frequency	Continuously
QA/QC procedures	As per the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"
Purpose of data	Calculation of project emissions.
Additional comment	The data will be archived throughout the crediting period and two years thereafter.

SDG 8

Data / Parameter	Total number of jobs
Unit	-
Description	Number of jobs generated by the project activity during the year y
Source of data	Project proponent

Value(s) applied	

Year	Jobs
From 31/07/2020	10
2021	10
2022	10
2023	10
2024	10
Until 30/07/2025	10

Measurement methods and procedures	Continuously measured by project proponent through employment records. The quality of the jobs created will also be monitored through payroll checks and other employee benefits.
Monitoring frequency	Continuously
QA/QC procedures	-
Purpose of data	Measurement of project benefits
Additional comment	-

SDG 4

Data / Parameter	Total number of people provided skill development training
Unit	-
Description	Number of persons trained
Source of data	Project proponent
Value(s) applied	

Year	Trainings
From 31/07/2020	0
2021	0
2022	0
2023	0
2024	19

	Until 30/07/2025	19	
Measurement methods and procedures	Continuously measured by project proponent through employee enrollment in skill development and capacity building courses sponsored by the project activity, as well as certificates and other evidences of completion of these courses. The total investment will also be monitored.		
Monitoring frequency	Continuously		
QA/QC procedures	-		
Purpose of data	Measurement of project benefits		
Additional comment	-		

B.7.2 Sampling plan

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Not applicable.

B.7.3 Other elements of monitoring plan

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The monitoring plan will be done according to the methodology ACM0001 and the applicable tools. The monitoring equipment locations are presented in the picture below:

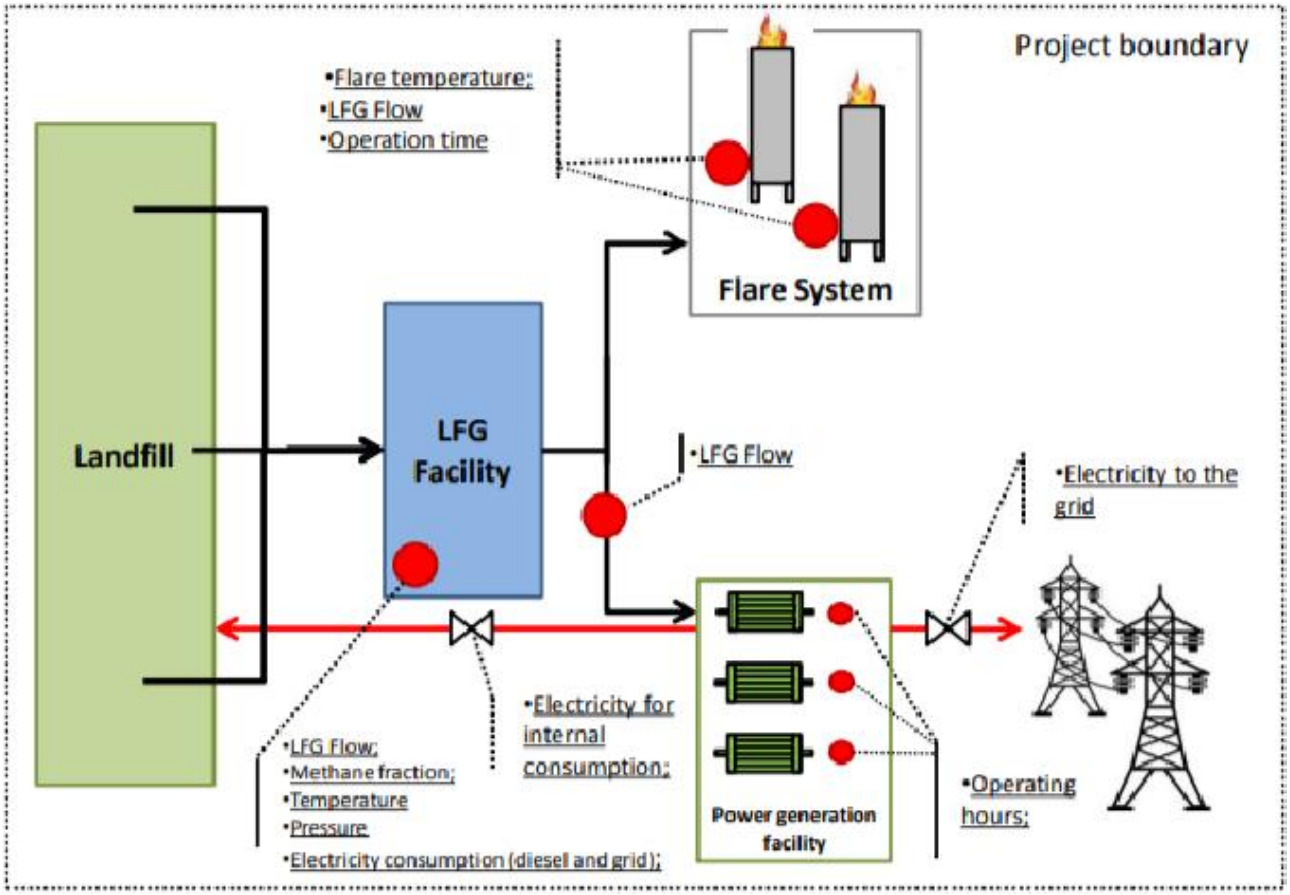

Figure 12 - Monitoring equipment locations

All continuously measured parameters (LFG flow, LFG CH4 concentration, flare temperature, flare operating hours, engine operating hours, and engine electrical output) will be recorded electronically via a datalogger, located inside the site boundary which will have the capability to aggregate and print the collected data in the frequencies range specified above. It will be the Site Operator responsibility to provide all requested data logs which will be stored during the reporting period at the Site office. The data logs will be summarized into emission reduction calculations prior to each verification. This task will be completed by Project Participant and reported directly to the DOE. These logs will be available to the DOE when requested in order to prove the operational integrity of the Project.

1. **Management Structure**

The collected operational data will be used to support the periodic verification report requiring CER auditing. The herein discussed monitoring plan has been designed to

meet or conservatively exceed the UNFCCC requirements (approved monitoring methodology ACM0001).

The monitoring program routine system required to determine emission reductions is discussed in section 2 below, while the additional system data collected to ensure the safe, correct, and efficient operation of the LFG management system is discussed in section 3.

1.1. Responsibility of the personnel involved

The personnel involved in the monitoring will be responsible for carrying out the following tasks:

- Supervise and verify metering and recording: The staff will internally coordinate with other departments the adequate verification of data metering and recording.
- Collection of sales/billing receipts and additional data: The staff will collect sales receipts and additional data such as daily operational reports of project
- Calibration: The staff will internally coordinate to ensure that calibration of the metering instruments will be carried out in accordance with the equipment manufacturers" specifications.
- Preparation of monitoring report: The staff will prepare the monitoring report for verification. - Data Archives: The staff will be responsible for keeping all monitoring data, and making it available to the DOE for the verification of the emission reductions.

1.2. Responsibility of the personnel involved

All meters will be installed in order to fulfill the proposed monitoring plan.

2. Monitoring Work Program

The LFG monitoring program is designed to collect system operating data required for the safe system operation and for the verification of CERs. This data is collected in real time, and will provide continuous recording which can be easily monitored, reviewed, and validated.

The following sections will outline and discuss the key elements of the monitoring program presented below:

- LFG Flow;
- LFG quality;
- Uncombusted methane;
- Electricity consumption;
- Project electricity output;
- Regulatory requirements;
- Data records;
- Data assessment and reporting.

2.1. LFG Flow

The data will be collected continuously using flow meters located in the piping leading to the flare, to the electricity generation plant and the other on the main piping measuring the total collected landfill gas. The data will be aggregated monthly and yearly for the flare. The data will be archived for a minimum of two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

The meter will be provided with a normalizer unit which normalizes the flow rate at standard temperature and pressure.

The equipment selected for the project activity will utilize a continuous monitoring system as defined in ACM0001, which measures and aggregates flow data.

2.2. LFG Quality

The concentration of methane will be measured via common sample line that runs to the main collection system piping and is measured in real time. The equipment selected for the site aggregates gas composition as per the definition of a continuous monitoring system in ACM0001.

Regular calibrations will be made according to manufacturer specification.

2.3. Uncombusted Methane

The efficiency of the enclosed flare will be measured per the methodological "Project emissions from flaring ".

2.4. Electrical Consumption

The consumed electricity from the grid by the project activity will be continuously measured by electricity meters for the grid. The respective data will be electronically recorded.

Monthly electrical bills charged to the project will be monitored and considered as the actual energy consumption for the project.

2.5. Project Electricity Output

The generated electricity used for the landfill internal consumption (i.e. administration offices, truck garage, recycling plant, leachate pumps), excluding the LFG facility electricity consumption by the project activity40 will be continuously measured by an electricity meter and respective data will be electronically recorded.

The electricity output crosscheck will be made using monthly electricity invoices. The substation is located into the project activity area. The distance between point of electricity generation and electricity distribution is negligible.

2.6. Regulatory Requirements

Regulatory requirements relating to LFG projects will be evaluated annually by investigating municipal, state and national regulations regarding the LFG. This will be done through consultation with the appropriate regulatory agencies, on-going discussions with regulators and monitoring of publications delineating upcoming legislative changes governing landfills and LFG.

2.7. Data Records

Data collected from each of the parameter sensors is transmitted directly to an electronic database. Backup of the electronic data will be carried out frequently. Calibration records will be kept for all instrumentation during 2 years after the end of the crediting period.

2.8. Data Assessment and Reporting

The record data will be daily analyzed by the LFG Plant Supervisor. If detected any inconsistency regarding monitoring parameter data, it will be reported in a log-book and the LFG Plant Supervisor along with the LFG Plant Manager will provide corrective actions, according to internal operational procedures.

Daily consolidated data will be sent by the LFG Plant Supervisor to the LFG Plant Manager through electronic reports. The data of the monitored parameters will be storage using internal system network.

The data will be compiled and assessed to produce the required quantification and validation. The periodic monitoring report will contain the data required for the verification of the CERs. The records of regular maintenance performed will also be a component of the verification reports.

3. Corrective actions

The staff will log all corrective actions and will report these in the monitoring report. In case when the corrective actions are considered necessary, these actions will be implemented according to internal procedures.

4. Procedures for monitoring personnel training

The PP will conduct a training and quality control program to ensure that the good management practices are carried out and implemented by all project operating personnel in terms of recordkeeping, equipment calibration, overall maintenance, and procedures for corrective action.

5. Emergency procedure

As a precautionary measure, it will be made regularly backups to avoid data loss due to power outages. The LFG Plant Manager will check daily the records. In addition, an emergency plan will be developed including other types of emergencies such as fire and *work accidents*.

6. Calibration

All the measurement instruments will be subject to regular calibration as per manufacturer's specifications or, when applicable, the calibration frequency will be defined by the PP. The regular check and calibration will be made by the operators. The LFG Plant Manager will be responsible for checking the equipment's proper working conditions, as well as checking and storing up the calibration certificates and records. Calibration certificates will be kept for all the equipment during the crediting period and two years after.

SECTION C. DURATION AND CREDITING PERIOD

C.1. Duration of project

>>

C.1.1 Start date of project

>>

Project starting date: 31/07/2013.

The starting date of the project activity is the date of signature of the purchasing agreement[43] of the main equipment.

C.1.2 Expected operational lifetime of project

[43] 1 Agreement sent to DOE

>>

25 years and 0 months

C.2. Crediting period of project

C.2.1 Start date of crediting period

>>

The 2nd crediting period will start on 31/07/2020.

C.2.2 Total length of crediting period

>>

From 31/07/2020 to 30/07/2025.

SECTION D. SUMMARY OF SAFEGUARDING PRINCIPLES AND GENDER SENSITIVE ASSESSMENT

D.1 Safeguarding Principles that will be monitored

A completed Safeguarding Principles Assessment is in Appendix 1, ongoing monitoring is summarised below.

Principles	Mitigation Measures added to the Monitoring Plan
Principle 6.1 Labour Rights	Refer to the monitoring parameter "Total number of jobs" in Section B.7.1.

The following additional monitoring parameters related to Safeguarding 6.1 will be included the monitoring reports:

Data / Parameter	Prevention of work accidents
Unit	-
Description	Stablishes the directives to mitigate environmental and occupational risks for the employees.
Source of data	Project participant. Based on Program of Medical Control and Occupational Health (PCMSO) and on Environmental Risk Prevention Program (PPRA) or Risk Management Program (PGR)
Value(s) applied	2023: PGR and PCMSO registered for 7 employees
Measurement methods and procedures	Based on the directives included in both the Program of Medical Control and Occupational Health (PCMSO) and the Environmental Risk Prevention Program (PPRA) or Risk Management Program (PGR).
Monitoring frequency	Programs will be revised every year in order to incorporate any necessary improvements.
QA/QC procedures	-
Purpose of data	
Additional comment	Safeguarding Principles 3 and 6.1.

Data / Parameter	Total number of employee having landfill gas technology and power plant related trainings (onsite and in Europe) and total technology equipment imported
Unit	-

Description	Parameter refers to the process of transferring skills, knowledge, technologies, methods of manufacturing, samples of manufacturing and facilities
Source of data	Human Resources department.
Value(s) applied	To be determined annually
Measurement methods and procedures	Number of employees receiving technical training related to the operation of the project (landfill gas collection and flaring/utilization)
Monitoring frequency	Trainings will be conducted every year.
QA/QC procedures	-
Purpose of data	-
Additional comment	Safeguarding Principle 6.1.

Data / Parameter	Number of employees having Safety Trainings
Unit	-
Description	Provide sufficient training of concerned employees in the functioning and management of the project activity, such as Fire Brigade Training Courses. That is pre-condition for the successful implementation of the project and empowers and builds up capacity of workers.
Source of data	Human Resources department.
Value(s) applied	To be determined annually
Measurement methods and procedures	Based on the directives included in the Program of Medical Control and Occupational Health (PCMSO).
Monitoring frequency	Programs will be revised every year in order to incorporate any necessary improvements.
QA/QC procedures	-
Purpose of data	-
Additional comment	Safeguarding Principles 6.1.

D.2. Assessment that project complies with GS4GG Gender Sensitive requirements

Question 1 - Explain how the project reflects the key issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy.	As an LFG collection and utilization, the project does not adversely impact women or men. All the key gender issues and requirements of GS4GG are	

	respected, as well as Brazilian laws, principles and guidelines which deal with gender equality. The project provides employment opportunities equally for men and women.	
Question 2 - Explain how the project aligns with existing country policies, strategies and best practices.	The project complies with the requirements of gender equality, as it is under the jurisdiction of Brazilian legislation. Article 5 of the Brazilian Constitution[44] declares women equal to men in all legal respects, explicitly stating that "men and women have equal rights and duties under the terms of this Constitution." The law Nº 7.35345 of 1985 established the National Council on Women's Rights, which advocated successfully on behalf of including gender conscious legislation in the updated constitution of 1988. Moreover, the Consolidation of Labour Laws (CLT)[46], which regulates labour relations in Brazil, prohibits gender-based wage discrimination (Article 461, §1º) and ensures equal rights for men and women in the workplace.	

[44] https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm

[45] http://www.planalto.gov.br/ccivil_03/leis/1980-1988/L7353.htm

[46] https://www.planalto.gov.br/ccivil_03/decreto-lei/del5452.htm

Question 3 - Is an Expert required for the Gender Safeguarding Principles & Requirements?	No. The project is an LFG collection and utilization initiative, and it does not discriminate among gender nor reduce access to or control of resources for women. The Project beneficiaries in terms of employment and social upliftment of the area are common for both the gender and it does not involve any kind of discrimination in any form.	
Question 4 - Is an Expert required to assist with Gender issues at the Stakeholder Consultation?	A Stakeholder's consultation was held in the year 2022 by following the applicable requirements for Gold Standard Projects valid at the time. Since the project complies with all the requirements of "Principle 2 – Gender Equality and Women's Rights" from the currently valid version of the GS4GG "Safeguarding Principles and Requirements", no Expert is required to assist with Gender issues at the Stakeholder Consultation.	

SECTION E. SUMMARY OF LOCAL STAKEHOLDER CONSULTATION

The below is a summary of the 2 step GS4GG Consultation for monitoring purposes. Please refer to the separate Stakeholder Consultation Report for a complete report on the initial consultation and stakeholder feedback round.

E.1 Summary of stakeholder mitigation measures

>>

The project implementer sent the letters in October 2023, and obtained a receipt confirmation for all of them. On the letters, there was an invitation to see the project activity and to send any comments or questions to the project activity implementer. After the submission of the letters, the company received no comments from any of the stakeholders and the period for consultations was deemed closed at the end of the following month.

The performed Local Stakeholder Consultation (LSC) audience/meeting took place at a meeting room located at the CTR Macaúbas landfill on 28/11/2023.

Further details about the people invited and attendants of the meeting are presented in the Stakeholder Consultation Report (which is being submitted along with this revised version of the GS4GG Transition request form + PDD).

E.2 Final continuous input / grievance mechanism

Method	Include all details of Chosen Method (s) so that they may be understood and, where relevant, used by readers.
Continuous Input / Grievance Expression Process Book (mandatory)	The process book has been located in the project activity as the stakeholders's chosen place Project Participant will be checking the comments in the book on a regular basis, and record responses. They will be respectful to the views of stakeholders and suggest alternative solutions or compromises wherever possible. It is chosen as main mechanism.

GS Contact (mandatory)	help@goldstandard.org
Other	Vital Engenharia Ambiental S.A. Santa Luzia Street, 651 – Centre, Santos Dumont Building, Rio de Janeiro, RJ – Brazil +55 (21) 2131-7204 neiber.silva@vitalambiental.com.br https://www.vitalambiental.com.br/

APPENDIX 1 - SAFEGUARDING PRINCIPLES ASSESSMENT

>> Fill this section

Complete the Assessment below and copy all Mitigation Measures for each Principle into SECTION D above. Please refer to the instructions in the Guide to Completing this Form.

Assessment Questions/ Requirements	Justification of Relevance (Yes/potentially/no)	How Project will achieve Requirements through design, management or risk mitigation.	Mitigation Measures added to the Monitoring Plan (if required)
Principle 1. Human Rights			
1. The Project Developer and the Project shall respect internationally proclaimed human rights and shall not be complicit in violence or human rights abuses of any kind as defined in the Universal Declaration of Human Rights	No	1. The project respects internationally proclaimed human rights. Brazil has its own legislation[47] in place prohibiting the violation of the human rights principle and it actively enforces the compliance of such principle. Brazil has ratified two UN human rights treaties:	Not applicable

[47] https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2014/lei/l12986.htm

2. The Project shall not discriminate with regards to participation and inclusion		- the International Covenant on Civil and Political Rights[48] - the International Covenant on Economic, Social, and Cultural Rights[49]. 2. The project does not discriminate with regards to participation and inclusion. The project is under conformance with national and international rules of equality and does not involve nor is complicitly in any form of discrimination.	
Principle 2. Gender Equality			

[48] https://treaties.un.org/Pages/ViewDetails.aspx?chapter=4&clang=_en&mtdsg_no=IV-4&src=IND

[49] https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=IV-3&chapter=4&clang=_en

1. The Project shall not directly or indirectly lead to/contribute to adverse impacts on gender equality and/or the situation of women 2. Projects shall apply the principles of non-discrimination, equal treatment, and equal pay for equal work 3. The Project shall refer to the country's national gender strategy or equivalent national commitment to aid in assessing gender risks 4. (where required) Summary of opinions and recommendations of an Expert Stakeholder(s)	No	1. The project does not decrease women´s access to or control of resources. The project participants do not discriminate on gender and support gender equality. 2 - The project offers equal opportunities for women and men to contribute both in volunteer and working positions. The project does not involve and is not complicit in any form of discrimination based on gender, race, religion, sexual orientation or any other basis. The National Council on Women's Rights, formed in 1975, advocated successfully on behalf of including gender conscious legislation in the updated constitution of 1988. 3 - The project complies with the requirements of gender equality, as it is under the	Not applicable

		jurisdiction of Brazilian legislation. Article 5 of the Brazilian Constitution[50] declares women equal to men in all legal respects, explicitly stating that "men and women have equal rights and duties under the terms of this Constitution." The law Nº 7.353[51] of 1985 established the National Council on Women's Rights, which advocated successfully on behalf of including gender conscious legislation in the updated constitution of 1988. Moreover, the Consolidation of Labour Laws (CLT)[52], which regulates labour relations in Brazil, prohibits gender-based wage discrimination (Article 461, §1º) and ensures equal	

[50] https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm
[51] http://www.planalto.gov.br/ccivil_03/leis/1980-1988/L7353.htm
[52] https://www.planalto.gov.br/ccivil_03/decreto-lei/del5452.htm

		rights for men and women in the workplace. 4 – Not required for the project activity.	
Principle 3. Community Health, Safety and Working Conditions			
1. The Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community	No	There are no perceived health risks to the local communities due to the project activity. The project participants are committed to apply safe and healthy working conditions for all employees during all phases of the project.	Not applicable
Principle 4.1 Sites of Cultural and Historical Heritage			
Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture?	No	No cultural heritage was observed on the project site prior to the implementation of the landfill (as confirmed in the EIA Report) or the project.	Not applicable
>>			
Principle 4.2 Forced Eviction and Displacement			
Does the Project require or cause the physical or economic	No	The project activity is within the area of an existing landfill,	Not applicable

relocation of peoples (temporary or permanent, full or partial)? >>		which obtained prior approval from the local environmental authority for its implementation. As demonstrated in the EIA Report, the construction of the landfill (and subsequently of the project) did not require or cause the physical or economic relocation of people (temporary or permanent, full or partial).	
Principle 4.3 Land Tenure and Other Rights			
a. Does the Project require any change, or have any uncertainties related to land tenure arrangements and/or access rights, usage rights or land ownership? b. For Projects involving land use tenure, are there any uncertainties with regards to land tenure, access rights, usage rights or land ownership? >>	No	The project does not require any change, or have any uncertainties related to land tenure arrangements and/or access rights, usage rights or land ownership.	Not applicable
Principle 4.4 - Indigenous people			

Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples? >>	No	There are no indigenous people or group identified within the area of influence of the Project, as confirmed in the EIA Report for the CTR Macaúbas landfill.	Not applicable
Principle 5. Corruption			
1. The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects	No	The project does not involve, is not complicit nor inadvertently contributes to any kind of corruption.	Not applicable
Principle 6.1 Labour Rights			
1. The Project Developer shall ensure that all employment is in compliance with national labour occupational health and safety laws and with the principles and standards embodied in the ILO fundamental conventions	Potentially	1 – The project participants are committed to apply safe and healthy working conditions for all employees during all phases of the project. All employees of the project are protected by the Brazilian Federal set of labour regulations denominated Consolidation of Labour Laws	Refer to parameter "Number of employment".

2. Workers shall be able to establish and join labour organisations 3. Working agreements with all individual workers shall be documented and implemented and include: a) Working hours (must not exceed 48 hours per week on a regular basis), AND b) Duties and tasks, AND c) Remuneration (must include provision for payment of overtime), AND d) Modalities on health insurance, AND e) Modalities on termination of the contract with provision		(CLT)[53], which represents the regulatory framework that regulates labour relations in Brazil, and the principles and standards embodied in the International Labour Organization (ILO) fundamental conventions. Law compliance is subject to governments inspection and ruling. 2 - The rights to establish and join labour organizations or unions are protected by Brazilian Labour Laws. The project fully respects the employees' rights in accordance with all labour related laws endorsed in Brazil. 3 - Working agreements between the company and individual workers are	

[53] https://www.planalto.gov.br/ccivil_03/decreto-lei/del5452.htm

for voluntary resignation by employee, AND f) Provision for annual leave of not less than 10 days per year, not including sick and casual leave. 4. No child labour is allowed (Exceptions for children working on their families' property requires an Expert Stakeholder opinion) 5. The Project Developer shall ensure the use of appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency		documented and implemented, including working hours, duties and tasks, remuneration, modalities on health insurance, modalities on termination of contract, provision for annual leave, etc., always under conformance with applicable regulations and best practice The employment model applied is locally, nationally and culturally appropriate. 4. Brazil has published laws for the protection of children[54], which also includes employment regulations. The project requires skilled employees and it does not employ and is not complicit in any form of child labour.	

[54] https://www.planalto.gov.br/ccivil_03/leis/l8069.htm

preparedness and response measures		5. The project is operated in accordance with the applied working procedures and safety regulation rules and best practice. The project organizes employee training with topics on technical, environmental/safety code, and operational/maintenance procedures. Thus, the project participants ensure the use of appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures.	
Principle 6.2 Negative Economic Consequences			
1. Does the project cause negative economic consequences during and after project implementation?	No	The Project does not cause negative economic consequences.	Not applicable.
>>			
Principle 7.1 Emissions			

Will the Project increase greenhouse gas emissions over the Baseline Scenario? >>	No	The project will reduce greenhouse gas emissions as it avoids methane from being freely emitted into the atmosphere and it also displaces equivalent amount of electricity that would be otherwise generated from fossil fuel fired power plants.	Not applicable
Principle 7.2 Energy Supply			
Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users? >>	No	The Project will supply electricity to the national electricity grid of Brazil. It may consume grid-sourced electricity whenever the power plant is temporarily out of operation. It therefore does not use energy source from a local grid or power supply or fuel resource that provides for other local users.	Not applicable
Principle 8.1 Impact on Natural Water Patterns/Flows			
Will the Project affect the natural or pre-existing pattern of watercourses, ground-water and/or the watershed(s) such	No	The Project will not affect the natural or pre-existing pattern of watercourses, groundwater and/or the watershed(s) such	Not applicable

as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity? >>		as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity. Nonetheless, the parameters and conditions established in the operational license for the CTR Macaúbas landfill (which include drainage of the leachate generated at the landfill) are regularly inspected by the local environmental authority.	
Principle 8.2 Erosion and/or Water Body Instability			
a. Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion? b. Is the Project's area of influence susceptible to excessive erosion and/or water body instability? >>	No	The impact of the project on erosion and/or in the water body is negligible. As also demonstrated in the EIA Report for the construction of the landfill, the project's area of influence is not susceptible to excessive erosion and/or water body instability.	Not applicable
Principle 9.1 Landscape Modification and Soil			
Does the Project involve the use of land and soil for	No	The project is a LFG recovery and utilization project and it	Not applicable

production of crops or other products? >>		does not involve the use of land and soil for production of crops or other products.	
Principle 9.2 Vulnerability to Natural Disaster			
Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions? >>	No	The Project is not susceptible to and does not lead to increased vulnerability to extreme climatic conditions.	Not applicable
Principle 9.3 Genetic Resources			
Could the Project be negatively impacted by or involve genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development, or take place in facilities or farms that include GMOs in their processes and production)? >>	No	The project activity is a LFG utilization project with no involvement genetically modified organisms or GMOs.	Not applicable
Principle 9.4 Release of pollutants			

Could the Project potentially result in the release of pollutants to the environment? >>	No	As a LFG recovery and destruction/utilization project, it actually reduces emissions of pollutants to the atmosphere.	Not applicable
Principle 9.5 Hazardous and Non-hazardous Waste			
Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials? >>	No	The project does not involve the manufacture, trade, release, and/or use of hazardous and non-hazardous chemicals and/or materials.	Not applicable
Principle 9.6 Pesticides & Fertilisers			
Will the Project involve the application of pesticides and/or fertilisers? >>	No	The Project does not involve the application of pesticides and/or fertilizers.	Not applicable
Principle 9.7 Harvesting of Forests			
Will the Project involve the harvesting of forests? >>	No	Project does not involve the harvesting of forests.	Not applicable
Principle 9.8 Food			
Does the Project modify the quantity or nutritional quality	No	The Project does not modify the quantity or nutritional	Not applicable

of food available such as through crop regime alteration or export or economic incentives?		quality of food available such as through crop regime alteration or export or economic incentives.	
>>			
Principle 9.9 Animal husbandry			
Will the Project involve animal husbandry?	No	The Project does not involve animal husbandry.	Not applicable
>>			
Principle 9.10 High Conservation Value Areas and Critical Habitats			
Does the Project physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified?	No	As demonstrated in the EIA Report for the construction of the CTR Macaúbas landfill, this landfill (and consequently the project) does not physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified.	Not applicable
>>			
Principle 9.11 Endangered Species			
a. Are there any endangered species identified as potentially being present within the	No	As demonstrated in the EIA Report for the construction of the CTR Macaúbas landfill,	Not applicable

Project boundary (including those that may route through the area)? b. Does the Project potentially impact other areas where endangered species may be present through transboundary affects?		there are no endangered species identified as potentially being present within the project boundary (including those that may route through the area of the landfill), and the project would not potentially impact other areas where endangered species may be present through transboundary affects.	
>>			

APPENDIX 2- CONTACT INFORMATION OF PROJECT PARTICIPANTS

>> Fill this section

Organization name	Vital Engenharia Ambiental S.A.
Registration number with relevant authority	
Street/P.O. Box	Santa Luzia Street, 651 - Centre
Building	Santos Dumont Building
City	Rio de Janeiro
State/Region	RJ
Postcode	20030-130
Country	Brazil
Telephone	+55 (21) 2131-7204
E-mail	
Website	https://www.vitalambiental.com.br/
Contact person	Neiber Rodrigues da Silva
Title	Manager
Salutation	Mr.
Last name	Da Silva
Middle name	Rodrigues
First name	Neiber
Department	
Mobile	
Direct tel.	
Personal e-mail	neiber.silva@vitalambiental.com.br

APPENDIX 4-SUMMARY OF APPROVED DESIGN CHANGES

Please refer to Design Change Requirements for more information on procedures governing Design Changes.

Revision History

Version	Date	Remarks
1.0	10 July 2017	Initial adoption