Validation Report

Canhanduba Landfill Project

GLC Report No: 307, Rev. 14a

Germanischer Lloyd Certification GmbH • Brooktorkai 18 • 20457 Hamburg • Germany
Handelsregister Hamburg, Abt. B., Nr. 52078

Validation Report

GLC Report No. 307, Rev. 14a

Organisational Unit Germanischer Lloyd Certification GmbH (GLC), Greenhouse Gas Services			
Client Itajaí Biogás e Energia S.A.	Client reference person Eduardo Covas Barrionuevo		
Summary:			
Project Name:	Canhanduba Landfill Project		
Project Country:	Brazil		
		Involvement of Party as PP:	
Project's Host Country(ies):	Brazil	☐ Yes	☒ No
Annex I Country(ies):	Not yet identified	☐ Yes	☐ No
Sectoral Scope, Technical Area	CDM Sectoral Scope 13, Technical Area 13.1		
Methodology(ies) / Version(s):	ACM0001 (version 13): Flaring or use of landfill gas		
Project Size:	☒ Large Scale	☐ Small Scale	
ER Estimation:	547,881 tCO_2e (total during the whole crediting period)	78,269 tCO_2e (average value per year)	
Crediting Period:	☐ Fixed (10 years)	☒ Renewable (7 years)	
Start date the crediting period:	2014-07-01 or considered date of registration, whichever is later		
Validation opinion:	☒ Positive ☐ Negative Note: The only changes made to this version of the Validation Report when compared to the Validation Report rev. no. 14 dated 2014-01-21 (which is referred to in the issued Letter of Approval (LoA) of the DNA of Brazil) are information related to the status of issuance and assessment of the LoA issued by the DNA of Brazil including *inter alia* the written approval of voluntary participation from the DNA of Brazil and the confirmation that the project activity assists Brazil in achieving Sustainable Development. No participating Annex I Party is yet identified.		
Project Assessment Team: Marco A. Ratton Benedikt Maibaum	**Technical Review Team:** Anu Chaudhary	**Approval by:** Markus Weber	
Date of this revision: 2014-04-11	Revision No. 14a	Number of pages 228	

Mode of Distribution:

☒ No distribution without permission from the client or responsible organisational unit ☐ Limited distribution ☐ Unrestricted distribution

History of report revisions:

Rev.	Date	**Person** (short sign or name)	**Function**	**Action**
01	2013-04-08	Marco A. Ratton	Assessment Team Leader	Preparation of Draft Report
02	2013-05-20	Anu Chaudhary	Technical Reviewer	Review with corrections and comments
03	2013-07-25	Marco A. Ratton	Assessment Team Leader	Review of the report in order to address comments from the Technical Reviewer.
04	2013-08-20	Anu Chaudhary	Technical Reviewer	Review of revised documents
05	2013-08-23	Marco A. Ratton	Assessment Team Leader	Review of the report in order to address comments from the Technical Reviewer.
06	2013-08-26	Anu Chaudhary	Technical Reviewer	Review and closure of comments
07	2013-08-27	Marco A. Ratton	Assessment Team Leader	Review of the report in order to address comments from the Technical Reviewer.
08	2013-08-28	Anu Chaudhary	Technical Reviewer	Review of revised documents
09	2013-09-09	Markus Weber	Final Reviewer and approver	Final reviewed and approved
10	2014-01-08	Marco A. Ratton	Assessment Team Leader	Review of the report in order to address corrections due to the new crediting period.
11	2014-01-08	Anu Chaudhary	Technical Reviewer	Review of changes made according to new Crediting period
12	2014-01-15	Marco A. Ratton	Assessment Team Leader	Review of the report in order to address comments from the Technical Reviewer.
13	2014-01-16	Anu Chaudhary	Technical Reviewer	Review of revised documents and closure of comments
14	2014-01-21	Markus Weber	Final Reviewer and approver	Final reviewed and approved
14a	2014-04-11	Marco A. Ratton / Markus Weber	Assessment Team Leader / Final reviewer and approval	Information related to the status of issuance and assessment of the Letter of Approval (LoA) from the DNA of Brazil (including the written approval of voluntary participation from the DNA of Brazil and the confirmation that the project activity assists Brazil in achieving Sustainable Development) was added by the Assessment Team Leader + final reviewer approval.

Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB	CDM Executive Board (the board)
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification request
CMP	Meeting of the Parties to the Kyoto Protocol
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COP/MOP	The Conference of the Parties to the United Nations Framework Convention on Climate Change serving as the Meeting of the Parties to the Kyoto Protocol
DNA	Designated National Authority
DOE	Designated Operation Entity
EIA	Environmental Impact Assessment
FAR	Forward Action Request
FOD	First Order Decay
GSC	Global Stakeholder Consultation
GHG	Greenhouse gas
GLC	Germanischer Lloyd Certification GmbH
GWP	Global Warming Potential
HDPE	High density polyethylene
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardization
LFG	Landfill gas
LoA	Letter of Approval
LPNRS	Law for the National Policy on Solid Waste Management
MoC	Modalities of Communication
MSW	Municipal Solid Waste
NGO	Non-governmental Organisation
NPV	Net present value
ODA	Official development assistance
O&M	Operation and maintenance
PDD	Project Design Document
PNRS	National Policy on Waste Management
PP	Project Participant (s)
SWDS	Solid Waste Disposal Site
UNFCCC	United Nations Framework Convention on Climate Change
VVS	CDM Validation and Verification Standard

Table of Contents **Page**

1 INTRODUCTION 7

1.1 Objective 7

1.2 Scope and Criteria 7

2 VALIDATION TEAM 8

2.1 Assessment Team 8

2.2 Technical Review Team and Approval 9

3 METHODOLOGY 10

3.1 Desk Review of the Project Design Documentation and Supporting Documents 10

3.2 On-Site Assessment and Follow-Up Interviews with Project Stakeholders 10

3.3 Resolution of Clarification and Corrective Action Requests 11

4 VALIDATION REPORTING 14

4.1 Global Stakeholder Consultation 14

4.2 Participation and Authorisation 14

4.3 Contribution to Sustainable Development 15

4.4 Modalities of Communications 15

4.5 Project Design Document 16

4.6 Description of Project Activity 16

4.7 Application of the Selected Baseline and Monitoring Methodology 20
4.7.1 Applicability of the Selected Methodology to the Project Activity 20
4.7.2 Project Boundary 27
4.7.3 Baseline Scenario Identification and Description 29
4.7.4 Algorithms / Formulae used to Determine Emission Reduction 35

4.8 Additionality of the Project Activity 53
4.8.1 Assessment of Prior Consideration of the Clean Development Mechanism 53
4.8.2 Identification of Alternatives 54
4.8.3 Investment Analysis 55
4.8.4 Barrier Analysis 63
4.8.5 Common Practice Analysis 63

4.9 Monitoring Plan 66

4.10 Environmental Impacts 79

4.11 Local Stakeholder Consultation 79

4.12 Validation requirements specific for small-scale project activities 82
4.12.1 Project Activity Eligibility 82
4.12.2 Debundling 82
4.12.3 Additionality 82

5. VALIDATION OPINION 83

6. REFERENCES 85

ANNEX A: VALIDATION QUESTIONNAIRE AND RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS (LIST OF FINDINGS) 93

ANNEX B: FINANCIAL PARAMETERS 220

ANNX C: CERTIFICATES OF COMPETENCE..... 210

ANNEX D: MINUTES (REPORT) OF MEETING FOR THE OCCURRED PUBLIC AUDIENCE DATED 2013-07-19 WITH THE GOAL OF PRESENTING THE PROPOSED CDM PROJECT ACTIVITY CANHANDUBA LANDFILL PROJECT TO THE GENERAL PUBLIC AND TO SELECTED LOCAL STAKEHOLDER (+ TRANSLATION INTO ENGLISH LANGUAGE)..... 224

1 INTRODUCTION

Itajaí Biogás e Energia S.A. has commissioned Germanischer Lloyd Certification GmbH (GLC) to perform the validation assessment for the proposed CDM project activity "Canhanduba Landfill Project" in Brazil (hereafter called "the project"). This Validation Report summarizes the findings of the validation assessment of the proposed CDM project activity, which was performed by GLC on the basis of applicable UNFCCC criteria and requirements for the CDM validation assessment, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions made by COP/MOP and the CDM Executive Board (CDM-EB).

1.1 Objective

The purpose of a CDM validation assessment is to have an independent third party assessing the project design and its compliance with applicable CDM eligibility and methodological requirements. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant applicable UNFCCC and host Party criteria are all validated in order to confirm that the project design, as documented, is sound, reasonable and meets the identified criteria. Validation is a requirement for all proposed CDM projects and it is seen as necessary to provide assurance to stakeholders of the quality and integrity of a CDM project and its forecasted generation of certified emission reductions (CERs).

1.2 Scope and Criteria

The validation scope is defined as an independent and objective review of Project Design Document (PDD) and supporting documentation for the proposed CDM project activity. As part of the validation assessment, the PDD and supporting documentation are reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM Modalities and Procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board, including the approved consolidated baseline and monitoring methodology ACM0001 (version 13) /5/ and applied methodological tools. The validation assessment was performed based on the recommendations and guidance of the Validation and Verification Standard (VVS) /4/.
The validation assessment is not meant to provide any consulting towards the project participant. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design and its description in the PDD.

2 VALIDATION TEAM

2.1 Assessment Team

A competent validation team with relevant knowledge and experience in the specific sectoral scopes and project activity was appointed by GLC. Furthermore, the appointment of the team takes into account required local relevant knowledge about host country and knowledge about general requirements for validating the project activity design. The assessment team can be composed of an Assessment Team Leader (ATL), auditors (A) and host country or technical expert (TE). Table 1 below shows the composition of the assessment team, the qualification of the team members and their functions.

Table 1: Validation team

Name	Function [1)]	Sectoral scope specific knowledge	Technical area specific knowledge	Local knowledge	Type of involvement				
					Desk review	On-site visit / interviews	Reporting	Supervision of work	Expert input
Mr. Marco A. Ratton	ATL, FE, LE			X	X	X	X	X	X
Mr. Benedikt Maibaum	TE	X	X		X		X		X

A	Auditor	FE	Financial expert	T-ATL	Trainee ATL
ATL	Assessment team leader	LE	Local expert	T-A	Trainee auditor
				TE	Technical expert

2.2 Technical Review Team and Approval

Prior to submitting the final Validation Report to the CDM-EB of the UNFCCC, a technical review of the whole validation assessment (including the draft report) is carried out by an appointed technical review (TR) team. The TR team is composed of person(s) with proven competence in the technical area the project activity falls under. Each member of the review team is independent to the validation assessment.
The complete assessment prepared by the validation team is checked and, if required, adjusted prior to have compliance with all applicable requirements finally confirmed by the TR team. The members of the TR team and the person responsible for approval of the report are found in the table below:

Table 2: Technical review and approval team

Name	Function [2)]	Technical area specific knowledge	Sectoral scope specific knowledge	Supervision of work
Mrs Anu Chaudhary	R	X	X	X
Mr. Markus Weber	AP			X

AP Approver
FR Final reviewer
TE Technical expert
T-R Trainee reviewer
R Reviewer

3 METHODOLOGY

The validation assessment consists of the following three phases:
I desk review of the project design documentation and supporting documents
II on-site assessment and follow-up interviews with project stakeholders
III resolution of outstanding issues and the elaboration of the final Validation Report which includes the GLC's validation opinion

This version of the Validation Report summarizes the assessment after all phases of the validation. The following sections outline each step.

3.1 Desk Review of the Project Design Documentation and Supporting Documents

The initial version of the PDD /1/ as well as supporting documents are assessed in the context of an initial desk review in order to verify the correctness, credibility and interpretation of presented information. A further crosscheck of information provided was done by using information from other sources as available.

The performed initial desk review was based on the first version of the PDD /1/ made available to GLC (version 2) which were uploaded for Global Stakeholder Consultation (GSC). A list of documentation reviewed as part of the validation assessment is presented in section 6.

3.2 On-Site Assessment and Follow-Up Interviews with Project Stakeholders

On 2013-01-03 and 2013-01-04, Mr. Marco A. Ratton from GLC's validation team conducted an on-site visit to the Canhanduba landfill which is located to the Southwest of the city of Itajaí in Santa Catarina State, Brazil. As part of the performed on-site visit, the project site was observed, documents were assessed/reviewed and interviews with operative and management staff of the Canhanduba Landfill were performed in order to confirm selected information and to resolve issues earlier identified during the desk review phase of the validation assessment.

Interviewed persons are summarized in the Table 3. The main topics of the performed interviews are the following:
- Amount and type of municipal solid waste (MSW) disposed at the Canhanduba landfill;
- Project design and applied technology;
- Demonstration of additionality (including demonstration of prior consideration of the CDM);
- GHG emission reduction calculations (including *ex-ante* estimation of emission reductions);
- Application of the monitoring methodology (including the expected design and application of the monitoring plan);
- Global and local stakeholder consultation process;
- Project overview, and detailed explanation about the project's relevant technical aspects;
- Project implementation schedule;
- Assessment of environmental aspects, environmental licensing and legal compliance of both the proposed project activity and the Canhanduba landfill with applicable environmental legislation;

- Determination of the baseline scenario (including assessment of applicable regional and national legal requirements in Brazil for LFG management and applicable operational LFG management requirements in the particular case of the Canhanduba landfill);
- Procedure applied by the Designated National Authority (DNA) of Brazil for issuance of the Letter of Approval (LoA) for the proposed CDM project activity and expected time schedule.

Table 3: Interviewed persons

Name	Organization/Function
Mr. Eduardo Covas Barrionuevo	Itajaí Biogás e Energia S.A., Director
Mr. Nuno Barbosa	Unicarbo Energia e Biogás Ltda. Director

3.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation assessment was to resolve outstanding issues (issues that require further elaboration, research or expansion) in order to determine whether the project activity meets the CDM requirements, and can achieve credible emission reductions. Such issues needed to be clarified prior to GLC's positive conclusion on the project design as described in the Project Design Document (PDD) and supporting documentation.

In order to ensure transparency, an earlier designed validation questionnaire was customised for the project activity, as per the latest version of the Validation and Verification Standard (VVS) /4/.This questionnaire shows in transparent manner UNFCCC's requirements, source, means and findings of validation as well as the results from validating the identified criteria. As part of the validation assessment, the validation questionnaire serves the following purposes:

- It organises, details and clarifies the requirements a CDM project activity expected to meet;
- It ensures a transparent validation process where the validation team will document how a particular requirement was validated and the result of such validation.

The Validation Questionnaire consists of one table with sub-sections. These sections are related to the different topics which have to be assessed, checked and confirmed by the GLC's validation team with respect to the UNFCCC'S requirements. The completed Validation Questionnaire for the Canhanduba Landfill Project is enclosed in Annex A to this report. The different columns of this questionnaire are explained in Table 4.

Findings established during the validation assessment can either be seen as a non-fulfilment of criteria of the applicable CDM baseline and monitoring methodology, and/or applicable criteria of the CDM or where a risk to the fulfilment of project objectives is identified.

In accordance with the latest version of the Validation and Verification Standard (VVS) /4/, Corrective Action Requests (CAR) are issued, where:

i) the project participant have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions; or
ii) applicable baseline and monitoring methodology, and/or applicable criteria of the CDM have not been met; or
iii) there is a risk that emission reductions cannot be monitored or calculated or that the project would not be accepted as CDM project activity

Also in accordance with the latest version of the Validation and Verification Standard (VVS) /4/, a Request for Clarification (CL) may be raised in cases provided information is insufficient or not clear enough to determine whether a specific applicable CDM requirement was met or where additional information is needed to fully clarify a particular issue.

The validation questionnaire also includes a list of findings which consists of rows for each Corrective action requests (CAR) and request for clarification (CL) raised. The content of each row is described in Table 5. To guarantee the required transparency of the validation assessment, all concerns raised by GLC and the responses provided by the project proponents are also fully documented in the list of findings (Resolution of Corrective Action and Clarification Requests including list of Forward Action Requests) in Annex A of this report.

Forward Action Requests (FARs) are issued during validation to highlight issues related to project implementation that require review/assessment during the subsequent verification(s) of the project activity. FARs are not related to the CDM requirements for registration.

Table 4: Structure of the Validation Questionnaire

CHECKLIST QUESTION / VVS and PoA REQUIREMENTS	***SOURCE***	***MEANS AND FINDINGS OF VALIDATION***	***ASSESSMENT***	***FINAL CONCLUSION***
Lists CDM requirements which the project activity should meet. The checklist is organised in several different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.	Gives reference to documents where the checklist question or item is from.	The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached by the Validation Team for the issue.	This field is completed as acceptable based on evidence provided (in this case marked as "OK"). As an alternative, reference to the particularly raised Corrective Action Request (CAR), Clarification request (CL), or Forward Action Request (FAR) is added.	This field is completed as "OK" when the particular requirement was earlier met or when raised CAR and/or CL have been successfully closed out.

Table 5: Structure of the List of Findings – Resolution of Corrective Action and Clarification Requests

Description of Finding (CAR, CL, FAR)	Summary of Project Participants Response	GLC Assessment	Final Conclusion (OK or OPEN)
In this column, a finding is described in a clear, objective and transparent manner. It also shall be described which further information is needed or which correction must be applied. The date the finding was raised is also indicated.	In this column, a clear summary of explanations to close the finding as provided by the project participant(s) is added. This statement shall be sustained with suitable arguments and evidences. The date the response from the project participant(s) was received is and the number rounds for addressing the findings are also indicated.	In this column, the GLC's validation team provides the conclusion of its assessment. The finding can be closed here or, if the argumentation and/or evidence are not suitable or sufficient, a new row in inserted for the CAR/CL in question by indicating the particular CAR/CL is still opened. The date for the related GLC's assessment and the number rounds for addressing the finding are also indicated.	GLC indicates whether the issue raised was resolved or not by indicating "OK" for closed out or "Open" for findings which were not closed out. It is important to note that it is a requirement for a positive validation opinion for the project activity under validation that all raised CARs and CLs be successfully closed.

4 VALIDATION REPORTING

4.1 Global Stakeholder Consultation

As established by applicable CDM procedures, GLC made the initial version of the PDD (version 2) /1/ available at UNFCCC's CDM website (http://cdm.unfccc.int/Projects/Validation/DB/BT0IZPMHUX55CQKEC529OAUGTL5OAL/view.html) during the period from 2012-11-23 to 2012-12-22 in order to have Parties, stakeholders and non-governmental organisations (NGOs) making comments about the proposed CDM project activity. As a result of the performed Global Stakeholder Consultation (GSC) process, no comments were received.

As established by the applicable rules from the DNA of Brazil, a local stakeholder consultation was also performed for the Canhanduba Landfill Project as assessed in Section 4.11.

4.2 Participation and Authorisation

Document review, background research and document checking are used as means of validation of related participation requirements and confirmation of authorization from the DNA of Parties.
The only so far identified project participant for the proposed CDM project activity is Itajaí Biogás e Energia S.A. The project participant is from the host Party Brazil. No Annex I project participant or Party is yet identified.

Description of the project participant is listed in a tabular form in Section A.4 of the PDD /1/. Information made available in Section A.4 is consistent with the further details about the project participant as provided in Annex I of the latest version of the PDD /1/. No entities other than the identified project participant are included in these sections of the PDD.

A Letter of Approval (LoA) for the project activity was issued by the DNA of Brazil. This issued LoA (dated 2014-04-07) /77/ confirms that:
- Brazil is a Party to Kyoto Protocol;
- The participation of Brazil and the project participant Itajaí Biogás e Energia S.A. is voluntary;
- The project activity assists Brazil in achieving Sustainable Development.

A copy of the issued LoA /77/ was available to the GLC's validation team (directly received by the project participant Itajaí Biogás e Energia S.A.) on 2014-04-08. In order to confirm the authenticity of the received LoA, the GLC's validation team contacted the DNA of Brazil by email communication in order to request confirmation of issuance of such LoA by the DNA of Brazil. A copy of the received LoA /77/ was enclosed in the submitted email communication. As a response to its submitted request, the GLC's validation team received an email communication issued by the DNA of Brazil on 2014-04-11 /78/ confirming the authenticity of the previously issued LoA for the proposed project activity (as per the copy of the LoA /77/ made available to GLC by the project participants). The GLC's validation team was thus able to sufficiently confirm the authenticity of the LoA issued by the DNA of Brazil, thus confirming that the proposed CDM project activity indeed fulfils all relevant approval requirements from the host Party Brazil.

4.3 Contribution to Sustainable Development

The description of the project's contribution towards Sustainable Development was made available in the PDD /1/ and also in a separate document name "*Anexo III*" (as required by the DNA of Brazil). As per current applicable rules of the DNA of Brazil, the contribution towards Sustainable Development of any CDM project activity being proposed in Brazil shall be described by the project participant in a separate document named "*Anexo III*" (translated into English as "Annex III"). In accordance with applicable guidance of the DNA of Brazil, this document should emphasize the contribution of the proposed CDM project activity within the following 5 main aspects:

- Local environmental sustainability
- Development in local laboring conditions and net generation of employment opportunities
- Income distribution
- Technological development
- Regional integration and articulation with other sectors / actors

The GLC's validation team assessed the "*Anexo III"* document compiled for the project activity, which was also made publicly available (www.unicarbo.com.br/projetos). It was confirmed that Anexo III document was completed by following the applicable requirements from the DNA of Brazil. Adequate elaboration of the "*Anexo III"* document (in Brazilian Portuguese language) /59/ is a pre-requisite for the issuance of the LoA by the DNA of Brazil.

As further assessed in Section 4.2, a Letter of Approval (LoA) for the project activity was issued by the DNA of Brazil. This issued LoA (dated 2014-04-07) /77/ confirms that:

- Brazil is a Party to Kyoto Protocol;
- The participations of Brazil and all above-listed project participants are voluntary;
- The proposed CDM project activity contributes towards Sustainable Development in Brazil.

4.4 Modalities of Communications

A completed Modalities of Communication (MoC) form /35/ for the project activity (signed by the project participant on 2013-03-01) was made available to the GLC's validation team by Itajaí Biogás e Energia S.A. (which is the project participant with whom GLC set a contractual agreement for performing the validation assessment). The corporate identity of the identified project participant (Itajaí Biogás e Energia S.A.) is included in the MoC statement and was verified to be correct by the GLC's validation team. The corporate identity and name for the focal point is also indicated in the completed MoC form.

The GLC's validation team confirmed the validity and authenticity of specimen signatures and engagement (employment) status of authorized person by checking the original version of the following document (which was registered/verified by the local official notary services agency "Malucelli 6ª Serventia Notarial" (located in the city of Curitiba, Brazil):

- A written and signed statement from Itajaí Biogás e Energia S.A. (Power of Attorney document) /28/ nominating Mr. Eduardo Covas Barrionuevo as the responsible person for dealing with all issues related to the development of the project as a CDM project activity. The document also nominates Mr. Barrionuevo as the contact person among GLC, DNA of Brazil and UNFCCC for any issue related to the project activity.

The GLC's validation team also confirmed that the completed MoC statement is based on the currently valid form "Modalities of Communication Statement" (F-CDM-MOC form version 02.1) /53/. Moreover, the GLC's validation team was also able to confirm that information required by the form (including its Annex 1) is correct.

In conclusion, the GLC's validation team confirmed that the completed MoC statement provided by the project participant and supporting related material made available to GLC for review are all in accordance with the applicable requirements and assessment procedures as per the CDM Validation and Verification Standard (VVS) /4/.

4.5 Project Design Document

The GLC's validation team confirmed that the latest version of the large scale PDD form (form F-CDM-PDD version 04.1 /54/) was applied. The latest version of the PDD /1/ is completed by correctly following all applicable guidance for completing the PDD as per the latest version of the "Guidelines for completing the project design document form" (version 01.0) (EB66, Annex 8) /21/.

4.6 Description of Project Activity

The Canhanduba Landfill Project comprises the construction, operation and maintenance of a complete landfill gas (LFG) collecting and destruction facility and also an electricity generation facility using LFG as fuel which are both yet to be built at the Canhanduba landfill. The project proponent and project participant is Itajaí Biogás e Energia S.A.. The Canhanduba landfill is a private landfill owned and operated by the private waste management service company Ambiental Limpeza Urbana e Saneamento Ltda. In October 2012, the company Ambiental Limpeza Urbana e Saneamento Ltda. awarded the project participant Itajaí Biogás e Energia S.A., the rights to build and operate a LFG collection and destruction/utilization initiative at the Canhanduba landfill. This landfill is located in the Southwest region of the city of Itajaí in Santa Catarina State, Brazil.

The purpose of the proposed CDM project activity is to promote effective collection and destruction/utilization of LFG (which is rich in methane) through its collection and combustion in high temperature enclosed flare(s) and in the engine-generator set(s) of an electricity generation facility. Thus, besides promoting generation of electricity from a non-conventional renewable energy source, the proposed CDM project activity is intended to promote real and measurable reductions of methane (CH_4) emissions. The project activity is also intended to promote emission reductions of CO_2 by generating electricity using LFG as non-conventional renewable energy source. In the absence of the project activity, LFG (which is rich in methane) generated at the Canhanduba landfill would continue to be freely emitted into the atmosphere without any treatment, collection or control[1].

[1] As further assessed in Section 4.7.4.1, it is assumed that in the absence of the project activity (baseline scenario), a small share of generated LFG (which is rich in methane) would continue to be vented in existing conventional LFG venting drains (and additional similar drains that would be built in the baseline scenario as a result of the forecasted expansion of the Municipal Solid Waste (MSW) disposal surface in the landfill). Other share of generated LFG would be expected to be directly emitted into the atmosphere through the surface of the landfill.

Based on information presented in the PDD, the design of the proposed project activity encompasses the utilization of collected LFG only as gaseous fuel for electricity generation. The project activity does not aim to supply collected LFG to a natural gas distribution network or use LFG for thermal or other energy applications.

Municipal solid waste (MSW) generated and collected at the cities of Itajaí and Balneário do Camboriú has initiated to be disposed in the Canhanduba landfill site in January 2006 /30/, it is important to note that the landfill receives domestic municipal waste as well as hospital waste. According to the PDD, the landfill receives approximately 1.26 tons per day of hospital waste. The historically received streams of hospital waste was correctly not taken into account in the estimations of emission reductions to be achieved by the project activity as such solid waste streams have been disposed in an area of the landfill which is not expected to be encompassed by the LFG collection wells of the project activity.

The Canhanduba landfill currently has a total surface area of 27.52 hectares /34/. As per the available data from Ambiental Limpeza Urbana e Saneamento Ltda. /30/ up to the end of December 2012 about 748,800 ton of MSW have been disposed at the Canhanduba landfill since the start of its operations in January 2006. Available data on MSW disposal /30/ as well as MSW disposal forecasts /33/ were used to estimate the volume of LFG to be collected and destroyed/utilized by the project activity.l

The GLC's validation team reviewed an available draft schematic drawing / layout diagram of the Canhanduba landfill /34/. During interviews performed with representatives of the project participant, the GLC's validation team was also informed about the probable design of the project activity (including probable location of the project's components within the landfill area, probable distribution of LFG collection wells, probable location of LFG destruction facility with enclosed high temperature flare(s), probable location of the electricity generation facility (which will utilize LFG as gaseous fuel), probable location of the off-grid captive generator (fuelled by diesel), etc)). As argued by the interviewed representatives of Itajaí Biogás e Energia S.A., the final design and disposition lay-out of project's main equipment (LFG collecting wells, LFG pipeline, enclosed high temperature flare(s), electricity generation facility, off-grid captive generator, etc.) was at that time yet to be confirmed as it fully depends on progress and dynamics of the ongoing MSW disposal activities. Moreover, no detailed engineering and procurement work was at that time initiated for the construction and implementation of the project activity. As outlined in the PDD /1/, the project starting date is forecasted to occur in 2014-06-01. Such estimated project starting date corresponds to the foreseen date when initial engineering and construction related work will start or estimated date when ordering (acquisition) of project related main equipment will occur.

As confirmed by the GLC's validation team through visual inspection during the performed on-site visit to the project site, the Canhanduba landfill is a well designed solid waste disposal site (SWDS) of which MSW disposal activities have initiated in January 2006. As also confirmed by the GLC's validation team, currently there are few passive and conventional LFG venting drains in the landfill. The existing conventional LFG venting drains are designed to prevent hazardous LFG accumulation in the inner section of the landfill and also to address safety requirements. Moreover, while the Canhanduba landfill is a well managed landfill, burning of disposed waste is not a practice at the site (as burning of disposed MSW is not allowed as per the currently valid operational license /49/ for the Canhanduba landfill).

After the proposed CDM project activity is fully implemented and operational, qualitative changes in the performance of MSW disposal activities in the landfill are not expected to occur (when compared to the situation prior to the implementation of the project activity).

The Canhanduba landfill has an estimated total accumulated solid waste disposal capacity of 4,166,630 m^3 of waste. By taking into account a daily waste disposal rate of 300 tons per day /33/, the closure of the Canhanduba landfill is currently not expected to occur prior to year 2032.

The construction phase of the project activity has not yet initiated (e.g. drilling of new LFG collection wells, conversion of existent passive LFG venting drains into LFG collecting wells, installation of LFG flaring and control equipment, installation of power generation equipment, etc.).

The implementation of the proposed CDM project activity is planned to comprise:
- the construction and installation of a complete LFG collection network (comprising vertical LFG collection wells and eventually horizontal LFG collection trenches) interconnected through a high density polyethylene (HDPE) pipeline network
- the implementation of a LFG destruction and utilization solutions comprising:
    - o high temperature enclosed flare(s). The specifications and definition of quantity of high temperature enclosed flares will be confirmed as part of the project engineering phase (which is expected to be initiated right after the successful registration of the project as a CDM project activity by the CDM-EB);
    - o electricity generation component (to be implemented since the start of operation of the project activity). The specifications and definition of power generation plants /64/ (which is currently forecasted to encompass three 1,060 kW LFG internal combustion engine-generator set (to become operational according to the a forecasted implementation schedule: 1,060 kW in 2014, plus 1,060 kW in 2015 and the last 1,060 kW in 2021)) will be later also confirmed as part of the project engineering phase[2];
    - o off-grid captive generator (fuelled by diesel) with a rated capacity of 60 kW to be installed at the project site, only for emergency situations (temporary planned or unplanned interruptions of the supply of grid electricity);
    - o LFG pre-treatment system, in order to dry and clean landfill gas to be directed to the engine-generator sets;
    - o all other supporting mechanical and electrical sub-systems and appurtenances necessary to collect and measure LFG and electricity related parameters as per applicable requirements of ACM0001 (version 13) /5/ and applied methodological tools (e.g. LFG flow meter, LFG temperature sensor, LFG pressure sensor, CH_4 content gas analyzer, thermocouple, conditions of exhaust gas of the flare(s), electricity meters, etc.). The specifications of supporting mechanical and electrical sub-systems and related appurtenances are currently expected to be defined only during the complete project engineering phase (which is expected to be only initiated right after the successful registration of the project as a CDM project activity by the CDM-EB).

The latest version of the PDD /1/ indicates the utilization of collected LFG as fuel for electricity generation. The electricity demand of the project activity is normally expected to be sourced by the grid.

[2] Is important to note that the implementation schedule for the project's electricity generation component might be changed as a result of LFG availability at the landfill.

Moreover, all electricity generated by the project's electricity generation facility (fuelled by LFG) shall be entirely directed to the grid. During temporary planned or unplanned interruptions of the supply of grid electricity, the electricity demand of the project activity shall be sourced by a backup off-grid captive electricity generator (fuelled by Diesel), which will also be implemented as part of the project activity.

Technology and design details of the project activity (including equipment specifications and suppliers, LFG collection pipeline layout, etc.) are also yet to be defined. So far, there is no detailed project engineering in place. As informed in the PDD /1/ and confirmed by the GLC's validation team, all related project engineering, installation of equipment and selection of equipment suppliers are expected to occur only after the successful registration of the project as a CDM project activity by the CDM-EB. The technology to be employed is expected to encompass both domestically sourced and imported equipment.

While all project related engineering, design, equipment procurement and construction phases are yet to be initiated, the project starting date is thus not yet confirmed.

The expected (estimated) starting date of the project activity (i.e. to be based on event(s) related to signature of equipment purchase contract(s) and/or signature of contract(s) for development of construction services for the project activity) is estimated and indicated in the latest version of the PDD /1/ as being 2014-06-01.
The previously occurred signature of the contractual agreement between the project participant Itajaí Biogás e Energia S.A. and Ambiental Limpeza Urbana e Saneamento Ltda. (company in charge of the management of the landfill, according to contract signed with Prefeitura Municipal de Itajaí /28/) on 2012-10-01 /28/ for the yet to be initiated implementation and operation of the proposed project activity does not represent the project starting date as per its definition in the Glossary of CDM Terms /15/.

The operational lifetime of the project activity is estimated to be at least 20 years. That reasonably corresponds to the minimum expected equipment lifetime (considering the typical equipment type and operational conditions for a LFG destruction/utilization initiative). The selected 7-year renewable crediting period is indicated as starting on 2014-07-01 or on the considered date of the registration of the CDM project activity (whichever is later).

The total emission reductions to be achieved by project activity over the selected 7-year renewable crediting period are estimated to be 547,881 tCO_2e. This corresponds to annual average emission reductions of 78,269 tCO_2e per year).

Document checking, physical inspection, follow-up interview, and background research were used as means of validation for project design by the GLC's validation team. The proposed project activity is a LFG collecting and destruction/utilization initiative that is expected not to encompass any change in the on-going MSW disposal process at the Canhanduba landfill.

No diversion of Official Development Assistance (ODA) is involved in project financing. The implementation and operation of the project activity will be entirely financed by private capital. As per the previously set contractual agreements between the project participant Itajaí Biogás e Energia S.A. and Ambiental Limpeza Urbana e Saneamento Ltda. /28/, all capital expenditures (CAPEX) for the

implementation of the project activity and all related operation and maintenance costs during its entire operational phase are expected to be funded by the project participant Itajaí Biogás e Energia S.A.

As a conclusion, a clear and sufficient description of the proposed project activity is provided in the latest version of the PDD /1/, covering all relevant aspects. Precise nature of the project activity and the general technical aspects of its implementation are also presented in the PDD /1/ in an understandable and sufficiently detailed manner. All information regarding project design, as presented in the latest version of the PDD /1/, is consistent with observations from the GLC's validation team during the performed on-site inspection and document check.

4.7 Application of the Selected Baseline and Monitoring Methodology

4.7.1 Applicability of the Selected Methodology to the Project Activity

Through the performed document checking and background research, it was verified that the project has correctly applied the latest version of the Approved Consolidated Methodology ACM0001 – "Flaring or use of landfill gas" (version 13) /5/. The following methodological tools are also applied:

- "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0, EB 70) /6/
- "Emissions from solid waste disposal sites" (version 06.0.1, EB 66) /7/
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1, EB 39) /8/
- "Project emissions from flaring" (version 02.0.0, EB 68) /9/
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0, EB 61) /10/
- "Tool to calculate the emission factor for an electricity system" (version 04.0.0, EB 75) /11/

As appropriately justified in the latest version of the PDD /1/, the "Tool to determine the remaining lifetime of equipment" /13/ is not applicable in the context of the project activity.

The GLC's validation team also confirmed that as per the project design description made available in the latest version of the PDD /1/, no fossil fuel is expected to be used within the project boundary as part of operation of the project activity. Thus, the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" /12/ is not applicable to the proposed project either. By means of on-site visit and interviews with the project participant, the GLC's validation team had also confirmed that no fossil-fuel based electricity generation system is existent in the pre-project scenario. The conventional LFG venting drains which are applied in the baseline scenario as the only LFG management solution do not require any consumption of electricity. Moreover, the electricity demand for the Canhanduba landfill has been historically met by imports of grid electricity (with no captive off-grid electricity generator (fuelled by diesel or any other type of fossil fuel) being applied).

The "Tool to determine the baseline efficiency of thermal or electric energy generation system" is not applicable either.

Also by means of performed on-site visit and interviews with the project participant, the GLC's validation team was also able to confirm that only conventional and passive LFG venting drains are currently in

place at the Canhanduba landfill with no LFG being captured by an active (forced) LFG collection system. Furthermore, there is no pre-project LFG flaring system and/or electricity generation facility fuelled by LFG which would be complemented or even replaced by the project's electricity generation component. In this sense, it is reasonable to also exclude the "Tool to determine the remaining lifetime of equipment" from the list of methodological tools which are applicable for the project activity.

The application of the ACM0001 (version 13) /5/ CDM baseline and monitoring methodology is deemed justifiably as assessed in the table below.

Table 6: Applicability criteria of ACM0001 (version 13) /5/

Applicability criteria	GLC's assessment	Applicability condition met?
"This methodology is applicable to project activities which: *(a) Install a new LFG capture system in a new or existing SWDS[3]; 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 can not 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.* *(c) Flare the LFG and/or use the captured LFG in any*	Applicability criteria (a) is fulfilled, as a new LFG capture system will be installed in an existing landfill (or SWDS). Through document review and on-site inspection, the GLC's validation team was able to confirm that the project is being implemented in an existing SWDS. A new LFG collection and destruction system will be installed and it is included in the project boundary. As also confirmed by the GLC's validation team during the performed on-site visit to the project site, the proposed project activity currently does not have any existing active (forced) LFG capture system. Thus, condition (b) is regarded as not applicable. Condition (c) (i) is also fulfilled as the proposed project activity comprises collection and flaring of LFG. As per the currently considered project design, collected LFG is expected to be utilized as gaseous fuel for generation of electricity; however, the utilization of LFG as fuel for heat generation (boiler, air heater or kiln) or glass melting furnace; and/or being supplied to consumers through a natural gas distribution network is not encompassed by the project design and it is not expected to occur. Thus, only criteria (c) (i) is an applicable alternative.	☒ *Yes* ☐ *No* ☐ *N/A*

[3] SWDS: Solid waste disposal site.

(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; and/or* *(iii) Supplying the LFG to consumers through a natural gas distribution network.* (d) *Do not reduce the amount of organic waste that would be recycled in the absence of the project activity."*	Condition (d) is also applicable since there are no expected changes on the operation of the landfill as a result of the implementation of the project activity. No change in the current practice of landfilling of MSW at the Canhanduba landfill expected to occur after the implementation of the project activity. With or without the project activity, no recycling of the organic fraction of the waste, neither aerobic treatment, neither incineration, is expected to occur at the Canhanduba landfill. In fact, recycling of organic matter, aerobic treatment and incineration are not common practice in Brazil /44/ and in the region of influence of the landfill either. As part of the performed validation assessment, interviews were conducted with representatives of the project participant and it was confirmed that the project participant does not intend to change the operation of the Canhanduba landfill site under any aspect. By taking into account the content/rationale for the applicability condition (d), and based on assessment of (i) detailed information made available in the latest version of the PDD /1/ on how the condition is met + (ii) assessment of credible documented information/evidences /23/ /41/ /42/ (of which some /44/ /25/ /75/ are interpreted and referenced in the PDD in a correct manner), thus sufficiently justifying the plausibility and correctness of information made available in the PDD); the GLC's validation team is of the opinion that the implementation and operation of the project activity do not represent any driver or incentive to promote any reduction in the amount of organic waste that would be recycled in the absence of the project activity at the Canhanduba landfill and/or at any other existent or potential (hypothetical) waste treatment or utilization facility under the area of influence of this landfill. The prevailing waste management practices pertinent to organic solid waste	

	recycling in the region attended by the landfill was also assessed by the GLC's validation team. As verified by the GLC's validation team, detailed information (including aspects, facts and statistics related to recycling of organic fraction of MSW in the region of Canhanduba landfill and in other regions of Brazil) are included in the related documented evidences /44/ /25/ /75/ which are referred in the PDD /1/. Such data sources confirm the non-existence of any facility with relevant scale/size to promote utilization or recycling of organic fraction of solid waste (such as a solid waste composting plant) in the region of the project site. The GLC's validation team also assessed the amount of organic waste currently being recycled or utilized in the region and whether such amount would be potentially negatively impacted by implementation of the project activity. Available and credible statistical data and information sources were assessed by the GLC's validation team (including both related sources indicated in the PDD /44/ /25/ /75/ as well as other credible sources selected by the GLC's validation team /23/ /41/ /42/). Assessed data and information sufficiently confirm the suitability and plausibility of all related argumentation and explanations which are made available in the PDD /1/. Furthermore, based on assessment of related construction and design documentation for the Canhanduba landfill /30/ /33/ /34/ /49/ and also based on interviews performed with representatives of Itajaí Biogás e Energia S.A., the GLC's validation team was also able to confirm that no initiative involving recycling of organic fraction of MSW or any other type of solid waste is currently expected to be implemented at the Canhanduba landfill or in any other site by Itajaí Biogás e Energia S.A. Moreover, by taking into account the applicable regulatory framework and typical business environment for waste management services (as a public serve) in Brazil, it is also the understanding and	

	opinion of the GLC's validation team (based on its sectoral expertise and performed assessment of related sectoral literature /23/ /41/ /42/), that the implementation of the project activity does not represent any potential incentive or driver for any administration of municipality in the region, any other public entity or any other relevant recycling practitioner (if existent in the future) to promote changes in existent regional policies, rules and practices involving recycling of organic waste in the region either. The publication "Panorama dos Resíduos Sólidos no Brasil – 2012" (Outlook of Solid Waste Sector in Brazil – 2012, available online at: http://www.abrelpe.org.br/Panorama/panorama2012.pdf), states the following: "*solid waste recycling initiatives in Brazil are quite limited and encompass mostly aluminium, paper, plastic (including PET bottles) and glass material. In case of existing recycling activities, material to be recycled is separated from waste stream prior to being disposed in a landfill or dumpsite. For the specific case of recycling of organic waste material, paper waste sent to disposal in landfills is not even regarded as recyclable material (and thus not even accounted in the available statistics for recyclable material). Only clean (not contaminated) and previously separated paper waste material is considered as recyclable material. No other type of organic material has been recycled in Brazil".* In the particular case of the landfill where the project activity will be implemented, no received organic waste stream has been or is expected to be directed to recycling. Thus, the project activity will not promote any volume or practice changes in terms of recycling of organic solid waste. The *"Panorama dos Resíduos Sólidos no Brasil – 2012"* is a publication annually published by the "Associação Brasileira de Empresas de Limpeza Pública e Resíduos Especiais – ABRELPE" (Brazilian Association for	

	Municipal Solid Waste and Special Waste) and represents the most credible outlook and statistics source for the solid waste sector in Brazil. According to GLC's opinion, this source of information is a reliable and also realistic evidence that the management of SWDS will not change after the project activity implementation. As a conclusion, it is sufficiently demonstrated that under no circumstance the implementation and expected continuous operation of project activity would *per se* represent a driver or incentive to have any party reduce or prevent the volume of organic waste stream that would be recycled in the baseline scenario in order to get such solid waste stream being disposed using landfilling practices at the Canhanduba landfill (or at any other solid waste disposal site (SWDS)). As a summary, it is deemed demonstrated in the PDD /1/ that condition (d) of the above-quoted applicability criteria is sufficiently met.	
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) Partial or total release of LFG from the SWDS; 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* *For heat generation: that heat would be generated using fossil fuels in equipment located within the project boundary.*"	Applicability condition (a) is fulfilled because, as confirmed by the GLC's validation team, the baseline scenario is identified as the release (free emission) of generated LFG into the atmosphere. As the currently considered project design encompasses the utilization of collected LFG as fuel for electricity generation, condition (b) (i) is thus an applicable alternative. Although, while no on-site heat requirements were identified during the performed on-site visit, the project participants do not intend to generate heat using LFG as fuel or even supply LFG for heat generation off-site. Therefore, condition (b) (ii) is not an applicable alternative.	☒ *Yes* ☐ *No* ☐ *N/A*

"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."*	Condition (a) is not applicable as LFG captured by the project activity is not expected to displace fossil fuels in a kiln, air heater or glass melting furnace. Moreover no baseline and monitoring methodology other than ACM0001 (version 13) /5/ is applied. Condition (b) is not applicable either as no changes on the operation of the landfill are expected to occur as a result of the implementation of the project activity. With or without the project activity, no recycling of the organic fraction of the waste, aerobic waste treatment or waste incineration are expected to occur. In fact, recycling of waste, waste aerobic treatment and waste incineration are not common practices in Brazil. During performed on-site visit, interviews were conducted with representatives of the project participant and it was confirmed that the project participant does not intent to change the operation of the Canhanduba landfill site under any aspect.	☒ *Yes* ☐ *No* ☐ *N/A*
"*The applicability conditions included in the tools referred to above also apply.*"	Demonstration of how applicability conditions for the methodological tools which ACM0001 (version 13) /5/ refers to (and which are applied by the project activity) are met is sufficiently demonstrated in Section B.2 of the PDD /1/. Sufficient substantiation about the applicability conditions of the following tools are presented in Section B.2 of the PDD /1/: - "Project emissions from flaring" (version 02.0.0) /9/ - "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) /8/ - "Emissions from solid waste disposal sites" (version 06.0.1) /7/ - "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/ - "Tool to determine the mass flow of a greenhouse gas in a gaseous	☒ *Yes* ☐ *No* ☐ *N/A*

	stream" (version 02.0.0) /10/ - "Tool to calculate the emission factor for an electricity system" (version 04.0.0) /11/	

The baseline scenario is the release (free emissions) of LFG into the atmosphere (through the surface of the landfill and through the existent conventional passive LFG venting drains currently available at the landfill and additional conventional drains that would be otherwise implemented along the baseline scenario). Thus, the baseline scenario corresponds to the continuation of current situation at the Canhanduba landfill. The project activity encompasses the installation of an active (forced) LFG collecting system and enclosed high temperature flaring system in order to destroy collected LFG. The project also encompasses installation of an electricity generation facility with forecasted/estimated gradual installation of power generation equipment as follows:

- installation of one engine-generator set with nameplate power generation capacity of 1,060 kW in 2014
- installation of an additional identical engine-generator set in 2015
- installation of an additional identical engine-generator set in 2021

It is important to note that an off-grid captive generator (fuelled by Diesel) with a rated capacity of 60 kW is planned to be installed at the project site, only for emergency situations (temporary planned or unplanned interruptions of the supply of grid electricity).

Based on the facts above, the GLC's validation team was able to verify that the applicability conditions of ACM0001 (version 13) /5/ and applied tools are thus completely and sufficiently satisfied and met. Sufficient explanations and justification on how all applicability criteria for the applied baseline and monitoring methodology + applicable methodological tools are met are presented in the latest version of the PDD /1/.

4.7.2 Project Boundary

As established by the applied baseline and monitoring methodology ACM0001 (version 13) /5/, the project boundary of the project is correctly identified as the site where LFG is captured and destroyed/utilized (LFG being flared and used as gaseous fuel for electricity generation facility as part of operation of the project activity).
In the particular case of the proposed project activity, the project's electricity demand will be met by imports of the National grid of Brazil, and during emergency situations by the off-grid captive generator (fuelled by Diesel)[4].

[4] The captive off-grid backup electricity generator (fuelled by diesel) is expected to be used only for emergency purposes (whenever supply of grid electricity to the project activity is temporarily interrupted). Thus, in the context of ex-ante estimates of emission reductions to be achieved by the project activity, there is no estimated amount of electricity to be generated this generator and/or amount of fossil fuel diesel to be consumed by the generator either. Project emissions due to the consumption of electricity sourced by this generator are thus estimated as zero (null) in the particular context of ex-ante estimations of emission reductions to be achieved by the project activity. However, such project emissions will be determined ex-post along the crediting period (based on applicable monitoring and calculation requirements according to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption") and will be accounted for the determination of emission reductions.

The GHG emission sources and gases included in the project boundary are presented in the table below:

Table 7: GHG emission sources included in the project boundary

	GHGs included	Description
Baseline	CH_4	Methane in the LFG generated as a result of anaerobic decomposition of the organic fraction of the municipal solid waste (MSW) deposited in the landfill from year 2006 onwards.
	CO_2	Baseline emissions from electricity generation using LFG as a fuel.
Project	CO_2	Grid electricity consumption by the project activity and eventually diesel consumption by the off-grid captive electricity generator [5].
	CH_4	CH_4 emissions resulted from flaring (residual CH_4 in the exhaust gas of the flare(s)). It is however important to note that as per ACM0001 (version 13) /5/, such emissions are to be considered in the context of the calculation of baseline emissions (BE_y).

The selected sources and GHGs are justified for the project activity. No leakeage emissions are required to be accounted as per ACM0001 (version 13) /5/

As further assessed in Section 4.7.3, emissions from heat generation and use of natural gas are correctly not included in the project boundary. Moreover, the use of fossil fuel for electricity generation is expected to occur only during emergency situations (whenever the supply of grid electricity for the project activity is interrupted). For this reason, the project participant ex-ante estimates such project emissions as zero. However, such project emissions will be determined ex-post along the crediting period and will be accounted for the determination of emission reductions.

The identified project boundary is under compliance with ACM0001 (version 13) /5/ and it is sufficiently justified.

[5] The captive off-grid backup electricity generator (fuelled by diesel) is expected to be used only for emergency purposes (whenever supply of grid electricity to the project activity is temporarily interrupted). Project emissions due to the consumption of electricity sourced by this generator ($PE_{EC,captive,y}$) are thus estimated as zero (null) in the particular context of ex-ante estimations of emission reductions to be achieved by the project activity. However, such project emissions will be determined ex-post along the crediting period (based on applicable monitoring and calculation requirements according to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption") and will be accounted for the determination of emission reductions.

By taking into account the project design, the GLC's validation team confirms that there are no emission sources, which are not addressed by the applied methodology, and which are expected to contribute more than 1% of the overall expected annual average emission reductions.

4.7.3 Baseline Scenario Identification and Description

For the determination of the baseline scenario (the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed project activity), besides of assessing and confirming whether the project activity meets all applicability criteria of ACM0001 (version 13) /5/ (as outlined in Section 4.7.1), the application of the stepwise approach established by ACM0001 (version 13) /5/ for determining the baseline scenario was also assessed by the GLC's validation team.

The stepwise approach established by ACM0001 (version 13) /5/ for determining the baseline scenario (by following the applicable guidance of the latest version of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/)) was correctly applied as follows:

Step 1: Identification of alternative scenarios: As part of application of Step 1, all applicable alternatives which are referred by ACM0001 (version 13) /5/ were correctly considered and analysed as follows:

Step 1a: Define alternative scenarios to the proposed CDM project activity

The following alternatives were initially considered:

- LFG1: The project activity implemented without being registered as a CDM project activity (i.e. capture and flaring/utilization of LFG);
- LFG2: Atmospheric release of the LFG or partial capture of LFG and destruction to comply with regulations or contractual requirements, or to address safety and other concerns;
- LFG3: LFG is partially not generated because part of the organic fraction of the solid waste is recycled and not disposed in the SWDS;
- LFG4: LFG is partially not generated because part of the organic fraction of the solid waste is treated aerobically and not disposed in the SWDS;
- LFG5: LFG is partially not generated because part of the organic fraction of the solid waste is incinerated and not disposed in the SWDS.

As correctly outlined in the PDD /1/, scenarios LFG3, LFG4 and LFG5 were not taken into account under the application of Step 1a since, the implementation and operation of the project activity will not promote any change in the waste disposal activities at the Canhanduba landfill or any other landfill in the region.

Moreover, by taking into account the nature and scope of the project activity, its implementation and operation is not expected to promote any reduction or prevention of the amount of MSW that would be eventually recycled in the Canhanduba landfill or in any other landfill in the region. Actually, the recycle of organic fraction of MSW has not been common practice in the region where the project activity will be implemented.

Thus, as previously presented in Section 4.7.1, no changes on the operation of the landfill as a result of the implementation of the project activity are expected to occur. Therefore, it is deemed appropriate to exclude LFG3, LFG4 and LFG5 from the list of alternative scenarios.

While the design of the proposed project activity currently does not encompass any utilization of collected LFG as gaseous fuel for heat generation or supply of LFG to a natural gas distribution network, potential alternative scenarios for these particular utilizations of LFG were thus not considered. This is in accordance with ACM0001 (version 13) /5/.

Also in accordance with ACM0001 (version 13) /5/, in addition to the alternative baseline scenarios identified for the destruction of LFG, while the project activity will promote utilization of LFG, alternative scenarios for LFG use were also considered as follows:

(a) For the project's electricity generation component, possible baseline alternative(s) shall include, *inter alia*:

E1: Electricity generation from LFG, undertaken without the project being implemented and registered as CDM project activity;

E2: Electricity generation in existing or new on-site or off-site renewable based captive power plant(s);

E3: Electricity generation in existing and/or new grid-connected power plants.

Exclusion of alternative E2:
The scenario E2 is excluded. As confirmed by the GLC's validation team, the utilization of a captive off-grid electricity generation source (using renewable or fossil energy sources) has never occurred at the project site. However, an off-grid captive generator (fuelled by diesel) will be installed as part of the project activity for emergency purposes (whenever the supply of grid-sourced electricity is interrupted). As confirmed by the GLC's validation team during interviews conducted with representatives of the project proponent and further confirmed by means of visual inspection at time of on-site visit, the Canhanduba landfill has met its electricity demand by imports of electricity from the grid[6]. There is no pre-project captive off-grid power plant or electricity generator installed at the project site. It is further deemed not realistic that a new on-site or off-site renewable based captive power plant would be installed in the absence of the project activity. While the expected electricity demand for the landfill is correctly assumed as quite low, the deployment of an on-site or off-site renewable based captive power plant is regarded as unjustifiable and not plausible when the associated investment, operation & maintenance costs as well as all perceived operational risks are taken into account vis-à-vis the technology and expertise currently available for captive power plants powered by renewable energy. Thus, E2 alternative is correctly regarded as not plausible.

[6] It is relevant to note that the existent conventional LFG venting drains (which are the LFG management practice considered in the baseline scenario) do not require electricity for their operation.

Exclusion of alternatives H1 to H7:

Alternatives for (b) "Heat generation" are not considered either as heat generation is not encompassed by the project activity. The exclusion of heat generation related alternatives (alternatives H1 to H7) is in accordance with ACM0001 (version 13) /5/. The GLC's validation team thus confirms that excluding baseline alternatives H1 to H7 from the list of alternative scenarios is deemed appropriate and in conformance with the applied methodological approach for identifying the baseline scenario.

Furthermore, the implementation of a thermal energy generation power plant or a cogeneration plant seems not to be a realistic alternative to the project. There is no compatible heat demand in the site or nearby facilities. Moreover, heat demand is reasonably confirmed as not expected to be existent in the future either. Thus, H1 to H7 alternatives are correctly regarded as not plausible and are excluded.

Alternatives for (c) (supply equivalent energy with natural gas) are not considered either since supply of LFG to a natural gas distribution network is not considered as part of the project activity. Furthermore, there is no natural gas distribution network at the landfill. This is in accordance with ACM0001 (version 13) /5/.

Outcome of Step 1a:

As the outcome of application of Step 1a of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/, the realistic and credible alternatives left (as defined by ACM0001 (version 13) /5/ are identified as LFG1, LFG2, E1 and E3. The GLC's validation team considers the list of realistic and credible alternatives after the application of Step 1a of the methodological tool to be complete, correct and appropriate.

Step 1b: Consistency with mandatory applicable laws and regulations:

As outlined in the latest version of the PDD /1/, the list of alternatives left after application of Step 1b of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/, is the same as after application of Step 1a of the methodological tool: LFG1, LFG2, E1 and E3 are the alternatives left.

As correctly indicated in the latest version of the PDD /1/ *"(...) So far, there is still no legal restrictions or requirements for LFG collection and destruction in Brazil, neither for passive venting of LFG. Therefore alternative LFG1 and LFG2 are thus in compliance with applicable mandatory laws and regulations. Also there is no legal requirement to destruct LFG either*".

The GLC's validation team was able to confirm that indeed there is no legislation requiring the collection and destruction of landfill gas in Brazil. Moreover, the GLC's validation team was also able to confirm that collection and destruction of landfill gas is not forbidden in Brazil either.

The GLC's validation team assessed a technical study "Methane to Markets Partnership – Country Profiles: *Brazilian Country Profile*" /42/ (which is dated year 2007 and is made publicly available by the environmental authority for São Paulo State in Brazil (CETESB)). This technical study states the following:

> "(...) *There is not a specific law to landfills or solid waste management, not a national politic to this issue [use of LFG](...)*".

Furthermore, the GLC's validation team also assessed the technical study "Landfill Guidelines - An Approach to Support Climate Change - Friendly Landfill Investments" /43/ (which is dated year 2010 and is publicly available by the Inter-American Development Bank. This technical study states the following:

> *"(...) the most common method of handling waste in Latin America and the Caribbean (LAC) is disposal in controlled landfills or open-air dumps. […]. However, due to a lack of resources, institutional weakness, inadequate legislation and other environmental governance issues, in most cases Municipal Solid Waste (MSW) is disposed of in dumps or controlled landfills that do not fulfil minimum technical standards, rather than sanitary landfills. Most controlled landfills do not include an LFG management system, […] only 23% of collected waste is disposed of in sanitary landfills (...)"*

The GLC's validation team also assessed the Federal Decree No. 7,404/10 /57/ and Federal Law No. 12,305/10 /57/ which currently represents the regulatory framework for the new Brazilian National Policy on Waste Management.
As assessed by the GLC's validation team, the validity for the new National Policy on Solid Waste Management in Brazil was initiated with the publication of the Federal Decree No. 7,404/10 /57/ on 2010-12-23. In force since its publication, this decree aims to regulate the National Policy on Waste Management (PNRS), which is per se established by Federal Law No. 12,305/10 /57/ (the Law for the National Policy on Solid Waste Management - LPNRS). This law creates the Steering Committee for the Implementation of Reverse Logistics Systems (Steering Committee) and the PNRS Inter-ministerial Committee. As confirmed by the GLC's validation team, while representing a legal directive for the solid waste management sector in Brazil, the new National Policy on Solid Waste Management does not establish any requirement, obligation or even recommendation or guidelines for LFG management in landfills in Brazil.

The GLC's validation team also assessed an interpretative paper /58/ about the new PNRS issued by the Brazilian law firm "Tauil & Chequer Advogados". This paper highlights the following about the new PNRS:

> *"The Regulation of the National Policy on Waste Management, established by Decree No. 7,404/10 (the Decree), was published on December 23, 2010. In force since its publication, the Decree regulates the National Policy on Waste Management (PNRS), established by Federal Law No. 12,305/10 (the LPNRS), and creates the Steering Committee for the Implementation of Reverse Logistics Systems (Steering Committee) and the PNRS Interministerial Committee.*
>
> *The main purpose of the PNRS Interministerial Committee is to support the PNRS structuring and implementation, in order to enable the accomplishment of the provisions and goals set forth by the LPNRS. The Steering Committee has the basic function of guiding the implementation of reverse logistics.*
> *Among the instruments regulated by the Decree are the Reverse Logistics Systems, the Waste Management Plans (PGRS) and the National Registry for Hazardous Waste Operators.*
> *The Decree lists three specific instruments for the implementation and operation of the reverse logistic systems: (i) sectorial agreements, executed between public authorities and the industry; (ii) regulations, issued by the executive branch; and (iii) commitment agreements—which are to be*

adopted in the absence of sectorial agreements and regulations and when specific circumstances require more restrictive obligations—to be approved by the competent environmental agency.
Regarding the obligation to prepare a PGRS, which should be required within environmental permitting proceedings, the Decree mentions the possibility of jointly submitting the PGRS under specific conditions and in cases where activities are conducted in the same condominium, municipality, micro-region or metropolitan/urban areas. Additionally, the Decree establishes that small companies that generate household waste, as provided for by article 30 of the LPNRS, are not required to submit a PGRS.
Regarding the National Registry for Hazardous Waste Operators, which must be integrated to the already existing Federal Technical Registry of IBAMA [7], the Decree establishes a registration obligation for companies that manipulate or operate hazardous waste. The Decree also describes those who are considered generators or operators of hazardous waste, establishing several requirements for their authorization or permitting. These include the preparation of hazardous waste management plan, the demonstration of technical and economic capacity and the obtaining of civil liability insurance for environmental damages."

The GLC's verification team was thus able to confirm that the recently regulated PNRS does not includes any regulatory requirement, obligation or recommendation related to LFG management at landfills in Brazil. As a conclusion, the GLC's validation team was able to confirm that, there is no obligation for LFG collection and flaring or utilization in Brazil.

As a conclusion, the GLC's validation team was able to confirm that, there is no obligation for LFG collection and flaring or utilization in Brazil.

Outcome of Step 1b:

As the outcome of application of Step 1b of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/, the realistic and credible alternatives left (as defined by ACM0001 (version 13) /5/ are identified as LFG1, LFG2, E1 and E3. The GLC's validation team considers the list of realistic and credible alternatives after the application of Step 1b of the methodological tool to be correct, complete and appropriate.

Step 2: Barrier Analysis:

As part of the application of Step 2 of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/, no barriers were identified by the project participant.

Outcome of Step 2:

As the outcome of application of Step 2 of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/, the realistic and credible alternatives left (as defined by ACM0001 (version 13) /5/ are identified as LFG1, LFG2, E1 and E3. The GLC's validation team considers the list of realistic and credible alternatives after the application of Step 1b of the methodological tool to be correct, complete and appropriate.

[7] The Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) is one of the main Brazilian federal authorities for environmental affairs.

Step 3: Investment analysis:

The application of Step 3 of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/ is assessed in Section 4.8.3.

Outcome of Step 3:

As assessed in Section 4.8.3, as the outcome of application of Step 3 of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/, the list of alternative scenarios includes the following combinations:

Combination of alternative scenarios	Description
LFG2 and E3	"*Continuation of current situation, not requiring any investment or expenses to maintain the current situation […]*" (S3 [8]): "*Atmospheric release of LFG*" + "*No investment is undertaken by the project participant but third party(ies) undertake(s) investments or actions which provide the same output to users of the project activity*" (S2 [9]): "*Electricity generation in existing and/or new grid-connected power plants*"
LFG1 and E1	"*The proposed project activity undertaken without being registered as a CDM project activity*" (S1 [10]): "*Implementation of a landfill gas capture and flaring activity*" + "*Electricity generation from LFG*"

Step 4: Common practice analysis:

The application of Step 4 of the Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/) is assessed in Section 4.8.5.

Conclusion about the determination of baseline scenario:

As a conclusion of its assessment, the GLC's validation team was able to confirm that alternative LFG2 (atmospheric release of the landfill gas or, eventually, partial capture of landfill gas and destruction to comply with regulations or contractual requirements, or to address safety and other concerns) and E3

[8] As per the "Combined tool to identify the baseline scenario and demonstrate additionality" scenario S3 refers to "*Continuation of current situation, not requiring any investment or expenses to maintain the current situation, such as the continued venting of methane from landfill […].*" This is further assessed in Section 4.8.3.

[9] As per the "Combined tool to identify the baseline scenario and demonstrate additionality" scenario S2 refers to "*No investment is undertaken by the project participant but third party(ies) undertake(s) investments or actions which provide the same output to users of the project activity*". This is further assessed in Section 4.8.3.

[10] As per the "Combined tool to identify the baseline scenario and demonstrate additionality" scenario S1 refers to "*The proposed project activity undertaken without being registered as a CDM project activity*".

(Electricity generation in existing and/or new grid-connected power plants) is correctly identified as the only realistic baseline alternative to the implementation of the project activity.

Thus, it is correctly assumed that, in the absence of the project activity, LFG would have been released in an uncontrolled manner to the atmosphere (through the surface of the landfill and through the existing conventional and passive LFG venting drains) and electricity generation (in an amount equivalent to the amount of electricity to be generated by the project activity) would be generated by existent electricity generation sources connected to the National Electricity Grid of Brazil (and new additions of power generation sources).

The identified baseline scenario is correctly determined as per applicable guidance of ACM0001 (version 13) /5/ and the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) /6/). The application of guidance of the baseline methodology ACM0001 (version 13) /5/ in the context of the determination of the baseline scenario is deemed transparent and correct. All the assumptions and data used by the project participant are transparently presented in the PDD /1/ (including their references and sources). All documentation used is relevant for establishing the baseline scenario and are correctly quoted and interpreted in the latest version of the PDD /1/. Moreover, assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by documented evidences and are thus regarded as deemed correct. Relevant national and/or sectoral policies and circumstances are appropriately considered and listed in the PDD /1/.

As a conclusion, the GLC's validation team is of the opinion that the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

4.7.4 Algorithms / Formulae used to Determine Emission Reduction

As outlined in the latest version of the PDD /1/, calculations of GHG emissions reductions to be achieved by the project activity are correctly based on the application of the baseline and monitoring methodology ACM0001 (version 13) /5/ and the following methodological tools:

- "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0, EB 70) /6/
- "Emissions from solid waste disposal sites" (version 06.0.1, EB 66) /7/
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1, EB 39) /8/
- "Project emissions from flaring" (version 02.0.0, EB 68) /9/
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0, EB 61) /10/
- "Tool to calculate the emission factor for an electricity system" (version 04.0.0, EB 70) /11/

While as per ACM0001 (version 13) /5/, no leakage effects are required to be accounted, GHG emissions reductions (ER_y) are thus determined (in tCO_2e) as the difference between baseline emissions (BE_y) and project emissions (PE_y), where BE_y and PE_y are determined as follows:

4.7.4.1 Baseline Emissions:

As established by ACM0001 (version 13) /5/, in the particular case of the project activity (which does not encompass utilization of LFG as fuel for heat generation or as displacement of natural gas) baseline emissions are determined as follows:

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

Where:

BE_y	Baseline emissions in year *y* (tCO_2e/yr)
$BE_{CH4,y}$	Baseline emissions of methane from the SWDS in year *y* (tCO_2e/yr)
$BE_{EC,y}$	Baseline emissions associated with electricity generation in year *y* (in tCO_2e/yr)

The determination of baseline emissions correctly applies the stepwise procedure which is established by ACM0001 (version 13) /5/ as follows:

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

Baseline emissions of methane from the considered SWDS ($BE_{CH4,y}$) are determined based on the amount of methane that is captured in the project scenario and the amount that would be captured and destroyed in the baseline scenario (such as due to regulatory, safety or health requirements). In addition, the effect of methane oxidation in the top layer section of the landfill in the baseline scenario (absent in the project) is also taken into account as required by ACM0001 (version 13) /5/. $BE_{CH4,y}$ is calculated (in tCO_2e/yr) as follows:

$BE_{CH4,y} = (1 - OX_{top\_layer}) * (F_{CH4,PJ,y} - F_{CH4,BL,y}) * GWP_{CH4}$

Where:

OX_{top_layer}	Fraction of methane in the LFG that would be oxidized in the top layer of the considered SWDS in the baseline (dimensionless). OX_{top_layer} is correctly *ex-ante* determined as 10% (default values as per ACM0001 (version 13) /5/).
$F_{CH4,PJ,y}$	Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (in tCH_4/yr). $F_{CH4,PJ,y}$ is determined by following Step A.1 of the stepwise approach of ACM0001 (version 13) /5/.
$F_{CH4,BL,y}$	Amount of methane in the LFG that would be flared in the baseline in year *y* (in tCH_4/yr). $F_{CH4,BL,y}$ is determined by following Step A.2 of the stepwise approach of ACM0001 (version 13)/5/.
GWP_{CH4}	Global Warming Potential of CH_4. GWP_{CH4} is correctly ex-ante determined as 25 tCO_2e/tCH_4.

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

During the selected 7-year renewable crediting period, $F_{CH4,PJ,y}$ will be determined (in tCH_4/yr) as the sum of the quantity of methane flared and quantity of methane used as gaseous fuel in the project's electricity generation facility as follows [11] [12]:

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

Where:

$F_{CH4,flared,y}$ Amount of methane in the LFG which is destroyed by flaring in year *y* (in tCH_4/yr). $F_{CH4,flared,y}$ is determined as the difference between the amount of methane supplied to the flare(s) and any methane emissions from the flare(s), as follows:

$$F_{CH4,flared,y} = F_{CH4,sent\_flare,y} - (PE_{flare,y} / GWP_{CH4})$$

Where:

$F_{CH4,sent\ flare,y}$ Amount of methane in the LFG which is sent to the flare in year *y* (in tCH_4/yr)

$PE_{flare,y}$ Project emissions from flaring of the residual gas stream in year *y* (in tCO_2e/yr)

$F_{CH4,EL,y}$ Amount of methane in the LFG which is used for electricity generation in year *y* (tCH_4/yr)

Determination of $F_{CH4,EL,y}$:

Both $F_{CH4,EL,y}$ and $F_{CH4,sent\ flare,y}$ are determined by following applicable guidance of the "Tool to determine the mass flow of greenhouse gas in a gaseous stream" /10/. In the context of the application of such methodological tool for the determination of $F_{CH4,EL,y}$ and $F_{CH4,sent\ flare,y}$ the following requirements are correctly regarded as applicable:

- The gaseous stream the tool shall be applied to, is the LFG stream delivery pipeline to the electricity generation facility. $F_{CH4,EL,y}$ is then calculated as the mass flow of methane to the electricity generation equipment *j*;
- CH_4 is the greenhouse gas for which the mass flow should be determined;
- The flow of the gaseous stream should be measured on continuous basis;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 or 17 in the methodological tool);

[11] According to the "Tool to determine the mass flow of greenhouse gas in a gaseous stream", the Amount of methane in the LFG which is used for electricity generation in year *y* ($F_{CH4,EL,y}$) and the Amount of methane in the LFG which is sent to the flare in year *y* ($F_{CH4,sent\_flare,y}$), are represented as $F_{i,t}$.

[12] It is also important to note that $F_{CH4,HG,y}$ and $F_{CH4,NG,y}$ were not considered in the calculations, as the Amount of methane in the LFG which is used for heat generation and Amount of methane in the LFG which is sent to the natural gas distribution network (e.g. quantities of methane flared and used in boiler(s), air heater(s), glass melting furnace(s), kiln(s) and natural gas distribution network).

- The mass flow should be summed to a yearly unit basis (tCH_4/yr).

Furthermore, for the determination of $F_{CH4,EL,y}$, as also required by by ACM0001 (version 13) /5/, the working hours of the each element of project's electricity generation facility (each engine-generator set) will be monitored in a way to ensure that that no emission reduction are claimed for methane destruction during non-working hours of the considered engine-generator sets. This is taken into account by monitoring the hours that each engine generator set utilizing the LFG as gaseous fuel is operating in year *y* ($Op_{j,h,y}$).

As assessed by GLC's validation team applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /10/ was correctly applied to determine parameter $F_{CH4,EL,y}$.

Determination of $F_{CH4,sent\ flare,y}$:

$F_{CH4,sent\_flare,y}$ is determined by also following the above-quoted applicable guidance of the "Tool to determine the mass flow of greenhouse gas in a gaseous stream" /10/, where the considered residual gaseous stream is the LFG flow delivered to the flare(s).

Use of applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /10/ for determining $F_{CH4,EL,y}$ and $F_{CH4,sent\ flare,y}$:

As assessed by GLC's validation team applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /10/ is correctly applied to determine parameter $F_{CH4,sent\_flare,y}$ and $F_{CH4,EL,y}$ as follows:

Option 2 "*Simplified calculation without measurement of the moisture content*" of the tool is selected. This is deemed appropriate. Under Option 2, Option A, C or D apply to the project activity. The following potential measurement options of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /10/ are considered for the determination of $F_{CH4,sent\_flare,y}$ and $F_{CH4,EL,y}$:

Option	Flow of gaseous stream	Volumetric fraction
A	Volume flow – dry basis	Dry or wet basis
C	Volume flow – wet basis	Wet basis
D	Mass flow – dry basis	Dry or wet basis

As indicated in the latest version of the PDD /1/, depending on the project conditions and installed equipment either Option A, C or D will be selected *ex-post*. The decision of the project participant to later select the calculation option *ex-post* is deemed reasonable and acceptable due to following aspects:

- During the performed on-site visit, representatives of the project participant argued that the selection of Option A, C or D for determining the parameter $F_{i,t}$ is not yet decided since it is not yet known whether the flow meter(s) to be installed will be of a mass flow type or of a volume flow type.

As also outlined in the PDD /1/, suppliers for related equipment and project engineering will only be selected after the successful CDM registration of the proposed project activity by the CDM-EB. In addition, although the temperature of LFG (T_t) is expected to be below 60°C (which would then make the project eligible for the application of Option A and D), there are however rare cases where the temperature of collected LFG becomes above 60°C. In that particular case, Option C would thus be applicable (or a gas dryer would otherwise be installed). Due to the currently yet existent uncertainties about the type and specifications of monitoring equipment to be installed, it is deemed reasonable and acceptable the applied approach of choosing either Option A, C or D *ex-post* as part of the application of the project's monitoring system.

- The GLC's validation team is aware that in case the temperature of the gaseous stream (T_t) is below 60°C (at the flow measurement point), the flow measurement can either be done on wet or dry basis. Thus, project participant may choose between Options A and D. This conclusion is due to following observations:
    - While under the CDM, it is assumed that moisture is not relevant when gas temperature is below 60°C, the considerations of alternatives for the correction of measured flow rate of the residual gas from wet basis to dry basis as included in the CDM Requests of Clarification AM_CLA_0092 /46/ and AM_CLA_0116 /47/ are thus to be later considered in the context of the determination of emission reductions during the crediting period. These Requests for Clarification were previously raised in the context of periodic verifications of other LFG collection and destruction/ utilization CDM project activities:
        - AM_CLA_0116: "*Further clarification on AM_ CLA_ 0092 – Alternatives for the correction of measured flow rate of the residual gas from wet basis to dry basis*",
        - AM_CLA_0092: "*Clarification on a conflict between ACM0001 and the 'Tool to determine project emissions from flaring gases containing methane' relating to the measurement of methane fraction and flow rate of landfill gas (wet or dry basis)*"

        It should be noted that, as per such Requests for Clarification *"[…] for temperatures below 60°C, moisture could be neglected due to its very low influence on final results. In such cases, the basis adopted for measurements is not important. The rationale for adopting dry basis is linked to the fact that most gas analyzers operate in dry basis and thus no corrections would be necessary*." /46/

As a result of its assessment, the GLC's validation team identified that for the project activity, as long as it can be shown that T_t is below 60°C at the flow measurement point, Option A or D can be chosen. However if the temperature of the LFG is above 60°C and no gas dryer will be installed, Option C is applicable. Thus, along the crediting period, depending on project conditions and equipment installed either Option A, C or D will be followed by applying Option 2 of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /10/ as assessed below:

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. If it is conservative to assume that the gaseous stream is dry, then $m_{H2O,t,db}$ is assumed to equal 0. If it is conservative to assume that the gaseous stream is saturated, then $m_{H2O,t,db}$ is assumed to equal the saturation absolute humidity ($m_{H2O,t,db,sat}$) and calculated as follows:

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

Where:

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

$$MM_{t,db} = \Sigma_i (v_{i,t,db} * MM_k)$$

Where:

$v_{k,t,db}$	Volumetric fraction of gas *k* in the gaseous stream in time interval *t* on a dry basis (m³ gas k/m³ dry gas)
MM_k	Molecular mass of gas *k* (kg/kmol)
k	All gases, except H_2O, contained in the gaseous stream (e.g. N_2, CO_2, O_2, CO, H_2, CH_4, N_2O, NO, NO_2, SO_2, SF_6 and PFCs).

In accordance with the simplification given in the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /10/ the project proponent correctly indicated that only the volumetric fraction of CH_4 ($v_{CH4,t,db}$) will be monitored and the difference to 100% will be considered as pure nitrogen.

Depending on the project conditions and equipment, the mass flow of methane $F_{CH4,t}$ will be determined using either Option A, C or D as below:

Option A

$$F_{CH4,t} = V_{t,db,j} * v_{CH4,t,db} * \rho_{CH4,t}$$

Where:

$F_{CH4,t}$	Mass flow of greenhouse gas *i* (*i* = CH_4) in the gaseous stream (LFG) in time interval *t* (kg gas/h)
$V_{t,db,j}$	Volumetric flow of LFG stream in time interval *t* on a dry basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare(s)) (m³ dry gas/h)

$v_{CH4,t,db}$ Volumetric fraction of methane in the gaseous stream (LFG) in time interval *t* on a dry basis (m³ gas *i*/m³ dry gas)

$\rho_{CH4,t}$ Density of methane in the gaseous stream in time interval *t* (kg gas *i*/m³ gas *i*). $\rho_{CH4,t}$ will be determined as follows:

$$\rho_{CH4,t} = P_t * MM_{CH4} / R_u * T_t$$

Where:

P_t Absolute pressure of the gaseous stream (LFG) in time interval *t* (Pa)
T_t Temperature of the gaseous stream (LFG) in time interval *t* (K)
MM_{CH4} Molecular mass of greenhouse gas *i* (*i = CH4)* (kg/kmol)
R_u Universal ideal gases constant (Pa.m³/kmol.K)

Option C

$$F_{CH4,t} = V_{t,wb,n} * v_{CH4,t,wb} * \rho_{CH4,n}$$

Where:

$F_{CH4,t}$ Mass flow of greenhouse gas methane in the gaseous stream in time interval *t* (kg gas/h)
$V_{t,wb,n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis at normal conditions (m³ wet gas/h)
$v_{CH4,t,wb}$ Volumetric fraction of methane in the gaseous stream (LFG) in time interval *t* on a wet basis (m³ gas /m³ wet gas)
$\rho_{CH4,n}$ Density of methane in the gaseous stream at normal conditions (kg gas *i* /m³ wet gas *i*). Parameter $\rho_{CH4,n}$ will be determined as follows:

$$\rho_{CH4,n} = P_n * MM_{CH4} / R_u * T_n$$

Where:

P_n Absolute pressure at normal conditions (Pa)
T_n Temperature at normal conditions (K)
MM_{CH4} Molecular mass of methane (kg/kmol)
R_u Universal ideal gases constant (Pa.m³/kmol.K)

The following equation should be used to convert the volumetric flow of the gaseous stream from actual conditions to normal conditions of temperature and pressure:

$$V_{t,wb,n} = V_{t,wb,j} *(T_n /T_t) * (P_t /P_n)$$

Where:

$V_{t,wb,n}$ Volumetric flow of the considered gaseous stream (LFG) in a time interval *t* on a wet basis at normal conditions (m³ wet gas/h)
$V_{t,wb,j}$ Volumetric flow of LFG stream in time interval *t* on a wet basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare(s)) (m³ wet gas/h)

P_t Pressure of the gaseous stream in time interval *t* (Pa)
T_t Temperature of the gaseous stream in time interval *t* (K)
P_n Absolute pressure at normal conditions (Pa)
T_n Temperature at normal conditions (K)

Option D
The mass flow of methane $F_{i,t}$ (i = CH_4) is determined using equations (A-7) and (A-8) as outlined in the latest version of the PDD /1/.
The volumetric flow of the LFG in time interval *t* on a dry basis for *j* (where j is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare(s)) ($V_{t,db,j}$) is determined by converting the mass flow of the gaseous stream to a volumetric flow as follows:

$$V_{t,db,j} = M_{t,db,j} / \rho_{t,db}$$

Where:
$V_{t,db,j}$ Volumetric flow of LFG stream in time interval *t* on a dry basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare(s)) (m³ dry gas/h)
$M_{t,db,j}$ Mass flow of the LFG stream in time interval *t* on dry basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare(s)) (kg/h)
$\rho_{t,db}$ Density of gaseous stream (LFG) in time interval *t* on a dry basis (kg dry gas / m³ dry gas). $\rho_{t,db}$ shall be determined as follows:

$$\rho_{t,db} = P_t * MM_{t,db} / R_u * T_t$$

Where:
$MM_{t,db}$ Molecular mass of the gaseous stream (LFG) in a time interval t on a dry basis (kg dry gas/kmol dry gas)
P_t Pressure of the gaseous stream (LFG) in time interval *t* (Pa)
T_t Temperature of the gaseous stream (LFG) in time interval *t* (K)

Determination of $PE_{flare,y}$ (in the context of the determination of $F_{CH4,flared,y}$):
As outlined in the PDD /1/, the parameter $PE_{flare,y}$ is determined using the methodological approaches of the latest version of the "Project emissions from flaring" /9/. If LFG is flared through more than one flare, $PE_{flare,y}$ is determined as the sum of the emissions for each flare determined separately (if applicable). Project emissions from flaring the residual gas ($PE_{flare,y}$) are determined based the flare efficiency ($\eta_{flare,m}$) and the mass flow of methane to the flare ($F_{CH4,RG,m}$).

As correctly described in the latest version of the PDD /1/, the 3-step approach for determining project emissions from flaring through continuous monitoring of following parameters will be used as per the applicable guidance of the "Project emissions from flaring" /9/. This tool involves the following steps:

- STEP 1: Determination of the methane mass flow of the residual gas

  This first step indicates that the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /10/ is used to determine the Mass flow of methane in the residual gaseous stream in minute *m* ($F_{CH4,m}$). Furthermore, $F_{CH4,m}$ shall be used to determine the Mass of methane in kilograms fed to the flare in minute *m* ($F_{CH4,RG,m}$).
  The following requirements are applied:

  - The gaseous stream tool shall be applied to the residual gas;
  - The flow of the gaseous stream shall be measured continuously;
  - CH_4 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*.

- STEP 2: Determination of the flare efficiency

  The efficiency of combustion in the flare in minute *m* is determined as the average of two measurements of the flare efficiency made in year *y* ($\eta_{flare,calc,y}$), based on monitored data as per Option B.1: Biannual measurement of the flare efficiency, as follows:

  $$\eta_{flare,calc,y} = 1 - \tfrac{1}{2} \sum (F_{CH4,EG,t} / F_{CH4,RG,t})$$

  Where:

$\eta_{flare,calc,y}$	Flare efficiency in the year *y*
$F_{CH4,EG,t}$	Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in time period *t* (in kg)
$F_{CH4,RG,t}$	Mass flow of methane in the residual gas on a dry basis at reference conditions in the time period *t* (in kg)
t	The two time periods in year *y* when the flare efficiency is measured (minimum of one hour and separated by at least six months)

  $F_{CH4,EG,t}$ is to be measured according to an appropriate national or international standard. $F_{CH4,RG,t}$ is calculated according to Step 1[13] and consists of the sum of methane flow in the minutes m that make up the time period *t.*

  As an alternative to this approach, default values may be applied (in case determining of the methane destruction efficiency of the flare (flare efficiency - $\eta_{flare,m}$) is not available) as per Option A: Default value. In case of flare efficiency being determined on the basis of the use of default values (Option A: Default value), minute values for the calculation parameter $\eta_{flare,m}$ will be selected as 90% if the following two conditions are met in order to demonstrate that the flare is operating:

[13] As per applicable guidance of Step 1, the parameter $F_{CH4,RG,t}$ is equal to the sum of methane flow values $F_{CH4,sent\_flare,y}$, in the minutes *m* that make up the time period *t.*

- 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 specifications for the flare ($SPEC_{flare}$) in minute *m*.
- The flame is detected in minute *m* ($Flame_m$).

Otherwise, the adopted default value for the parameter $\eta_{flare,m}$ is 0%.

The determination of minute values for the calculated parameter $\eta_{flare,m}$ should correctly takes into account whether the manufacturer's specifications for the correct operation of the flare equipment are met.

Both approaches are in accordance with the methodological tool "Project emissions from flaring" /9/.

- STEP 3: Calculation of project emissions from flaring

According to the applicable guidance of the "Project emissions from flaring" /9/, Project emissions from flaring ($PE_{flare,y}$) are calculated as the sum of emissions for each minute *m* in year *y* as follows:

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

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*

As assessed by the GLC's validation team, the application of the 3-step approach is correctly outlined in the PDD /1/.

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

As established by ACM0001 (version 13) /5/, the *ex-ante* estimation of emission reductions for the 7-year renewable crediting period was correctly calculated based on the application of the multi-phased first order decay (FOD) model as per applicable guidance of the "Emissions from solid waste disposal sites" /7/. In accordance to ACM0001 (version 13) /5/, in the context of the *ex-ante* estimations of emission reductions, $F_{CH4,PJ,y}$ is determined (in tCO_2e) as follows:

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

Where:

$F_{CH4,PJ,y}$	Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (in 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* (in tCO_2e/yr). $BE_{CH4,SWDS,y}$ was determined using the methodological tool "Emissions from solid waste disposal sites" (version 06.0.1) /7/. Application A "The CDM project activity mitigates methane emissions from a specific

existing SWDS" is selected. The calculation of values for $BE_{CH4,SWDS,y}$ correctly takes into account the different types of waste *j* with respectively different decay rates k_j and different fractions of degradable organic carbon (DOC_j). By correctly applying the multi-phased FOD model, in the context of the *ex-ante* estimation of emission reduction, baseline emissions of methane are calculated based on the actual and projected waste streams $W_{j,x}$ disposed in each year *x.*

η_{PJ} Efficiency of the LFG capture system that will be installed in the project activity. η_{PJ} is ex-ante determined as 92.80%.

Further assessment details about the ex-ante estimation of emission reductions to be achieved by the project activity is presented in Section 4.7.4.4.

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

As required by ACM0001 (version 13) /5/, the amount of methane assumed as being captured and destroyed (by flaring) in the baseline scenario (absence of the project activity) due to regulatory or contractual requirements, or to address safety and other concerns ($F_{CH4,BL,y}$) was determined by following the applicable approach by selecting one of the four cases as outlined in the table below:

Situation at the start of the project activity	Requirement to destroy methane?	Existing LFG capture and destruction system?
Case 1	No	No
Case 2	Yes	No
Case 3	No	Yes
Case 4	Yes	Yes

Source: ACM0001 (version 13) /5/

Assessment of the existence of requirement to destroy methane (as per the applicable definition of "requirement" of ACM0001 (version 13) /5/):

As confirmed by the GLC's validation team, in the particular case of the Canhanduba landfill there is so far no applicable legally binding obligation to capture and destroy the LFG due to regulatory requirements and/or due to safety or odor concerns. Currently, direct venting of LFG through existent conventional passive LFG venting drains (which are existent at the Canhanduba landfill) are regarded by environmental authorities and by the operator of the landfill as a deemed sufficiently enough solution to prevent possible dangerous accumulation of LFG in the inner section of the landfill. As per the applicable methodological approach for the determination of $F_{CH4,BL,y}$ of ACM0001 (version 13) /5/, besides of legal requirements, any other existing requirement to capture and destroy LFG in the landfill (e.g. in order to address safety and/or other concerns) is to be considered for the determination of "*existing requirement to destroy methane*", in the particular context the project activity, it is thus appropriately assumed that it does not exist any requirement to destroy methane at the landfill site.

By taking this assumption into account, Case 2 and Case 4 (*Requirement to destroy methane? = Yes*) are thus appropriately regarded as not applicable cases for the determination of $F_{CH4,BL,y}$.

Assessment of existence of LFG capture and destruction system at the Canhanduba landfill (as per the applicable definition of "existing LFG capture and destruction" of ACM0001 (version 13) /5/):

Capture of LFG (with no destruction of methane) in conventional LFG venting drains is assumed as the practice in the baseline scenario to prevent possible dangerous accumulation of LFG in the inner section of the landfill. Thus it is reasonably assumed that, under the baseline scenario, existing LFG venting drains would be maintained and even expended (eventual implementation of new similar and additional conventional LFG venting drains as a result of forecasted growth of the landfill surface covered with disposed MSW).

It is important to note that during its performed visual on-site inspection, the GLC's validation team did not identify any indication or proof of previous LFG combustion (e.g. the existent conventional LFG passive drains were found clean with no black coloration arising from potential LFG combustion). In addition, operational procedures for the landfill were reviewed by the validation team with no provisions for passive combustion of LFG being found as part of such working procedures. By means of performing visual inspection (during the performed on-site visit) and by means of interviews with representatives of the project participant (including responsible person for the operational staff of the landfill), the GLC's validation team thus confirmed that no methane has ever been destroyed in the pre-project scenario at the Canhanduba landfill. It was further identified that no active LFG collection system (using mechanical equipment to capture LFG by providing pressure gradients) was ever in place. Thus, the GLC's validation judges as deemed correct and reasonable to assume and select "No" as the option for validating the existence of "*Existing LFG capture and destruction system*".

Based on its sectoral expertise, the GLC's validation team also confirms that no continuous combustion of LFG through conventional venting drains has been the practice in several landfills and dump sites in Brazil and other countries in Latin America where no legal or operational requirements for destruction of LFG exists.

As appropriately outlined in the PDD /1/ in several cases, where no combustion of LFG to address safety requirements is required, LFG is just vented through conventional and in some cases very rudimentary LFG venting drains (without any LFG being combusted).

As a conclusion, the GLC's validation team was able to confirm that Case 1 is the only applicable case for the determination of $F_{CH4,BL,y}$.

Application of methodological guidance valid for Case 1:

As correctly outlined in the latest version of the PDD /1/ under Case 1, the following is applicable as per ACM0001 (version 13) /5/:

In this situation:

$F_{CH4,BL,y} = F_{CH4,BL,R,y}$

$F_{CH4,BL,R,y} = 0$

Where:

$F_{CH4,BL,R,y}$	Amount of methane in the LFG which is flared in the baseline due to a requirement in year y (in tCH_4).

Further details about the GLC's assessment for the *ex-ante* estimations of baseline emissions along the selected 7-year renewable crediting period are made available in Section 4.7.4.4.

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

The parameter $BE_{EC,y}$ was correctly determined using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" with following formula:

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

Where:

$BE_{EC,y}$	Baseline emissions associated with electricity generation in year y (tCO_2/yr).
$EC_{BL,k,y}$	Net amount of electricity generated using LFG in year y (MWh/yr).
$EF_{EL,k,y}$	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 *j* in year *y*.
k	Sources of electricity generated identified in the selection of the most plausible baseline scenario.

The emission factor $EF_{EL,k,y}$ is correctly identified by applying the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and Option A.1 was correctly chosen. Due to the definition of parameters in the methodology ACM0001 (version 13) /5/ superseding the tool, scenario A applies if the electricity end users would be supplied by the same power grid (i.e. National Electricity Grid of Brazil) which will be supplied by the project activity's power plant using LFG as a fuel. GLC confirms that Option A.1 has been correctly chosen because no captive power plant is installed at the site of the electricity consumption. Thus parameter $EF_{EL,k,y}$ has been correctly defined as "Combined margin CO_2 emission factor" $EF_{grid,CM,y}$.

It has been correctly explained in the PDD that the parameter $EF_{grid,CM,y}$ will be *ex-post* determined by following applicable guidance of the "Tool to calculate the emission factor for an electricity system." The *dispatch data analysis OM* has is selected as the calculation method. The selection of this approach is in accordance with guidance and definitions previously set by the Brazilian Ministry of Science and Technology (MCT) /29/, which is the DNA of Brazil (http://www.mct.gov.br/upd_blob/0024/24719.pdf).

In the particular context of the *ex-ante* estimation of emission reductions to be achieved by the project activity, the "Combined margin emission factor" ($EF_{grid,CM,y}$) has been estimated as 0.3593 tCO_2e/MWh.

The value was selected based on official data provided by the DNA of Brazil for year 2012. This is in accordance with the applicable guidance of the "Tool to calculate the emission factor for an electricity system", which requires the utilization of the most recent and valid data. As the valid data for year 2013 has not been published yet by the DNA of Brazil, the data selected by the project participant is the value

valid for 2012. Along the crediting period, $EF_{grid,CM,y}$ will be determined *ex-post* based on calculated values for the monitoring parameter "Build margin CO_2 emission factor in year y" ($EF_{grid,BM,y}$) and "Operating margin CO_2 emission factor" ($EF_{grid,OM,y}$) and also considering *ex-ante* selected values for w_{BM} and w_{OM}. This is in accordance with applicable guidance of the "Tool to calculate the emission factor for an electricity system".

The project activity is expected to generate a net amount of electricity using LFG as a gaseous fuel of approximately 14.46 GWh per year during the 7-year renewable crediting period. As the electricity generation option is implemented since the start of the project activity, the energy component is thus accounted on the estimation of baseline emissions. This is in accordance with related provisions of ACM0001 (version 13) /5/.

Summarizing *ex-ante* estimated baseline emissions include (A) "Baseline emissions of methane from the SWDS" and (B) "Baseline emissions associated with electricity generation". For the proposed project activity, baseline emissions of methane from the SWDS ($BE_{CH4,y}$) and baseline emissions associated with electricity generation ($BE_{EC,y}$) are estimated to be on the average of 72,170 tCO_2e and 6,238 tCO_2e per year over the selected 7-year crediting period respectively. The total *ex-ante* estimated baseline emissions (BE_y) (the sum between $BE_{CH4,y}$ and $BE_{EC,y}$) result in an average estimate of 78,408 tCO_2e per year over the 7-year selected crediting period. Further assessment about the appropriateness of the *ex-ante* determined parameters used in the context of the *ex-ante* estimation of baseline emissions is presented in Section 4.9.1.

4.7.4.2 Project Emission:

In accordance with ACM0001 (version 13) /5/, while project emissions resulting from flaring of the residual gas stream ($PE_{flare,y}$) are calculated as part of determination of baseline emissions, the only emission sources to be accounted as Project emissions in year *y* (PE_y) are as follows:

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

$$PE_{EC,y} = PE_{EC,grid,y} + PE_{EC,captive,y}$$

- Project emissions from consumption of grid electricity due to the project activity in year *y* ($PE_{EC,grid,y}$)
- Project emissions from consumption of electricity generated by a captive off-grid electricity generator fuelled by fossil fuel (Diesel) in year *y* ($PE_{EC,captive,y}$)
- Project emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year *y* ($PE_{FC,y}$). Since no fossil fuel is expected to be used by the project activity, $PE_{FC,y}$ is correctly assumed as zero [14].

[14] The PDD states that: *"The captive off-grid backup electricity generator (fuelled by diesel) is expected to be used only for emergency purposes (whenever supply of grid electricity to the project activity is temporarily interrupted). Thus, in the context of ex-ante estimates of emission reductions to be achieved by the project activity, there is no estimated amount of electricity to be generated this generator and/or amount of fossil fuel diesel to be consumed by the generator either. Project emissions due to the consumption of electricity sourced by this generator are thus estimated as zero (null) in the particular context of ex-ante estimations of emission reductions to be achieved by the project activity. However, such project emissions will be determined ex-post along the crediting period (based on applicable monitoring and calculation requirements according to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption") and will be accounted for the determination of emission reductions*".

Determination of Project emissions from consumption of grid electricity due to the project activity in year y ($PE_{EC,grid,y}$):

Project emissions from consumption of grid electricity due to the project activity in year *y* ($PE_{EC,grid,y}$) are determined (in tCO_2/yr) based on monitoring records of amount of grid electricity consumed by the project activity (by following applicable guidance and monitoring requirements of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /8/) and also by taking into account *ex-post* determined annual values for CO_2 emission factor for consumed grid electricity (by following applicable guidance and monitoring requirements of the "Tool to calculate the emission factor for an electricity system" /11/) and *ex-ante* determined value of the Average technical transmission and distribution losses in the National Grid of Brazil in year *y* ($TDL_{grid,y}$) (by also following the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /8/) as follows:

$$PE_{EC,,grid,y} = EC_{PJ,grid,y} * EF_{EL,grid,y} * (1 + TDL_{grid,y})$$

Where:

$EC_{PJ,grid,y}$ Quantity of grid electricity consumed by the project activity in year *y* (in MWh/yr). $EC_{PJ,grid,y}$ will be monitored (based on measurements) along the 7-year renewable crediting period. An estimated average annual value for $EC_{PJ,grid,y}$ is taken into account for the determination of *ex-ante* estimation of emission reductions.

$EF_{EL,grid,y}$ Emission factor for grid electricity generation in year *y* (in tCO_2/MWh). $EF_{EL,grid,y}$ will be monitored along the 7-year renewable crediting period. As established by the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /8/ and as correctly outlined in the PDD /1/, $EF_{EL,grid,y}$ is *ex-post* determined as the Combined margin CO_2 emission factor for the National Electricity Grid of Brazil. $EF_{grid,CM,y}$ is determined ($EF_{grid,CM,y}$) (in tCO_2/MWh) by following the applicable guidance of the latest version of the "Tool to calculate the emission factor for an electricity system" /11/, where the following formulae is applicable:

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

Where:

$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in year y (in tCO_2/MWh)
$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (in tCO_2/MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

The weighting factors for build and operating margin (w_{BM} and w_{OM}) were *ex-ante* selected as per applicable guidance of the "Tool to calculate the emission factor for an electricity system" /11/.
$EF_{grid,OM,y}$ is calculated ex-post by applying calculation guidance of the methodological tool applicable for *dispatch data analysis OM*. Under this calculation method, data for

the year in which the project activity consumes grid electricity is considered for determining emission factor annually during monitoring. As per this method $EF_{grid,OM,y}$ is determined based on the grid power units that are actually dispatched at the margin during each hour *h*. $EF_{grid,OM,y}$ is calculated (in tCO_2/MWh) as the dispatch data analysis operating margin CO_2 emission factor in year *y* ($EF_{grid,OM-DD,y}$).

Estimated annual values for $EC_{PJ,grid,y}$ and $EF_{EL,grid,y}$ are taken into account for the determination of *ex-ante* estimation of emission reductions. The estimated value of 0.3593 tCO_2/MWh for $EF_{EL,grid,y}$ corresponds to the Combined margin CO_2 emission factor ($EF_{grid,CM,y}$) for year 2012 which was determined and published by the DNA of Brazil. By means of checking the information made available at the website of the DNA of Brazil /29/, the GLC's validation team was able to confirm that for the official values for year 2012 of the build margin is given as 0.2010 tCO_2/MWh ($EF_{grid,BM,y}$) and the operating margin is given as 0.5176 tCO_2/MWh ($EF_{grid,OM,y}$). By also following applicable guidance of the "Tool to calculate the emission factor for an electricity system" /11/, 50% and 50% values were selected for both parameters w_{OM} and w_{BM} when estimating the value of $EF_{EL,grid,y}$.

Estimated annual value for $EC_{PJ,grid,y}$ is based on deemed acceptable and reasonable forecasts of grid electricity consumption by the project activity. While no project design details is yet available (as the project's detailed engineering and equipment procurement are yet to be initiated), the estimate of annual values of $EC_{PJ,grid,y}$ is deemed acceptable and reasonable when considering its magnitude.

$TDL_{grid,y}$ Average technical transmission and distribution losses in the National Grid of Brazil in year *y*. $TDL_{grid,y}$ is correctly *ex-ante* determined as 20% in accordance with Scenario A (Option A1) of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /8/.

Determination of Project emissions from consumption of electricity generated by a captive off-grid electricity generator fuelled by fossil fuel (Diesel) in year y ($PE_{EC,captive,y}$):

According to the PDD: *"the captive off-grid backup electricity generator (fuelled by diesel) is expected to be used only for backup purposes (whenever supply of grid electricity to the project activity is temporarily interrupted). Thus, in the context of ex-ante estimates of emission reductions to be achieved by the project activity, there is no estimated amount of electricity to be generated by this generator and/or amount of fossil fuel diesel to be consumed by the generator either. Project emissions due to the consumption of electricity sourced by this generator ($PE_{EC,captive,y}$) are thus estimated as zero (null) in the particular context of ex-ante estimations of emission reductions to be achieved by the project activity. However, such project emissions will be determined ex-post along the crediting period (based on applicable monitoring and calculation requirements according to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption") and will be accounted for the determination of emission reductions"*.

Emissions arising from diesel consumption of the off-grid captive generator will be monitored ex-post using approaches B2 or B4 presented in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /8/.

As per Option B2 of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /8/, $PE_{EC,captive,y}$ is calculated as follows:

$$PE_{EC,captive,y} = EC_{PJ,captive,y} * EF_{EL,captive,y} * (1 + TDL_{captive,y})$$

Where:

$EC_{PJ,captive,y}$ Quantity of electricity sourced by the captive electricity generator (fuelled by Diesel) and consumed by the project activity in year *y*. $EC_{PJ,captive,y}$ will be measured and monitored in MWh/year.

$EF_{EL,captive,y}$ CO_2 emission factor for electricity sourced by the captive off-grid electricity generator in year *y* (tCO_2/MWh). By following Option B2 of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /8/, $EF_{EL,captive,y}$ is *ex-ante* determined as 1.3 tCO_2/MWh.

$TDL_{captive,y}$ Average technical transmission and distribution losses for electricity sourced by the captive electricity generator in year *y*. In accordance with the applicable provisions of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /8/, as a simplification, $TDL_{captive,y}$ is *ex-ante* determined as zero.

The option B4 of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /8/, indicates that $PE_{EC,captive,y}$ is calculated based on the rated capacity of the installed captive off-grid electricity generator and by assuming a CO_2 emission factor of 1.3 tCO_2/MWh for electricity generated by the captive off-grid electricity generator (which is assumed as being operation of 8,760 hours per year) as follows:

$$PE_{EC,captive,y} = 11{,}400\ tCO_2/MWh * PP_{CP,Diesel\text{-}generator}$$

Where:

$PP_{CP,Diesel\text{-}generator}$ Rated capacity of the installed captive off-grid electricity generator (fuelled by Diesel) (in MW)

Further details about the GLC's assessment for the *ex-ante* estimations of project emissions along the selected 7-year renewable crediting period are made available in Section 4.7.4.4.

4.7.4.3 Leakage emissions

In accordance with ACM0001 (version 13) /5/, leakage emissions are not considered for the determination of emission reductions to be achieved by the project activity. Moreover, as part of its assessment, the GLC's validation team confirms that, as highlighted in the latest version of the PDD /1/,

no project emission or leakage (other than the ones covered by ACM0001 (version 13) /5/ which would contribute to more than 1% of the emission reductions to be achieved by the project activity were identified.

4.7.4.4 *Ex-ante* estimation of emission reductions:

The *ex-ante* estimation of emission reductions (as calculated in an emission reductions calculation spreadsheet /3/ and summarized in the PDD /1/) was assessed by the GLC's validation team. The performed assessment included checking of input parameters and formulas contained in the spreadsheet cells for estimating baseline and project emissions along the 7-year renewable crediting period. The GLC's validation team was also able to confirm that all assumptions and data used for estimating GHG emission reductions to be achieved by the project activity are listed in the PDD /1/. Furthermore, formulas, parameters and values are complete, accurate and transparent.

E*x-ante* estimated baseline emissions include (A) "Baseline emissions of methane from the SWDS" and (B) "Baseline emissions associated with electricity generation". For this project activity baseline emissions of methane from the SWDS ($BE_{CH4,y}$) and baseline emissions associated with electricity generation ($BE_{EC,y}$) are estimated to be on the average of 72,170 tCO_2e and 6,238 tCO_2e per year over the selected 7-year crediting period respectively. The total *ex-ante* estimated baseline emissions (BE_y) (the sum between $BE_{CH4,y}$ and $BE_{EC,y}$) result in an average estimate of 78,409 tCO_2e per year over the 7-year selected crediting period. The *ex-ante* estimated project emissions (PE_y) are 140 tCO_2e per year.

Discussion about the appropriateness of the *ex-ante* selected parameters used in the context of the *ex-ante* estimation of emission reduction is presented in Section 4.9.
Emission reductions (ER_y) to be achieved by the project activity were *ex-ante* estimated as the difference of *ex-ante* estimation of baseline emissions and *ex-ante* estimation of project emissions. ER_y are estimated to be (on the average) 78,269 tCO_2e per year over the selected 7-year renewable crediting period.

The annual average value for *ex-ante* estimates of emission reductions to be achieved by the project activity during the 7-year renewable crediting period from 2014-07-01 to 2021-06-30 is slightly higher than the annual average value as previously indicated in the initial version of the PDD. While in the initial version of the PDD, the 7-year crediting period was expected to encompass the period from 2013-04-01 to 2020-03-31, the occurred change in the expected starting date of the crediting period promoted an increase in *ex*-ante estimates of emission reductions. In accordance with the applied LFG generation model (First Order Decay (FOD) model), the amount of LFG generated at the Canhanduba landfill (as amount of LFG to be collected by the project activity) is expected to increase as long as MSW keep on being disposed in the landfill as per the current situation.

Detailed calculation of *ex-ante* estimation of both baseline and project emissions, as provided in the emission reduction calculation spreadsheet /3/ which is enclosed to the PDD, can be reproduced using data and parameter values provided in the latest version of the PDD /1/ and supporting files submitted to GLC. The selection and determination of all used factors and parameters are deemed reasonable and acceptable. In summary, the GHG calculations are complete and transparent, and data accuracy has been verified.

It is however noteworthy that the forecasted emission reductions over the 7-year renewable crediting period are deemed within reasonable limits. Based on assessment of other similar registered CDM project activities (also involving LFG collection and destruction/utilization), GLC highlights that methane generation and collection efficiency of LFG in landfills (as typically forecasted through the application of the FOD model in the context of ACM0001 (version 13) /5/ methodology) has an inherent high uncertainty level (of almost 50% in some cases) and hence the amount of emission reductions, which will be determined on the basis of *ex-post* monitoring, might significantly vary from the forecasted amount.

4.8 Additionality of the Project Activity

As established by the approved consolidated baseline and monitoring methodology ACM0001 – "Flaring or use of landfill gas" (version 13) /5/, the additionality of the project is demonstrated by applying the stepwise procedure as per the latest version of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0, EB 70) /6/. While the baseline identification (which is also identified by applying the stepwise procedure of the methodological tool) is mostly assessed in Section 4.7.3, this section provides an assessment of the demonstration of additionality of the project activity and also complements the determination of the baseline scenario. The following sections include assessment of the application of the stepwise procedure of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0, EB 70) /6/ for the demonstration of additionality for the project activity as well as for the continuation of the identification of the baseline scenario. References to Section 4.7.3 are made.

4.8.1 Assessment of Prior Consideration of the Clean Development Mechanism

While all project related engineering, design and construction phases are yet to be initiated, the exact project starting date (as per the applicable definition of the Glossary of CDM Terms /15/) is thus correctly assumed as not yet confirmed. As per contractual requirements established between the project participant Itajaí Biogás e Energia S.A. and Ambiental Limpeza Urbana e Saneamento Ltda. (company in charge of the management of the landfill, according to contract signed with Prefeitura Municipal de Itajaí /28/) on 2012-10-01 /28/, project engineering, equipment procurement and construction are only required to be initiated after successful registration of the project as a CDM project activity under UNFCCC, the expected starting date of the project activity (e.g. signature of equipment purchase contract(s) or signature of contract(s) for construction services) is indicated in the PDD to occur right after the successful registration of the project activity Thus, the starting date of the proposed project activity is after the start of CDM validation assessment for the project activity (which is the date of publication of the initial version of the PDD made available to GLC for global stakeholder consultation (GSC)[15]: 2012-10-30)

As confirmed by the GLC's validation team, no relevant capital expenditures have so far incurred. As also assessed by the GLC's validation team, so far there is no documented, detailed and scheduled commitment to initiate any capital expenditure related to the project construction and its operation. This was confirmed during the performed on-site visit to the Canhanduba landfill and to the office of the

[15] Further assessment details about the performed Global Stakeholder Consultation (GSC) process are presented in Section 4.1.

project participant. No action related to start of construction of the project activity was observed in the project site. The so far expected (estimated) project starting date, as indicated in the PDD /1/, is 2014-04-01. This date is assumed as the date right after the registration of the project as a CDM project activity by the CDM-EB.

In accordance with VVS /4/, while the assumed project start date is after 2008-08-02 and the starting date of the proposed project activity is after to the start of validation, it is thus not required for GLC to assess whether CDM benefits were considered necessary in the decision to implement the project activity. However, the project participant has anyway informed the DNA of Brazil and the UNFCCC CDM secretariat about the commencement of the project activity and of the intention to seek CDM status for the project activity. As confirmed by the GLC's validation team, Prior CDM consideration notification forms were submitted to both the DNA of Brazil /40/ and to UNFCCC CDM Secretariat /39/ .by the project participant Itajaí Biogás e Energia S.A. Copies of such forms were made available and assessed by the GLC's validation team. The UNFCCC webpage for Prior consideration of the CDM was also assessed by the GLC's validation team in order to confirm the receipt of the notification by the UNFCCC CDM Team. As confirmed by the GLC's validation team:

- Notification of CDM prior consideration that was sent to the UNFCCC CDM Secretariat. The submitted form /39/ is dated 2012-10-15; As per information made available in the UNFCCC webpage for Prior consideration of the CDM, the date of receipt of such notification is 2012-10-15.
- Notification of CDM prior consideration of the CDM was sent to DNA of Brazil. The submitted form (translated into Brazilian Portuguese language) /40/ is dated 2012-10-15. The form includes receipt confirmation /40/ from the DNA of Brazil.
- Both submitted notifications of CDM prior consideration of the CDM are presented in standard form, containing precise geographical location and a brief description of the proposed CDM project activity.

Thus, the GLC's validation team confirms that the proposed CDM project activity complies with applicable requirements for prior consideration of the CDM.

4.8.2 Identification of Alternatives

As established by the approved consolidated baseline and monitoring methodology ACM0001 – “Flaring or use of landfill gas” (version 13) /5/, the identification of alternatives to the proposed project activity is demonstrated by applying stepwise procedure of the latest version of the “Combined tool to identify the baseline scenario and demonstrate additionality” /6/. This is assessed in Section 4.7.3. The list of realistic and credible alternatives remaining after application of Step 2 of the methodological tool includes the following alternatives:

LFG1 The project activity implemented without being registered as a CDM project activity (i.e. implementation of a LFG capture and destruction system (by combusting collected LFG in high temperature enclosed flare(s));

E1 Electricity generation from LFG, undertaken without being registered as CDM project activity;

LFG2 Atmospheric release of the LFG or partial capture of LFG and destruction to comply with regulations or contractual requirements, or to address safety and other concerns;

E3 Electricity generation in existing and/or new grid connected power plants;

As further assessed in Section 4.8.3, while alternative LFG1 + E1 is identified as equivalent to scenario S1 (as per the "Combined tool to identify the baseline scenario and demonstrate additionality" /6/) and alternative LFG2 + E3 is identified as equivalent to scenario S3 (as per the methodological tool), the remaining alternatives are thus appropriately presented in the PDD /1/ as alternatives S1/LFG1 + E1 (with utilization of collected LFG as fuel for electricity generation) and S3/LFG2+ E3.

4.8.3 Investment Analysis

By applying the Step 3 of the "Combined tool to identify the baseline scenario and demonstrate additionality" /6/, an investment analysis is applied to compare the economic or financial attractiveness of the alternative scenarios remaining after Step 2 as per requirements of the stepwise approach of the methodological tool. The remaining list of alternatives correctly includes:
- a scenario where the project participant does not undertake an investment (scenario S3).
- a scenario where the project participant undertakes an investment (scenario S1).

As appropriately and correctly outlined in the PDD /1/, alternative LFG1 + E1 (as per ACM0001 (version 13) /5/) is correctly identified as equivalent to scenario S1 (as per the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality"). Moreover, alternative LFG2 combined with alternative E3 (as per ACM0001 (version 13) /5/) is identified as equivalent to scenario S3 (as per the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality"). The remaining alternatives are thus appropriately presented in the PDD /1/ as alternatives S1/LFG1 +E1 and S3/LFG2 + E3.

Definition of the applicable financial indicator:
As required by the "Combined tool to identify the baseline scenario and demonstrate additionality" /6/ net present value (NPV) has been correctly selected as the financial indicator for analyzing the economic or financial attractiveness for the selected realistic and credible alternatives remaining after Step 2 of the methodological tool (which includes situations described in S1 and S3 of this methodological tool).

Investment analysis was performed by comparing the calculated Net Present Value (NPV) for the alternatives on the basis of related investment capital expenditures + operation and maintenance costs applicable for these alternatives + expected revenues associated with commercialization of electricity to be generated (only in the particular case of alternative S1/LFG1 + E1).

Definition of the NPV value for alternative S3/LFG2 + E3:
While alternative LFG2 + E3 (which is equivalent to scenario S3 of the methodological tool) represents the continuation of the current situation (LFG2: "*total atmospheric release of LFG or eventually partial capture of landfill gas and destruction to comply with regulations or contractual requirements or to address safety and other concerns*" and E3: *"Electricity generation in existing and/or new grid-connected power plants"*), this alternative clearly represents the continuation of the current *status quo*, thus not requiring any capital investment (in equipment, civil construction, etc.) and not requiring any incremental operational and maintenance costs either by the project participant for LFG management at the Canhanduba landfill. Moreover alternative LFG2 + E3/S3 does not generate any financial revenue either. Thus, in accordance with the "Combined tool to identify the baseline scenario and demonstrate additionality" /6/, the NPV value for alternative S3/LFG2 + E3 is correctly selected as zero (null).

Calculation of the NPV value for alternative S1/LFG1 + E1:

Alternative S1/LFG1 + E1 represents the implementation and operation of the project activity (with electricity generation using LFG as fuel) but without taking into account any CDM benefit (i.e. revenues from the commercialization of CERs to be potentially generated by the project while registered as a CDM project activity). While the implementation and operation of an active (forced) LFG collection, destruction system (using high temperature enclosed flare(s)) and a LFG utilization system (using collected LFG as gaseous fuel for electricity generation) indeed requires significant capital investments and also implies in associated operation & maintenance costs, this alternative also generates revenues due to the commercialization of electricity to be generated.

The calculated NPV of the alternative S1/LFG1 +E1 was verified by the GLC's validation team to be correctly determined as – 1,102,883 €.

Assessment of calculated NPV value for alternative S1/LFG1 + E1:

The GLC's validation team thoroughly assessed all parameters and assumption applied for calculating the above-presented NPV value for alternative S1/LFG1 + E1. Available evidences and expertise in the relevant financial practices were considered as part of the assessment. All key parameters and main assumptions related to investment capital expenditures and regular operation and maintenance costs are sufficiently presented in the NPV calculation spreadsheet based on quotations and further investigations /2/ (which was earlier developed by Itajaí Biogás e Energia S.A. and hired CDM and LFG utilization consultants). The NPV calculation spreadsheet includes details of the following assumptions used in investment analysis including the following[16] :

- Electricity sale price (assumed as BRL 102.41 per MWh) [17]

[16] As assessed by the GLC's validation team, related capital expenditures for the acquisition or rental of a backup off-grid captive electricity generator (fuelled by diesel) are not considered in the investment analysis. As argued by the project participant, related capital expenditures were not considered at the time of the project's implementation decision-making process. The non-inclusion of such related capital expenditures is however acceptable in the context of the demonstration of the additionality for the project activity as it potentially makes the NPV for alternative S1/LFG1 + E1 higher, thus not adversely affecting the demonstration of non-financial attractiveness for the project activity in the absence of CDM revenues.

[17] Commercialization price for electricity to be generated by the project activity was estimated to be 102.41 BRL/MWh and the value is sourced by the Empresa de Pesquisas Energéticas (EPE) which is part of the Brazilian Ministry of Energy /66/. The value from the Leilão de Energia A3/2011 was published on 2011-08-17. EPE has published this electricity sale tariff based on a study on future electricity demand and supply in Brazil. The prices are valid for electricity supply from 3 years upon auction date (2011). Hence electricity is deemed to be delivered from 2014 onwards. According to the Leilão de Energia A3/2011, the auction has been carried out to identify which energy power company will supply electricity on the lowest price. The final auction price for electricity from biomass energy source is set as 102.41 BRL/MWh. The value has been crosschecked with the Leilão de Energia de Reserva (Energy Reserve Auction) /67/, published on 2011-08-18, estimating an electricity sale price of 100.4 BRL for electricity from biomass energy source. It should be noted that in each auction the electricity sale price from biomass energy source is the highest compared to other sources, such as wind, hydro or natural gas. Further of both sources Leilão de Energia /66/ and Leilão de Energia de Reserva /67/, the highest value has been chosen which is deemed conservative.
The electricity sale price has been crosschecked with other registered CDM landfill gas to energy projects in Brazil:

1. UNFCCC registration number 1626 (http://cdm.unfccc.int/Projects/DB/DNV-CUK1203743009.45/view); electricity sale price = 71.9 USD/MWh (= 139.87 BRL/MWh with average yearly exchange rate for 2007)
2. UNFCCC registration number 3464 (http://cdm.unfccc.int/Projects/DB/SGS-UKL1267696608.78/view); electricity sale price = 137.32 BRL/MWh (sourced from electricity auction 2007)

Hence it can be confirmed that the price from the electricity auction published by Brazilian Ministry of Energy (EPE) /66/ is a credible and reliable source. GLC identified that the electricity sale price of 102.41 BRL/MWh is appropriate and the value is valid and applicable at time of investment decision. The value has been correctly indicated in PDD /1/ and Financial Excel Sheet /2/.

- Refurbishment/residual values of engine generation sets and remaining equipment for the project's electricity generation component (no equipment refurbishment is planned, as the expected lifetime of the project equipment is at least 20 years) [18]
- Exchange rate (2.45 BRL/EUR) [19]
- Benchmark rate in nominal terms (16.40%) [20]
- Income taxes (combined company income tax rate in Brazil is 34%) [21]
- Investment capital expenditures (the total required investment for both the LFG flaring plant and the electricity generation facility is estimated as 2,164,945 €) [22]

---

[18] The lifetime of the engine-generator sets is estimated to be 20 years. The value is sourced from the technical and commercial proposal supplied by engine supplier Guascor S.A. /64/.By means of background research, it was verified by the GLC's validation team that most of the LFG to energy projects in Brazil (applying investment analysis to demonstrate additionality) a project lifetime of 20 years is applied (e.g. UNFCCC project no 5947, 0164, 0373, 0052). By means of local and sectoral knowledge, GLC identified that the applied value is appropriate and the source is deemed credible. The value is valid and applicable at time of investment decision. The value has been correctly indicated and applied in both the PDD /1/ and in the investment analysis spreadsheet /2/.

[19] This value corresponds to the average historical exchange rates from October 2011 to September 2012, which is valid at the time of the project implementation decision taking.

[20] The selected discount rate is determined as 16.40 %. The selected value represents the conservative default value applicable for a similar project being hosted in Brazil as per the "Guidelines on the assessment of investment analysis" (EB 62 Annex 5) /17/. The selected value is applicable for the host country Brazil and Group 1 + inflation rate forecasts. As the value provided in the CDM-EB guidance is based on real terms and the investment analysis is carried out in nominal terms, the GLC's validation team confirmed that inflation forecasts were correctly considered in the determination of the discount rate. As the inflation forecast and target inflation rate from the Brazilian Central Bank is only available until 2014, project participants chose the average forecasted inflation rate for the host country as published at the publication World Economic Outlook issued by the International Monetary Fund (IMF) for the period from 2013 to 2017. The selected average value is 4.6472% per year. In summary, the selection of the discount rate as being equal to 11.75% + 4.6472% = 16.40% is confirmed to be deemed reasonable and acceptable. The selected value was also confirmed to be correctly indicated and applied in both PDD (Section B.5) and the investment analysis spreadsheet.

[21] The applied corporate tax rate (34%) is sourced from Deloitte (2011) "Corporate tax rate 2011 – International tax" /32/.
By means of financial expertise and local and sectoral knowledge, the GLC's validation team confirms that the applied value is appropriate and the source is deemed credible. The value is valid and applicable at time of investment decision. The value has been correctly indicated in PDD /1/ and investment analysis spreadsheet /2/.

[22] The total capital investment is estimated to be 2,164,945 € and the value is based on commercial proposals received from equipment suppliers /56/ /68/. As also verified by the GLC's validation team, the total required capital investment encompasses the required investment for construction of LFG collecting wells /68/, LFG pipeline /56/, all equipment for the electricity generation facility (including engine-generator sets and ancillary equipment) /64/. As also verified by the GLC's validation team, the required investment also includes capital expenditures for implementing the LFG flaring system and a sophisticated monitoring equipment (which is indeed not used for a project activity without being registered under the CDM). The commercial proposals for supply of equipment were received from the equipment suppliers Guascor S.A., Biotecnogas S. R. I..
The calculated total capital investment per kW of installed nameplate capacity for the project's electricity generation component (i.e 680 €/kW for this project activity) was compared to calculated values for other similar registered CDM landfill gas to electricity projects as follows:

1. UNFCCC registration number 1626 (http://cdm.unfccc.int/Projects/DB/DNV-CUK1203743009.45/view); 1,680 USD/kW (= 1,228 €/kW with average yearly exchange rate for 2007)
2. UNFCCC registration number 3464 (http://cdm.unfccc.int/Projects/DB/SGS-UKL1267696608.78/view); 1018 €/kW

It is noteworthy that although required capital investments normally vary considerably depending on project aspects such as the size, geography, location, etc; the selected value was confirmed to be plausible.

Is important to note that the forecasted nameplate installed capacities for both the project's LFG destruction facility as well as for project's electricity generation facility are estimated based on forecasts for quantity of LFG to be collected by the project activity as per the application of the LFG generation model,of the methodological tool "Emission from Solid Waste Disposal Sites" (version 06.0.1) /7/.

- Operation and maintenance costs (O&M costs variable is 20.20 €/MWh and O&M cost fixed is 195,357 €/yr) [23] [24]

Annex B includes further assessment details for the values for the selected economical and technical parameters and assumptions applied in the context of the performed investment analysis.

By applying the assumptions summarized above, the NPV calculation for alternative S1/LFG1 + E1 was verified to be performed in a transparent, correct and reproducible manner as reported in the investment analysis spreadsheet /2/ which is enclosed to the PDD /1/.

In the context of the performed NPV calculation, the benchmark rate in nominal terms was calculated as 16.40% per year (which is the sum between the relevant benchmark of 11.75% [25] and the assumed average annual inflation rate of 4.6472%). All key parameters and assumptions for the investment capital expenditures and regular operation and maintenance costs are correctly applied in the NPV calculation spreadsheet /2/ which was earlier developed by CDM consultants and LFG-to-electricity specialists contracted by Itajaí Biogás e Energia S.A.. During interviews performed by the GLC's validation team, the contracted CDM consultants and LFG-to-electricity specialists have proven experience and/or expertise in the area of implementation and operation of active (forced) LFG collection and destruction (using high temperature enclosed flare(s)) + electricity generation using LFG as gaseous fuel.

By using all available expertise and experience in the field of LFG collection and destruction/utilization, Itajaí Biogás e Energia S.A. and their consultants thus developed a comprehensive NPV calculation spreadsheet /2/ with all related investment and cost estimations applicable for the implementation of an

---

In summary, total required capital investment (2,164,945 €) has been crosschecked by means of background research and identified to be appropriate. It is valid and applicable at time of investment decision. The value has been correctly indicated in PDD Section B.5 /1/ and investment analysis spreadsheet /2/.

[23] The estimates for variable operation and maintenance (O&M) costs for the operation of the project's electricity generation component are based on figures included in technical and commercial proposals received from the engine-generator set supplier Guascor S.A. /64/.
Hence the average O&M cost are estimated as 52.40 BRL/h which is equivalent to 49.43 BRL/MWh. By taking into account an exchange rate of 2.45 BRL/€, the average O&M costs for the operation of the project's electricity generation component are estimated as 20.20 €/MWh.
The calculated average O&M cost for electricity generation was compared by the GLC's validation team against values determined for other similar registered CDM landfill gas to energy projects in Brazil:

1. UNFCCC registration number 1626 (http://cdm.unfccc.int/Projects/DB/DNV-CUK1203743009.45/view); O&M cost (power plant) = 23 USD/MWh (= 16.8 €/MWh with average yearly exchange rate for 2007)
2. UNFCCC registration number 3464 (http://cdm.unfccc.int/Projects/DB/SGS-UKL1267696608.78/view); O&M cost (power plant) = 25 €/MWh

In summary, the estimated value for average O&M cost for the project's electricity generation component (20.20 €/MWh) is thus regarded as deemed reasonable and acceptable. It is valid and applicable at time of investment decision. The value has been correctly indicated in the PDD (Section B.5) /1/ and the investment analysis spreadsheet /2/.

[24] The total fixed O&M cost for the operation of the project's LFG destruction + electricity generation facility is estimated based on following assumptions:

- The maintenance of the LFG collection system: 6% of gas collecting system cost /71/
- Direct manpower: 4 people receiving each 7500 BRL/mth for 13.33 month/yr. /71/

Based on local and sectoral knowledge, GLC identified these O&M cost to be appropriate for a landfill operation in Brazil. The value (195,357 €/yr) is valid and applicable at time of investment decision. The value has been correctly indicated in both the PDD (Section B.5) /1/ and the investment analysis spreadsheet /2/.

[25] The relevant benchmark rate of 11.75% is selected for energy projects under Group 1 located in Brazil as the Appendix of the "Guidelines on the assessment of investment analysis" (version 5).

active (forced) LFG collection and destruction/utilization system and expected revenues for electricity generation when using collected LFG as gaseous fuel (alternative S1/LFG1 + E1).

As confirmed by the GLC's validation team, all estimated figures and assumptions were correctly considered in the context of the NPV calculation spreadsheet /2/ which is enclosed to the latest version of the PDD /1/. Such confirmation was made through detailed assessment of this document /2/ by the GLC's validation team. Evidences for the quotations were made available to the GLC's validation team.

The GLC's validation team acknowledges that considered values and assumptions could potentially change after a complete engineering and design work is developed for the project's LFG collection system at the Canhanduba landfill (which is expected to be performed only after the successful registration of the project as a CDM project activity). However, it is the opinion of the GLC's team that all presented estimates in terms of required capital investments, operation and maintenance costs and expected revenues due to the commercialization of generated electricity (in the particular case of alternative S1/LFG1 + E1) as well as timing of all related capital expenditures are reasonable and reflects the typical configuration of a well designed and well managed active (forced) LFG collection and destruction system using high temperature enclosed flare(s) with electricity generation using LFG as fuel for the particular case of alternative S1/LFG1 + E1).

Based on its sectoral expertise, the GLC's validation team acknowledges that, in the particular case of the project activity, no detailed project engineering or design work has been yet performed since at this early planning stage it is not feasible to develop a complete and detailed capital budget based on project-specific quotations for equipment acquisition or construction services. Also as part of its assessment, the GLC's validation team assessed all key parameters and assumption used for the determination of the NPV value for alternative S1/LFG1 + E1 (implementing the project activity (with electricity generation using LFG as fuel) without CDM revenues being taken into account).

In this context, the use of reasonable and plausible estimations for investment and costs is deemed acceptable. As also acknowledged by the GLC's validation team, assumptions such as a more precise number of LFG collecting wells, specifications of the LFG collecting wells (e.g. deep), length of LFG collecting network pipeline, exact location and also more specific details about the off-grid captive generator, the number and/or capacity of high temperature enclosed flare(s) and even the detailed engineering design of the electricity generation facility can only be known after the performance of a complete/detailed engineering and design work for the project activity [26].

On the basis of its related sectoral expertise [27], assessment of evidences made available (NPV calculation spreadsheet /2/ earlier developed by the Itajaí Biogás e Energia S.A. and available literature), the GLC's validation team was able to confirm that considered estimates in terms of required capital investments and operation and maintenance costs for implementing and operating the project activity are deemed reasonable and acceptable. The calculation of the NPV value (as presented in the investment analysis spreadsheet /2/ which is enclosed to the PDD) was thus

[26] It is important to note that the financial and economic assumptions and parameters are based inter alia on equipment and service supply quotations provided by equipment manufacturers/suppliers and service constructors at the time of the project implementation decision making process.

[27] As part of sectoral expertise, the GLC's validation team evaluated the magnitude and plausibility of values used for the parameters (investment and cost breakdowns) and assumptions.

confirmed to be deemed acceptable and correct. As assessed by the GLC's validation team, required capital investment expenditures include reasonable estimated values applicable for the following items [28]:

- construction of new LFG collection wells,
- all flaring equipment,
- all ancillary and safety equipment (access ladder, articulated dumper and service platform for flaring equipment, etc.),
- air compressor (including filters and air-dryer),
- additional monitoring equipment (continuous CH_4 gas content analyzer and portable CH_4 gas content analyzer),
- all required piping material,
- all required control and safety valves,
- system to collect condensate from LFG
- all required civil construction work.
- all required assembly service and yet to be done engineering work
- all required equipment for the construction of the electricity generation facility.

As also assessed by the GLC's validation team, applicable operation and maintenance costs include reasonable estimates for the following items [29]:

- General labour costs (including personnel safety equipment and uniforms)
- Electricity costs
- General maintenance service

By assessing the NPV calculations, (as per the investment analysis spreadsheet /2/), the GLC's validation team also confirmed that the period of assessment (20-year period) is in accordance with the "Guidelines on the assessment of investment analysis" (version 5) /55/. Moreover, all formulae used in NPV calculation for alternative S1/LFG1 + E1 are readable and all relevant cells are viewable and unprotected.

[28] It is also important to note that the values and assumptions provided by the project participant are just a projection of costs, made available to GLC's validation team. The referred estimations are presented in the proposals developed by equipment manufacturers and service contractors /56/ /64/ /68/ (please see Annex B: Financial Parameters). In order to enhance reliability to the estimated values, the GLC's validation team compared the values with other similar initiatives listed in the CDM Pipeline spreadsheet (available online: http://www.cdmpipeline.org). Moreover, according to GLC's sectoral expertise, the values are deemed acceptable and reliable.

[29] It is also important to note that the values and assumptions provided by the project participants are just a projection of costs, made available to GLC's validation team. The referred estimations are presented in the proposals of equipments developed by the equipment manufacturers /71/ /64/ /68/ (please see Annex B: Financial Parameters). In order to enhance reliability of the estimated values, the GLC's validation team compared the values with other similar initiatives listed in the CDM Pipeline spreadsheet hosted in http://www.cdmpipeline.org. Moreover, according to GLC's sectoral expertise, the values are deemed as acceptable and reliable.

Assessment of the following literature/documents (which defines technical design aspects and typical associated costs for LFG collection and destruction/utilization initiatives) and assessment of information made available in the PDDs and Validation Reports the following similar initiatives also located in Brazil (which were recently registered as CDM project activities or are currently requesting registration) were also performed by the GLC's validation team in order to substantiate its opinion on the acceptability and reasonability of selected figures and assumptions[30] reported in the NPV calculations (as per the investment analysis spreadsheet /2/) in the context of the assessment of the performed investment analysis under the demonstration of additionality for the project activity (which only incorporates capital investments and costs, thus not including any revenue, other than revenues from electricity generation in the particular case of alternative S1/LFG1 + E1 [31]):

Assessed specialized literature / documents:

- LANDTEC: "*Diseño de Ingeniería de los Sistemas de Biogás en Rellenos Sanitarios: Un Enfoque Práctico*" (Engineering of Biogas systems in landfills: a practical analysis approach /63/.
- United States Environmental Protection Agency (US-EPA): Landfill Methane Outreach Program. Project Development Handbook. Dated September 2010 /64/.
- Biotecnogas S.r.l.: Budgetary offer encompassing the supply of complete set of equipment (to be implemented as part of the implementation of a LFG collection and destruction system in a landfill in Brazil). (Dated 2012-02-24) /65/.
- SCS Engineers / John Zink Company: Presentation Material about the construction and operation of LFG collection and destruction / utilization initiatives (dated 2011) /73/

[30] Estimated figures for the following key parameters were assessed by using referred literature / documents and other Initiatives encompassing LFG collection and destruction/utilization in Brazil (recently registered as CDM project activities or currently requesting registration) as a comparison/benchmarking source:
- Average cost for an individual vertical LFG collection well;
- Average cost for an individual horizontal LFG collection trench
- Average cost for piping material and valves
- Average cost for the electricity generation component
- LFG destruction equipment (incl. high temperature enclosed flares)
- Monitoring equipment (for operational and safety purposes)
- Contingency cost
- Civil work

For some of the assumptions (such as quantity of wells, length of LFG collection network pipeline, etc.), the GLC's validation team acknowledges that the magnitude of such investments is dependant of the final configuration of the waste cells within the landfill area.

[31] It is important to note that as part if its assessment the GLC's validation team acknowledges that even by assuming that the earlier considered values and assumptions related to capital investment and costs for implementing and operating the project activity might, in the worse scenario, significantly change after a complete engineering and design work be developed for the project's LFG collection system at the Canhanduba landfill (of which is expected to be performed only after the successful registration of the project as a CDM project activity), in fact that would not undermine or adversely affect the demonstration of additionality for the project activity. By not incorporating any revenue (other than revenues due to electricity generation), under any variation of individual key parameters and assumptions for capital investment and costs of the NPV calculation the determined NPV value will always be negative. That clearly demonstrates that in the absence of CDM revenues, regardless of the magnitude of the associated required capital investment and costs, the implementation of the project activity is obviously not economically attractive as alternative S1/LFG1 + E1 (the proposed CDM project activity in the absence of the CDM and with electricity generation) is proven to be more costly than the only other alternative (S3/LFG2 + E3) under any circumstance. It is the opinion of the GLC's validation team that, by considering the relative simplified approach to compare the economic and financial attractiveness of alternative S1/LFG1 + E1 against alternative S3/LFG2 + E3, the fact that alternative S1/LFG1 + E1 is proven to be more costly than alternative S3/LFG2 + E3 under any circumstance represents a condition sufficiently enough to conclude that the project is additional.

- U.S. Department of Energy, Federal Energy Technology Center: Waste Management Project Contingency Analysis /74/

Initiatives encompassing LFG collection and destruction/utilization in Brazil recently registered as CDM project activities or currently requesting registration:
- "Uberlândia landfills I and II" (UNFCCC reg. no. 7110)
- "CGR Guatapara Landfill Project" (UNFCCC reg. no 6553)
- "CTL Landfill Gas Project" (UNFCCC reg. no 5947)
- "CTR Candeias Landfill Gas Project " (UNFCCC reg. no 3958)
- "Itaoca Landfill Gas Project" (UNFCCC reg. no 4657)
- "Constroeste Landfill Gas to Energy Project" (UNFCCC reg. no 8603)
- "ITVR São Leopoldo landfill gas project" (UNFCCC reg. no 9290)
- "CPTR Marituba landfill gas project" (UNFCCC reg. no 9298)
- "CTR da Caturrita landfill gas project" (UNFCCC reg. no 9302)
- "CTDR Bob Ambiental landfill gas project" (UNFCCC reg. no 9295)
- "Rio Grande landfill gas project" (UNFCCC reg. no 9300)

Comparison of NPV values for alternatives S1/LFG1 + E1 and S3/LFG2 + E3 and conclusion of the performed investment analysis:

While the NPV for alternative S3/LFG2 + E3 is correctly selected as zero (null), the NPV calculation performed for alternative S1/LFG1 + E1 was calculated as - 1,102,883 € (negative NPV value). The comparison of such determined NPV values sufficiently demonstrates the following:

- investing in the implementation of a LFG collection and destruction system (using high temperature enclosed flare(s)) and using collected LFG as gaseous fuel for electricity generation (alternative S1/LFG1 + E1) does not represent a financially and economically attractive alternative either when CDM revenues are not taken into account (even when revenues associated with commercialization of generated electricity are considered).

GLC's validation team was able to confirm that NPV calculation made available for alternative S1/LFG1 + E1 is deemed transparent, correct and reproducible. It is also deemed reasonable to assume all key parameters and assumptions in this NPV calculation are valid and applicable at the time of the investment decision taken by the project participant.

Sensitivity analysis for the NPV calculation of alternative S1/LFG1 + E1:

The GLC's validation team verified that in the context of the performed sensitivity analysis, five parameters are selected for performing positive and negative variations in their values: electricity tariff, investment capital expenditures, operation and maintenance costs, exchange rate and LFG generation. Through discussion of the possibility of their variations, it is justified that the attainable variation of sensitivity analysis indicators is not likely to turn the NPV positive for alternative S1/LFG1 + E1 (or making the IRR for this alternative reaching the discount rate).

It is noteworthy that no fair value was included for the project's assets at the end of the assessment period. Based on its sectoral expertise, the GLC's validation team acknowledges that most of the

required capital investment represents investments in facilities that cannot be sold or reused after the assessment period (i.e. construction of flaring station, construction of LFG collection wells, etc.).

Summary of investment analysis assessment performed by the GLC's validation team:
As an outcome of its technical assessment, the GLC's validation team was thus able to confirm that the proposed project activity is clearly not the most economically or financially attractive alternative when potential CDM revenues is not considered (even with revenues from the use of collected LFG as gaseous fuel for electricity generation). The GLC's validation team was thus able to confirm that the required investment capital expenditures + operation and maintenance costs associated for the proposed project activity (alternative S1/LFG1 + E1) and associated revenues due to commercialization of generated electricity (alternative S1/LFG1 + E1) make the implementation of the project activity less economically attractive than the alternative S3/LFG2 + E3 under plausible variations of the parameters and assumptions applied for the calculation of the NPV for alternative S1/LFG1 + E1.

The performed investment analysis (NPV calculation for alternative S1/LFG1 + E1 and its comparison with the NPV value for alternative S3/LFG2 + E3 which is equal to zero) is in accordance with applicable guidance of the "Guidelines on the assessment of investment analysis" (version 5) /55/ and also with applicable guidance of the "Combined tool to identify the baseline scenario and demonstrate additionality" /6/.

4.8.4 Barrier Analysis

Since no barriers were identified by the project participant, no barrier analysis is included in the PDD /1/. The non-identification of barriers in the context of the assessment and demonstration of additionality is in accordance with the "Combined tool to identify the baseline scenario and demonstrate additionality" /6/ and ACM0001 (version 13) /5/.

4.8.5 Common Practice Analysis

Step 4 "Common Practice Analysis" of the "Combined tool to identify the baseline scenario and demonstrate additionality" /6/ has been correctly applied as outlined in Section B.5 of the PDD /1/ as a credibility test to demonstrate additionality.

While as part of application of Step 0 - "Demonstration whether the proposed project activity is the first-of-its-kind", the proposed project activity is not claimed to be the first-of-its kind, the common practice analysis is perfomed as per the steps assessed below.

Since the proposed project activity is an initiative of LFG destruction/utilization by flaring, the "Stepwise approach for common practice" as per the latest version of the "Guidelines on Common Practice" (version 02.0) /19/ is applied for the common practice analysis. As methane destruction (example: landfill gas flaring) is regarded as "measure" within the definitions of the "Combined tool to identify the baseline scenario and demonstrate additionality" /6/, the application of the "Stepwise approach for common practice" as per the latest version of the "Guidelines on Common Practice" (version 02.0) /19/, as assessed below, is deemed correct.

Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

In the context of the performed common practice analysis, the applicable geographical area is correctly defined as the whole host country Brazil. The installed capacity of the project electricity generation component is considered for the determination of the applicable output range as +/-50% of the design installed capacity in the context of the common practice analysis. The total combined installed capacity for the project activity is 3.18 MW. The rationale of this assumption for the determination of the applicable output range as +/-50% of the design installed capacity is sufficiently explained in the latest version of the PDD /2/ and it is regarded as deemed acceptable by the GLC's validation team.

Furthermore, in this context, for the common practice analysis, potentially similar initiatives are defined as initiatives promoting destruction/utilization of LFG and with installed capacity between 1.59 MW and 4.77 MW. This is deemed acceptable.

Step 2: Identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

(a) The projects are located in the applicable geographical area;
(b) The projects apply the same measure as the proposed project activity;
(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

As part of its technical assessment, the GLC's validation team identified the projects which fulfil the conditions stated in Step 2 as follows:

(a) Projects located in Brazil;
(b) Projects applying methane destruction;
(c) Not applicable since a technology switch measure is not implemented by the project activity;
(d) Plants with electricity generation utilizing LFG as fuel;
(e) Plants within the output range between 1.59 MW and 4.77 MW;
(f) Projects which started its operations before the PDD is published for global stakeholder consultation on 2012-12-23.

By means of checking the ANEEL database (2012) [32] /52/, GLC identified no power plants which fulfil all applicable conditions for Step 2.

[32] http://www.aneel.gov.br/aplicacoes/autorizacoes/default_aplicacao_acompanhamento.cfm?IDACOMPANHAMENTOTIPO=1 accessed on 2012-12-23.

Step 3: Within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}

As part of the application of the "Guidelines on Common Practice" (version 02.0) /19/, Itajaí Biogás e Energia S.A. correctly identified that the number of proposed methane (from LFG) destruction/utilization initiatives in Brazil that are not CDM project activities and also meet all conditions of Step 2 is zero: $N_{all} = 0$.

GLC has also confirmed that the official publication "Second Brazilian Greenhouse Gases Emissions Inventory Report" /25/ (published in July 2010) states *"(...) all of Brazilian landfills with collection and destruction system (active system) are implemented projects under the CDM".* This official publication represents a credible confirmation that there are no similar activities to the proposed project activity in Brazil under operation or implementation without consideration of CDM benefits.

Step 04: Within plants identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

N_{diff} is defined as zero as part of the performed common practice analysis. As appropriately outlined in the latest version of the PDD /1/, all LFG destruction/utilization initiatives under operation in Brazil apply the same technology as proposed by the project activity.

Step 5: Calculate factor $F = 1 - N_{diff} / N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

As correctly demonstrated in the latest version of the PDD, the applicable values for N_{all} and N_{diff} are both determined as 0.

The formula to identify the share of plants using a technology different to the technology used in the proposed project activity in all plants that deliver the same output or capacity has been correctly identified using the formula as follows:

$F = 1 – N_{diff} / N_{all}$

As an outcome of application of Step 5 of the applicable guidance, by taking into account the determined value for N_{all} as zero and the fact that the determined value for N_{diff} is also zero, the value for Factor F (calculated as "$F = 1 - N_{diff} / N_{all}$") is thus correctly directly assumed as one.

Finally, by taking into account the determined value for factor F, the following conditions of the methodological tool (conditions for having the proposed project activity being regarded as "common practice" within a sector in the applicable geographical area) are correctly assumed not determinable (1 minus an undeterminable ratio (0/0)). Thus, does not simultaneously meet:

- Factor F greater than 0.2
- N_{all}-N_{diff} greater than 3.0

While as per the "Combined tool to identify the baseline scenario and demonstrate additionality", both conditions should be simultaneously fulfilled in order to have the proposed project activity being regarded as "common practice" within the sector in the applicable geographical area, since no value for Factor F is determinable, the proposed project activity is correctly and sufficiently demonstrated not to be "common practice".

4.8.6 Conclusion about the assessment of demonstration of additionality

As a conclusion of its assessment of the presented demonstration of additionality of the project activity, it is GLC's opinion that the implementation of the Canhanduba Landfill Project is sufficiently demonstrated not being common practice and not being a feasible scenario without the CDM incentives/revenues either. Therefore, the project activity is sufficiently regarded as additional.

4.9 Monitoring Plan

The project activity applies the monitoring provisions and requirements as per the Approved Consolidated Methodology ACM0001 – "Flaring or use of landfill gas" (version 13) /5/ and as per the following applied methodological tools:

- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) /8/
- "Project emissions from flaring" (version 02.0.0) /9/
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /10/
- "Tool to calculate the emission factor for an electricity system" (version 04.0.0) /11/

As established by ACM0001 (version 13) /5/ and applied methodological tools, the monitoring system for the project activity will basically consist on measuring the amount of methane actually combusted (destroyed) in enclosed flare(s) and/or used as gaseous fuel for electricity generation (via direct measurements of the parameters monitored *ex-post* which are presented in Table 10). Furthermore, project emissions resulting from flaring of collected LFG ($PE_{flare,y}$) will also be calculated as part of the determination of baseline emissions by following applicable measurements and calculations requirements as defined by "Project emissions from flaring" (version 02.0.0) /9/.

As indicated in the latest version of the PDD /1/, all the monitoring equipment and instruments will be maintained and managed in accordance with maintenance (service) & calibration requirements and recommendations defined by the equipment/instrument manufacturers. Also as per the latest version of the PDD /1/, measurement checking and calibration of the monitoring equipment/instruments will be performed on a regular basis as per manufacturer's related requirements in order to ensure the correct measurement of data to be monitored. The LFG flaring and electricity generation equipment will also be maintained as per recommendations of the equipment manufacturer. Monitoring information/data of flare equipment maintenance will be recorded and reported as required by ACM0001 (version 13) /5/. While no detailed project engineering was yet performed, specifications of main monitoring equipment/instruments are not yet available. Anyhow, the general design of the monitoring plan is in accordance with the applied monitoring methodology. The monitoring plan will give opportunity for real

measurements of achieved and real emission reductions and all the data pertaining to monitoring parameters will be archived for at least two years after the end of crediting period. General details of the data to be collected, frequency of data recording, and the project management responsibilities have been defined and clearly defined in the monitoring plan of the PDD /1/. It is the opinion of the GLC's validation team that the monitoring plan, as described in the latest version of the PDD /1/, is feasible for the project participant.

As outlined in the PDD /1/, maintenance service and routines for project's equipment and instruments will includes all preventive and corrective actions necessary for ensuring good functioning of all project related equipment (including visual control of the equipment state and real-time check of displayed parameters; cleaning up the equipment and the sensors; lubrication and greasing; replacement or overhauling of defective parts (including regular welding service in the HDPE pipelines and manifolds)). Furthermore, as also outlined in the PDD /1/, spare units for some of the monitoring instruments/equipment will eventually be kept on-site.

As also indicated in the PDD /1/, an appropriate project's operational and management structure will be defined and implemented as part of the implementation of the project. Such project's operational and management structure will rely on staff with responsibilities to be clearly defined; where all collaborators and employees involved with operation of project and/or monitoring will receive appropriate training. Training of project's operational and management staff will encompass general competence development about LFG generation and collection; review of equipment operational principles and captors; maintenance and calibration requirements for project's related equipment; procedures for monitoring data gathering and handling as well as emergency and safety procedures.

It is the opinion of the GLC's validation team that the description and design of the monitoring plan as per the latest version of the PDD /1/ complies with all the monitoring requirements of the methodology ACM0001 (version 13) /5/ and applied methodological tools. It is also opinion of the GLC's validation team, that the project participant is potentially able to implement and operate the monitoring plan. The GLC's validation team highlights that, as confirmed by the GLC's validation team during the performed on-site visit to the project site, no detailed design or construction of the project has been initiated yet.

4.9.1 Parameters determined *ex-ante*

The following *ex-ante* determined parameters were used for the *ex-ante* estimation of emission reduction and/or for the determination of baseline or project emissions along the crediting period.

Table 8: Parameters determined *ex-ante*[33]

Parameter / data	Unit	Value applied	Source of used data/ GLC assessment opinion
Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline (OX_{top_layer})	-	0.1	Default value as per ACM0001 (version 13) /5/ is correctly selected.
Global Warming Potential of CH_4 (GWP_{CH4})	tCO_2e/tCH_4	25	Value selected as per IPCC's: Global Warming Potential for Given Time Horizon /20/ is correctly selected. This is in accordance with the "Standard for application of the global warming potential to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol /51/.
Universal ideal gases constant (R_u)	$Pa.m^3/kmol.K$	8,314	Default value as per the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /10/
Molecular mass of greenhouse gas *i* (MM_i)	kg/kmol	16.04 (CH_4)	
Molecular mass of gas *k* (MM_k)	kg/kmol	28.01 (N_2)	
Molecular mass of water (MM_{H2O})	kg/kmol	18.0152	
Total pressure at normal conditions (P_n)	Pa	101,325	
Temperature at normal conditions (T_n)	K	273.15	
Efficiency of the LFG capture system that will be installed in the project activity (η_{PJ})	-	0.9280	Value was selected as per available literature. Information available in the technical paper " *Measuring landfill gas*

[33] The table includes all *ex-ante* determined parameters which are presented in Section B.6.2 of the PDD. Data that are calculated with equations provided in the applied baseline and monitoring methodology and default values specified in the applied methodology and methodological tools are not included in the table either in Section B.6.2 of the PDD.

			collection efficiency using surface methane concentration" /22/ estimates that the typical LFG collection efficiency in LFG collection and destruction initiatives in Brazil is about 92.80%. This paper is dated year 2011 and it is publicly available at the website of the Environmental Agency of São Paulo State, Brazil (CETESB).
Average technical transmission and distribution losses in the National Grid of Brazil in year *y* ($TDL_{grid,y}$)	%	20	Conservative default value is correctly selected as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (default values as established by option A.1)
Average technical transmission and distribution losses for electricity sourced by the captive electricity generator in year *y* ($TDL_{captive,y}$)	%	0	Applicable default value is correctly selected as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) when scenario B is selected by the project participant.
Weighting of build margin emissions factor (w_{BM})	%	0.5 (50%)	Values are correctly selected as per the "Tool to calculate the emission factor for an electricity system" /11/ (default value for "all other projects").
Weighting of operating margin emissions factor (w_{OM})	%	0.5 (50%)	

Model correction factor to account for model uncertainties ($\varphi_{default}$) [34]	-	0.75		Values are correctly selected according to the tool "Emissions from solid waste disposal sites" (default value for Application A) /7/
Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste) (OX)	-	0.1		
Fraction of methane in the SWDS gas (volume fraction) (F)	-	0.5		
Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS. ($DOC_{f,default}$)	Weight fraction	0.5		
Methane correction factor ($MCF_{default}$)	-	1.0		See assessment in Section 4.9.1.1.
Fraction of degradable organic carbon (by weight) in the waste type *j* (weight fraction) (DOC_j)	-	See assessment in Section 4.9.1.2.		
Decay rate for the waste type j (k_j)	1/yr			
Weight fraction of the waste type (W_j)	-			
Manufacturer's flare specifications for temperature, flow rate and maintenance schedule ($SPEC_{flare}$)	Temperature - °C	From 850	To 1,000	Values are correctly indicated as per the information assessed in the letter provided by the flare manufacturer Biotecnogás /56/.
	Flow rate - m^3/h	From 240	To 1,200	
	Maintenance schedule number of days	365		
Rated capacity of the captive backup diesel generator fuel by diesel ($PP_{CP,Diesel-generator}$)	MW	0.06		Value previously estimated according to decision of the project participant.
CO_2 emission factor for electricity sourced by the captive off-grid electricity generator in year *y* ($EF_{EL,captive,y}$)	tCO_2/MWh	1.3		To be determined by following applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /8/.

[34] It is important to note that $\varphi_{default}$ is equivalent to φ_y.

4.9.1.1 Assessment of the suitability of *ex-ante* determined value for parameter $MCF_{default}$

By taking into account the current and planned disposal and management practice for MSW at the Candanduba landfill (as verified by the validation team during the on-site visit to the project site and also by assessing the valid operational license for the Canhanduba landfill /49/), the GLC's validation team was able to confirm that MSW has been disposed in the landfill with depths greater than 5 meters and appropriate MSW landfilling measures have been undertaken and are expected continue throughout the landfill operational lifetime (such as effective mechanical compacting, leveling and covering of disposed MSW). The GLC's validation team was thus able to conclude that the selected value for the *ex-ante* determined parameter $MCF_{default}$ (equal to 1.0) is deemed acceptable, reasonable and in accordance with applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 06.0.1) /7/.

4.9.1.2 Assessment of the suitability of *ex-ante* determined values for parameters DOC_j , k_j and w_j

As established by the methodological tool "Emissions from solid waste disposal sites" /7/, default IPCC 2006 values /20/ were correctly selected for the parameters Fraction of degradable organic carbon in the waste type *j* (weight fraction) (DOC_j), Decay rate for the waste type *j* (k_j) and Weight fraction of the waste type (W_j) by taking into account the available statistics /20/ and meteorological data valid for the region where the Canhanduba landfill is located. The selected values for DOC_j, k_j and w_j for the different fractions of waste types are presented in Table 9[35]. Furthermore, the values were confirmed by the GLC's validation team to be deemed appropriate and correct. Values of mean temperatures and precipitation data for the city of Itajaí were also correctly taken into account for the determination of values of k_j as required by the methodological tool "Emissions from solid waste disposal sites" /7/.

Table 9: Composition of disposed MSW (w_j) and *ex-ante* selected values for the parameter DOC_j and k_j

Waste type *j*	Fraction of degradable organic carbon (by weight) in the waste type *j* (DOC_j)	Decay rate for the waste type *j* (k_j) (in 1/yr)	Weight fraction of the waste type *j* (w_j)
Wood and wood products	43%	0.035	4.7%
Pulp, paper and cardboard (other than sludge)	40%	0.07	17.1%
Food, food waste, beverages and tobacco (other than sludge)	15%	0.4	44.9%
Textiles	24%	0.07	2.6%
Garden, yard and park waste	20%	0.17	0.0%
Glass, plastic, metal, other inert waste	0%	0	30.7%

[35] It is important to note that, while the landfill receives around 1.26 tons of clinical waste per day, the clinical waste was not taken into account for the calculation of the ex-ante emission reductions.

4.9.1.3 Conclusion about the assessment of *ex-ante* determined parameters

In summary, the selection of the all *ex-ante* determined parameters is deemed reasonable, complete and transparent. The rationale/justification for selected values for all *ex-ante* determined parameters is provided in the PDD /1/ and supporting evidences for the selected values were made available to the GLC's validation team. Referred data sources were also verified by the GLC's validation team.

4.9.2 Parameters monitored *ex-post*

The parameters to be monitored *ex-post* are presented in the latest version of the PDD /1/ as required by the Approved Consolidated Methodology ACM0001 – "Flaring or use of landfill gas" (version 13) /5/ and the following applied methodological tools:

- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) /8/
- "Project emissions from flaring" (version 02.0.0) /9/
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /10/
- "Tool to calculate the emission factor for an electricity system" (version 04.0.0) /11/

The following parameters will be monitored *ex-post* along the 7-year renewable crediting period:

Table 10: Parameters monitored ex-post

Parameter	Unit	Instrument	Measuring/ recording frequency
Management of the SWDS	-	-	The design and operational conditions of the Canhanduba landfill will be annually monitored on the basis of different sources such as: - Original design of the landfill vis-a-vis eventual changes; - Technical specifications for the management of thE Canhanduba landfill vis-a-vis eventual related changes; - Applicable local or national regulations As required by ACM0001, (version 13) /5/, the design and operational conditions of the landfill should be confirmed not to be modified in order to

			ensure that no practice to increase methane generation have been occurring prior or after the implementation of the project activity. Any change in the management of the landfill after the implementation of the project activity should be justified by referring to technical or regulatory specifications.
Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb,j}$) for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare(s)) [36]	m^3wet gas/h	LFG flow meter(s)	Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications.
Volumetric flow of LFG stream in time interval *t* on a dry basis ($V_{t,db,j}$) for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare(s)) [37]	m^3dry gas/h		
Mass flow of the LFG stream in time interval *t* on dry basis ($M_{t,db,j}$) for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare(s)) [38]	kg/h		

[36] As assessed in Section 4.7.4 this parameter will be monitored if Option A of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" applies to equipment and project conditions.

[37] As assessed in Section 4.7.4 this parameter will be monitored if Option A of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" applies to equipment and project conditions.

[38] As assessed in Section 4.7.4 this parameter will be monitored if Option D of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" applies to equipment and project conditions.

Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis ($v_{CH4,t,db}$)[39]	m³ CH_4 / m³ dry gas	CH_4 content gas analyzer	Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications. In case of measurements for the applicable LFG flow parameter are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of this parameter may not be required (except if the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted. Under this circumstance, this parameter shall be monitored continuously to assure the applicability condition is indeed met).
Volumetric fraction of CH_4 in time interval *t* on a wet basis ($v_{CH4,t,wb}$)[40]	m³ CH_4 / m³ wet gas		
Temperature of the LFG stream in time interval *t* (T_t)	°C or K	LFG temperature sensor	
Pressure of the LFG stream in time interval *t* (P_t)	Pa or mbar	LFG pressure sensor	
Saturation pressure of H_2O at temperature T_t in time interval *t* ($p_{H2O,t,Sat}$)	Pa or mbar	Data as per the literature /18/.	
Quantity of grid electricity consumed by the project activity in year *y* ($EC_{PJ,grid,y}$)	MWh	Electricity meter	Continuous measurements will be aggregated manually or automatically. Accumulated measurement records will be recorded and reported at least with a every month frequency. Measurement records will be cross-checked against available electricity consumption

[39] As assessed in Section 4.7.4 this parameter will be monitored if Option A or D of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" applies to equipment and project conditions.

[40] As assessed in Section 4.7.4 this parameter will be monitored if Option C the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" applies to equipment and project conditions. Moreover, this parameter may be monitored if Option A or D the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" applies to equipment and project conditions.

			receipts/invoices issued by the local electricity distribution company.
Quantity of electricity sourced by the captive electricity generator (fuelled by Diesel) and consumed by the project activity in year *y* ($EC_{PJ,captive,y}$)	MWh	Electricity meter	Measurement records will be crosschecked against available diesel consumption receipts/invoices issued by the diesel distribution company.
Amount of electricity generated using LFG by the project activity in year *y* ($EC_{BL,y)}$)	MWh	Electricity meter	Continuous measurements will be aggregated manually or automatically. Accumulated measurement records will be reported with at least every-month frequency.
Operation margin CO_2 emission factor in year *y* = Dispatch data analysis operating margin CO_2 emission factor in year y ($EF_{grid,OM,y}$ = $EF_{grid,OM-DD,y}$)	tCO_2/MWh	-	To be calculated by following applicable guidance of the "Tool to calculate the emission factor for an electricity system" /11/.
Build margin CO_2 emission factor in year *y* ($EF_{grid,BM,y}$)	tCO_2/MWh	-	

Operation of the equipment that consumes the LFG ($Op_{j,h}$)	-	-	For each equipment unit *j* promoting utilization of LFG (each engine-generator set of the project's electricity generation component), it will be monitored if each equipment (element) of the electricity generation facility is operating in hour *h.* Such monitoring will be on the basis of continuous monitoring of the amount of electricity generated by each element.
Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period *t* ($F_{CH4,EG,t}$)	kg	LFG flow meter	Measured in accordance to an appropriate national or international standard e.g. UKs Technical Guidance LFTGN05. The time period *t* over which the mass flow is measured must be at least one hour. The average flow rate to the flare during the time period *t* must be greater than the average flow rate observed for the previous six months. Monitoring of this parameter is required in the case of enclosed flares and if the project participant select Option B.1 to determine flare efficiency.
Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$)	ºC	Thermocouple	Measured by an appropriate temperature measurement equipment with an every-minute frequency. Measurements outside the operational temperature specified by the manufacturer may indicate that the flare is

			not functioning correctly and may require maintenance. Flare manufacturers must provide suitable monitoring ports for the monitoring of the temperature of the flare. These would normally be expected to be in the middle third of the flare. Where more than one temperature port is fitted to the flare, the flare manufacturer must provide written instructions detailing the conditions under which each location shall be used and the port most suitable for monitoring the operation of the flare according to manufacturers specifications for temperature.
Flame detection of flare in the minute *m* ($Flame_m$)	Flame on or Flame off	Optical flame detector: Ultra Violet detector or Infra Red or both	Detection of flame recorded with an every-minute frequency as a minute that the flame was on, otherwise recorded as a minute that the flame was off.
Maintenance events completed in year *y* ($Maintenance_y$)	Calendar dates	-	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.

As established by ACM0001 (version 13) /5/, the volumetric or mass flow of landfill gas captured ($V_{t,wb/db,j}$ or $M_{t,db,j}$) and the methane fraction in the landfill gas ($v_{CH4,t,db/wb,j}$) will be continuously measured in the same basis (dry or wet).

In summary, the selection of the parameters monitored *ex-post* and their monitoring procedures are complete, transparent and in accordance with requirements of the applied monitoring methodology and methodological tools.

4.9.3 Management system and quality assurance

The project activity's monitoring plan, as outlined in the latest version of the PDD /1/, includes sufficient details about the following management and quality related aspects:

- General description of the staff responsibilities and authorities for project management;
- General description about procedures for data gathering and data reconciliation and reporting;
- General description about monitoring equipment/instruments; of which detailed specifications will only be available after the complete project's engineering phase (including selection of monitoring equipment).
- General information about calibration requirements of monitoring equipment/instruments;
- General information about data quality control, training, data management system, reporting and verification of data (data reconciliation).

A general and sufficient description of the monitoring plan is elaborated in the latest version of the PDD /1/. The monitoring plan is to be implemented to enable subsequent verification of emission reductions.

The application of the monitoring methodology is transparent and the GLC's validation team considers the project participant able to implement the monitoring plan.

All monitoring instruments and equipment will be calibrated as per manufacturer recommendations and/or as per international standards. In the particular case of the CH_4 content gas analyzer unit, this equipment will be calibrated by comparison with canisters of calibrated span gases purchased from a certified gas supplier. As also emphasized in the latest version of the PDD /1/, specifications and suppliers for the monitoring equipment/instruments will only be defined after successful CDM registration of the proposed project activity.

Operational data relevant for emission accounting will be logged continuously using automated computerized data storage system. On a monthly basis, the data will be analyzed, consolidated and a condensed monthly analysis will be issued. The system will issue a monthly log. Data records will be stored on an appropriate computer software or data recording system where daily log-sheet files will serve for backup and crosscheck purpose and archived at project site. Monthly reports will be made available at both the project site and administrative office in both electronic copy and hard copy to ensure data survival. All data will be kept up to 2 years after the end of crediting period.

The operational staff of the landfill will be trained for the relevant data record keeping, operation and maintenance related procedures. Moreover, staff will also be trained on procedures for corrective action before starting the operation and monitoring of the project activity.

In conclusion, it is the opinion of GLC's validation team that the project's monitoring plan (including planned project management and quality assurance procedures), as described in the PDD /1/, are deemed complete, reasonable and its implementation is potentially feasible for the project participant.

Through document check and interview it is verified that the monitoring plan described in PDD /1/ provides sufficient information, is in compliance with the methodology and all the monitoring arrangements are feasible within the project design and project participant's competence.

General description of the monitoring plan has thus been elaborated in the PDD /1/. The monitoring plan is to be implemented to enable subsequent verification of emission reductions. The application of the monitoring methodology is transparent and GLC considers the project participant able to implement the monitoring plan.

4.10 Environmental Impacts

The PDD /1/ includes comprehensive description of the project activity's environmental aspects. In the overall evaluation of environmental aspects of the project activity, positive environmental impacts are expected such as:

- reduction of risk of explosions
- reduction of emissions of particles,
- reduction of emissions of volatile organic compounds and ammonia,
- reduction of soil and ground water contamination
- reduction of odor

No relevant negative environmental impacts are expected from the implementation of the project activity. The project activity and the landfill where the project activity will be implemented comply with all applicable laws and regulations. As established by applicable legislation in Brazil, an Environmental Impact Assessment (EIA) is not required for the project activity. The Canhanduba landfill was granted with an operational license (Operational License no. 58/2012, issued on 2012-01-05 by FATMA – Fundação do Meio Ambiente (*Environmental Affairs Institute)* /49/ - Santa Catarina State Environmental Agency). The issued operational license is valid until 2016-01-05. This operational license does not include any restriction for the implementation of an active (forced) LFG collection and destruction system using enclosed high temperature flare(s) neither power generation plants below 10 MW in the Canhanduba landfill. No transboundary impacts due to the implementation of the project activity are foreseen.

4.11 Local Stakeholder Consultation

In accordance to Resolution No. 1 and Resolution No. 7 of the Inter-ministerial Commission on Global Climate Change (CIMGC) /50/, which is the DNA of Brazil, project participant of any proposed CDM project shall send letters /36/ to local stakeholder inviting for comments at least 15 days prior to the start of Global Stakeholder Consultation (GSC).

As also required by the DNA of Brazil, the initial version of the PDD (version 1) /1/ was translated into Brazilian Portuguese language and it was made available online (webhosted in the website www.unicarbo.com.br/projetos) 15 days prior to the start of the validation assessment by the GLC's validation team. This was confirmed by GLC's validation team through assessment of the website where the initial version of the PDD /1/ was made available. The "*Anexo III"* document is also webhosted in the same website. For further details about "*Anexo III"* are presented in Section 4.3.

In order to meet requirement of the DNA of Brazil, letters /36/ were sent to selected local stakeholder. The submitted letters /36/ refer to the project activity, with references to the webhosted PDD (translated into Brazilian Portuguese language) /1/ and "*Anexo III*" document. As confirmed by the GLC's assessment team the letters /36/ were submitted to local stakeholders as indicated in the table below:

- Inter-ministerial Commission for the Global Climate Change (DNA of Brazil)
- Santa Catarina State Environmental Agency (FATMA) (*Santa Catarina's State Environmental Affairs Institute*) (environmental authority in Santa Catarina State) – Central Office in Florianópolis city
- Santa Catarina State Environmental Agency (FATMA) (Santa Catarina*'s State Environmental Affairs Institute*) (environmental authority in Santa Catarina State) – Regional office in the municipality of Itajaí
- Brazilian Forum of NGO´s
- Brazilian Forum of Climate Change
- Federal Public Attorney Office – offices in Brasilia and Florianópolis
- Public Attorney Office for Santa Catarina State
- Santa Catarina Public State Attorney Environmental office - Centro de Apoio Operacional do Meio Ambiente (CME)
- City Hall of Itajaí
- City Council (local legislative chamber) of Itajaí
- Secretary of Municipal Services and Environmental of Itajaí

Copies of all submitted invitation letters sent on 2012-10-30 (with proof of delivery and receipt from the Brazilian National Post Service) /36/were made available and assessed by the GLC's validation team.
Based on information made available by Itajaí Biogás e Energia S.A., no comments were received from the above-described local stakeholders.
As a conclusion, the GLC's validation team confirms that the local stakeholder process has been carried out adequately and in accordance with the applicable requirements of the DNA of Brazil.

As also confirmed by the GLC's validation team, Itajaí Biogás e Energia S.A. organized a public audience on 2013-07-19 in order to present the proposed CDM project activity to the general public and to selected local stakeholders. As part of the event, answer to comments and questions received from such parties were also provided by representatives of the project participants. Selected local stakeholders were invited to the public audience through submission of invitation letters (dated 2013-07-11 of which copies were also made available to GLC /76/). As confirmed by the GLC's validation team, the following local stakeholders were invited through invitation letters:

- Famai (environmental authority in the municipality of Itajaí)
- Ambiental Limpeza Urbana e Saneamento Ltda.
- City Hall of Itajaí

- Fatma (environmental authority in Santa Catarina State)
- Interministerial Commission for the Global Climate Change (DNA of Brazil)
- Brazilian Forum of NGO´s;
- Brazilian Forum of Climate Change;
- Federal Public Attorney Office - Federal office in Brasilia;
- Federal Public Attorney Office – Santa Catarina State office in Santa Catarina;
- Public Attorney Office for Santa Catarina State;
- Santa Catarina Public State Attorney Environmental office - Centro de Apoio Operacional do Meio Ambiente (CME);
- City Council (local legislative chamber) of Itajaí;
- Secretary of Municipal Services and Environment of Itajaí;
- COOPERFOZ (Recyclable Waste Collectors Association of the Mouth of the Itajaí River);

As outlined in the minutes (report) of meeting for the occurred public audience event /76/ (of which copy was made available and assessed by the GLC's validation team and is included in Annex C), the following entities participated in the meeting:

- Itajaí Biogás e Energia S.A.;
- FAMAI (environmental authority in the municipality of Itajaí);
- Ambiental Limpeza Urbana e Saneamento Ltda.;
- City Hall of Itajaí;
- FATMA (environmental authority in Santa Catarina State).

As also outlined in minutes (report) of meeting /76/, as part of the event Mr. Bruno Francisco Muehlbauer (representative of the project participant) has also made a detailed presentation about the project design. During his presentation, it was highlighted all environmental positive and negative impacts for the project activity. Furthermore, aspects related to the contribution of the project activity toward Sustainable Development were also mentioned. The minutes (report) of the public audience event were compiled and signed by all participants. The occurred public audience event also included a field site visit to the area of the Canhanduba landfill.

4.12 Validation requirements specific for small-scale project activities

The following sections are not applicable to the project activity under assessment as it the project activity is not a small-scale project activity.

4.12.1 Project Activity Eligibility

Not applicable for large scale project activities.

4.12.2 Debundling

Not applicable for large scale project activities.

4.12.3 Additionality

Not applicable for large scale project activities.

5. VALIDATION OPINION

Germanischer Lloyd Certification GmbH (GLC) has performed the CDM validation assessment for the proposed project activity Canhanduba Landfill Project which is yet to be implemented in Brazil. The validation assessment was performed on the basis of UNFCCC criteria and requirements for CDM validation and host country criteria, as well as criteria given to provide consistent project operations, monitoring and reporting.

The project applies the consolidated CDM baseline and monitoring methodology Approved Consolidated Methodology ACM0001 – "Flaring or use of landfill gas"(version 13). The baseline and monitoring methodology has been correctly applied and the assumptions made for the determination of the baseline scenario are sound. The objective of the project activity is to capture, flare landfill gas (LFG) and also electricity generation using LFG as fuel. LFG is generated through anaerobic decomposition of municipal solid waste (MSW) disposed in the Canhanduba Landfill.

The operation of the project will result in estimated average annual GHG emission reductions of 78,269 per year. Emission reductions to be promoted by the project are real, measurable and give long-term benefits to the mitigation of climate change. If the project is implemented as designed, the project is likely to achieve the estimated amount of emission reductions.

It is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions attributable to the project are additional to any that would occur in the absence of the project activity (baseline scenario). No relevant negative environmental impacts are expected from the implementation of the project activity. A global and local stakeholder consultation was conducted.

A Letter of Approval (LoA) for the project activity was issued by the DNA of Brazil. This issued LoA (dated 2014-04-07) confirms that:

- Brazil is a Party to Kyoto Protocol;
- The participations of Brazil and all above-listed project participants are voluntary;
- The proposed CDM project activity contributes towards Sustainable Development in Brazil.

There is no Annex I Party yet identified.

In summary, it is GLC's opinion that "Canhanduba Landfill Project" in Brazil, as described in the latest version of the Project Design Document (PDD) (version 5, dated 2014-01-06), meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the Approved Consolidated Methodology ACM0001 – "Flaring or use of landfill gas" (version 13). The review of the project design documentation and the subsequent follow-up interviews represent deemed credible and sufficient evidence to GLC for confirming the fulfilment of all applicable CDM criteria and requirements.

It is thus the opinion of GLC that the project meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria. GLC will thus recommend the registration of the project as a CDM project activity.

Validation Report

GLC Report No. 307, Rev. 14a

Hamburg, 2014-04-11

Markus Weber

Germanischer Lloyd
Certification

6. REFERENCES

The following table outlines the documentation reviewed during the validation:

Reference	Author: Title, version, date of issue
/1/	Itajaí Biogás e Energia S.A.: Project Design Document (PDD) for the Canhanduba Landfill Project, version 5 dated 2014-01-06 Itajaí Biogás e Energia S.A.: Project Design Document (PDD) for the Canhanduba Landfill Project, version 4 dated 2013-07-25 Itajaí Biogás e Energia S.A.: Project Design Document (PDD) for the Canhanduba Landfill Project, version 3 dated 2013-03-20 Itajaí Biogás e Energia S.A.: Project Design Document (PDD) for the Canhanduba Landfill Project, version 2 dated 2012-11-15. Itajaí Biogás e Energia S.A.: Project Design Document (PDD) for the Canhanduba Landfill Project, version 1 dated 2012-10-30.
/2/	Itajaí Biogás e Energia S.A.: Investment analysis spreadsheet with NPV calculations for the Canhanduba Landfill Project, version 5, dated 2014-01-06
/3/	Itajaí Biogás e Energia S.A.: Emission reduction calculation spreadsheet (with ex-ante estimations of emission reductions) for the Canhanduba Landfill Project. Version 5, dated 2014-01-06
/4/	UNFCCC/CDM-EB: Clean Development Mechanism Validation and Verification Standard (VVS), version 05.0 as per EB 65. UNFCCC/CDM-EB: Clean development mechanism project cycle procedure, version 05.0 as per EB 65. UNFCCC/CDM-EB: Clean development mechanism project standard, version 05.0 as per EB 65.
/5/	CDM-EB: Approved Consolidated Methodology ACM0001 – “Flaring or use of landfill gas” (version 13)
/6/	CDM-EB: “Combined tool to identify the baseline scenario and demonstrate additionality” (version 5.0.0, EB 70).
/7/	CDM-EB: Methodological tool “Emissions from solid waste disposal sites” (version 06.0.1, EB 66).
/8/	CDM-EB: “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (version 1, EB 39).

/9/	CDM-EB: “Project emissions from flaring” (version 02.0.0, EB 68).
/10/	CDM-EB: “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 02.0.0, EB 61).
/11/	CDM-EB: “Tool to calculate the emission factor for an electricity system” (version 04.0.0, EB 75).
/12/	CDM-EB: “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion” (version 02).
/13/	CDM-EB: “Tool to determine the remaining lifetime of equipment” (version 01).
/14/	CDM-EB: “Tool to determine the baseline efficiency of thermal or electric energy generation system” (version 01).
/15/	CDM EB: “Glossary of CDM Terms” (Version 07.0), EB 70 Report Annex 07.
/16/	CDM EB: “Tool for the demonstration and assessment of additionality” (version 07.0.0), EB 70 Report Annex 08.
/17/	CDM-EB: “Guidance on the Assessment of Investment Analysis” (version 5), EB 62 Report Annex 05.
/18/	Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke: “Fundamentals of Classical Thermodynamics”; Authors: Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke; 4º Edition 1994. Published by John Wiley & Sons, Inc.
/19/	CDM-EB: “Guidelines on common practice” (version 02.0), EB 69 Annex 8.
/20/	IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Reference Manual. Dated year 2006. IPCC: Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 2007. Dated 2007. IPCC: Global Warming Potential for Given Time Horizon. Available at: www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14, on 29/01/2013
/21/	CDM-EB: “Guidelines for completing the project design document form” (version 01.0) EB 66 Report Annex 8.
/22/	Huitric, R. L. and Kong, D. et al: “Measuring landfill gas collection efficiency using surface methane concentration” Sao Paulo, Brazil (2011). Available on line: http://www.arb.ca.gov/cc/ccea/comments/april/huitric_kong.pdf
/23/	Ministry of Environment of Brazil: “Gestão integrada de resíduos sólidos” Brazil (2007).
/24/	Presidence of Republic of Brazil: “Decreto n° 7.404" dated 2010-12-23.

/25/	Ministry of Science and Technology: "The second Brazilian Greenhouse Gases Emissions Inventory Report." Available online: http://www.mct.gov.br/upd_blob/0213/213909.pdf
/26/	CETESB: 1st Direct and Indirect Greenhouse Gases Anthropogenic Emissions Inventory of Sao Paulo State. Dated year 2010. Available online: http://www.cetesb.sp.gov.br/userfiles/file/mudancasclimaticas/geesp/file/docs/publicacao/inventario_estadual/sao_paulo/inventario_sp/ingles/executive_summary.pdf
/27/	Brazilian Ministry of Science, Technology and Innovation (MCTI) (DNA of Brazil): Manual for Submitting CDM Projects to the Interministerial Commission on Global Climate Change. Version 2. Dated 2008-07-01. Available online: http://www.mct.gov.br/index.php/content/view/37146.html
/28/	Contract granting the use of LFG for Itajaí Biogás e Energia S.A. by Ambiental Limpeza Urbana e Saneamento Ltda. Dated 2012-10-01. Malucelli 6ª Serventia Notarial: Written and signed statement from Itajaí Biogás e Energia S.A. (Power of Attorney document) nominating Mr. Eduardo Covas Barrionuevo as the responsible person for dealing with all issues related to the development of the project as a CDM project activity.
/29/	Brazilian Ministry of Science and Technology (MCT) (DNA of Brazil): Publication of Emission Grid Factor for the year 2012 by DNA of Brazil. Available online: http://www.mct.gov.br/upd_blob/0024/24719.pdf
/30/	Ambiental Limpeza Urbana e Saneamento Ltda.: Records on accumulated historical of Municipal Solid Waste disposed in the Canhanduba landfill. Dated January 2012.
/31/	Deloitte Touche Tohmatsu Limited (DTTL): "International Tax and Business guide – Brazil." Dated 2011. Available online: http://www.deloitte.com/assets/Dcom-Belgium/Local%20Content/Articles/EN/Services/Foreign%20desks/Brazil%20desk/Brazil_Int-Tax-Business-Guide-2011.pdf
/32/	Deloitte: "Corporate tax rate 2011 – International tax." Dated 2012. Available online: http://www.deloitte.com/assets/Dcom-Global/Local%20Assets/Documents/Tax/Taxation%20and%20Investment%20Guides/matrices/dttl_corporate_tax_rates_2012.pdf
/33/	Ambiental Limpeza Urbana e Saneamento Ltda.: Internal estimates of amount of Municipal Solid Waste to be disposed in the Canhanduba landfill along its expected lifetime. Dated January 2013.
/34/	Itajaí Biogás e Energia S.A.: Schematic drawing / layout for the Canhanduba landfill (draft version).

/35/	Itajaí Biogás e Energia S.A.: Completed modalities of communication (MoC) for the Canhanduba Landfill Project. Dated 2013-03-01.
/36/	Itajaí Biogás e Energia S.A.: Letters of invitation for comments sent to selected local as part of the performed local stakeholder consultation.
/37/	ISO 14064-2:2006 - Greenhouse gases - Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements
/38/	ISO 14064-3:2006 - Greenhouse gases - Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions
/39/	Itajaí Biogás e Energia S.A.: Prior Consideration Form sent to UNFCCC dated 2012-10-15
/40/	Itajaí Biogás e Energia S.A.: Prior Consideration Form sent to DNA of Brazil (translated into Brazilian Portuguese language). Dated 2012-10-15
/41/	PAHO: "Analysis of the municipal solid waste management situation – Report on the regional evaluation of municipal solid waste management services in Latin America and the Caribbean". Dated year 2005. Available online: http://www.bvsde.ops-oms.org/bvsars/fulltext/informeng/cap3.pdf
/42/	CETESB: Environment Agency of the State of Sao Paulo; Authors: Alves, João Wagner Alves; Title: "Methane to Markets Partnership – Country Profiles: Brazilian Country Profile." Dated year 2007. Available online: http://www.globalmethane.org/documents/landfills_cap_brazil.pdf
/43/	Emmanuel Boulet (VPS/ESG), Stefanie Brackmann (VPS/ESG), Milena Breisinger (INE/ECC), Horacio Terraza (INE/WSA), and Hans Willumsen (LFG Consult) under the supervision of Janine Ferretti (VPS/ESG); "Landfill Guidelines - An Approach to Support Climate Change - Friendly Landfill Investments." Published by the Inter-American Development Bank. Dated June 2010. Available online: http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=35596985
/44/	ABRELPE: "Panorama dos Resíduos Sólidos no Brasil- 2012". Available online: http://www.abrelpe.org.br/Panorama/panorama2012.pdf
/45/	Titman Sheridan and Martin John D: "Valuation – the art & science of corporate investment decisions" Boston, MA. Dated year 2007.
/46/	CDM-EB: AM_CLA_0092 Clarification on a conflict between ACM0001 and the 'Tool to determine project emissions from flaring gases containing methane' relating to the measurement of methane fraction and flow rate of landfill gas (wet or dry basis) (submitted 08

	May 08) Available online: http://cdm.unfccc.int/methodologies/DB/EYUD9R1ZAUZ2XNZXD3HQH18OK3VWIV/view.html
/47/	CDM-EB: AM_CLA_0116 Further clarification on AM_ CLA_ 0092 – Alternatives for the correction of measured flow rate of the residual gas from wet basis to dry basis (submitted 11 Jul 08). Available on line: http://cdm.unfccc.int/methodologies/DB/EYUD9R1ZAUZ2XNZXD3HQH18OK3VWIV/view.html
/48/	CETESB (Sao Paulo State Environmental Agency): Regulation for Environmental Impact Studies in Brazil (Resolução CONAMA n° 1/86). Available online: http://licenciamento.cetesb.sp.gov.br/legislacao/federal/resolucoes/1986_Res_CONAMA_1_86.pdf
/49/	FATMA (Santa Catarina State Environmental Agency): Operational license no. 58/2012 for the Canhanduba landfill Dated 2012-01-05
/50/	CIMGC: Inter-ministerial Commission on Global Climate Change Resolution n° 1, 4 and 7 for the Local stakeholder consultation. Dated 2008-03-05.
/51/	CDM-EB: "Standard for application of the global warming potential to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol" (version 01.0), EB 69 Report Annex 3.
/52/	ANEEL (Brazilian Agency of Electric Energy): Registry of power generation plants using LFG as fuel. http://www.aneel.gov.br/aplicacoes/autorizacoes/default_aplicacao_acompanhamento.cfm?IDACOMPANHAMENTOTIPO=1 accessed on 2012-12-23.
/53/	UNFCCC: Modalities of Communication Statement form (F-CDM-MOC form version 02.1)
/54/	UNFCCC: Project Design Document form (F-CDM-PDD). Version 04.1
/55/	UNFCCC: Guidelines on the assessment of investment analysis. Version 5. EB 62, Annex 5
/56/	Biotecnogás s. r. l.: Executive project for the project activity. Document BTG 133/09. Dated September 2012.
/57/	Federal Republic of Brazil: - Federal Decree No. 7,404/10. Available online: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/Decreto/D7404.htm - Federal Law No. 12,305/10. Available online: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/l12305.htm
/58/	Mayer-Brown / Tauil & Chequer: Legal update / interpretation: Regulation of Brazil's National Policy on Waste Management Available online:

	http://www.tauilchequer.com.br/publications/article.asp?id=10261&nid=13012
/59/	Itajaí Biogás e Energia S.A.: "Anexo III" document compiled for the proposed CDM project activity "Canhanduba Landfill Project". Available online: http://www.unicarbo.com.br/pt/projetos/canhanduba/pdd.pdf
/60/	LANDTEC: "Diseño de Ingeniería de los Sistemas de Biogás en Rellenos Sanitarios: Un Enfoque Práctico" (Engineering of Biogas systems in landfills: a practical analysis approach)
/61/	United States Environmental Protection Agency (US-EPA): Landfill Methane Outreach Program. Project Development Handbook. Dated September 2010. Available online: http://www.epa.gov/lmop/publications-tools/handbook.html
/62/	Consultation of other LFG Project activities: UNFCCC no. 5947 – CTL Landfill Gas Project http://cdm.unfccc.int/Projects/Validation/DB/T08Y3HJJ196EWJA1QVNCLJR4LQCDV6/view.html
/63/	Consultation of other LFG Project activities: UNFCCC no. 0373 – São João Landfill Gas to Energy Project http://cdm.unfccc.int/Projects/DB/DNV-CUK1145141778.29
/64/	Guascor S.A.: Technical and Financial Proposal for 3 x 1.06 MW biogas engines, gas purification system including O&M cost for engines (File name: "Energia – GUASCOR 2010 08 30 – Grupo Gerador Cabinado S300810 rev 00.pdf") dated 2010-08-30
/65/	Huitric L. R. and Kong D.: "Measuring landfill gas collection efficiency using surface methane concentration". Solid Waste Management Department of the Los Angeles County Sanitation Districts. Page 57 of the 2011 edition of the "Inventário dos resíduos sólidos domiciliares".
/66/	Ministry of Energy (EPE): "Leilão de Energia de Reserva." press release published on 2011-08-18
/67/	Ministry of Energy (EPE): "Leilão de Energia A3/2011." press release published on 2011-08-17
/68/	Perfurasolo Empreiteira de Construções Ltda.: Proposal for the installation of the LFG collecting wells. Dated 2011-10-31.
/69/	Banco Central do Brasil (Central Bank of Brazil): Inflation targeting in Brazil. Historic series from year 1999 to year 2015. http://www.bcb.gov.br/pec/metas/InflationTargetingTable.pdf

	Acessed on 2012-10-10 for benchmarking calculation.
/70/	International Monetary Fund: Average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) from 2013 to 2017: http://www.imf.org/external/pubs/ft/weo/2012/01/weodata/weorept.aspx?pr.x=86&pr.y=14&sy=2013&ey=2017&scsm=1&ssd=1&sort=country&ds=.&br=1&c=223&s=PCPIPCH&grp=0&a=http://www.imf.org/external/pubs/ft/weo/2012/01/weodata/weorept.aspx?pr.x=86&pr.y=14&sy=2013&ey=2017&scsm=1&ssd=1&sort=country&ds=.&br=1&c=223&s=PCPIPCH&grp=0&a= Acessed on 2012-08-05 for benchmarking calculation.
/71/	Carbono Dois: Estimated labor cost for landfill operation “Canhanduba landfill project - Custos de Operação Biogás” (File name: “Operadores.xls”) http://www.guiatrabalhista.com.br/guia/planilha_custos_trab.htm
/72/	UNFCCC no. 0164 – Bandeirantes Landfill Gas to Energy Project http://cdm.unfccc.int/Projects/DB/DNV-CUK1134130255.56
/73/	SCS Engineers / John Zink Company: Presentation Material about the construction and operation of LFG collection and destruction / utilization initiatives. Dated year 2011.
/74/	U.S. Department of Energy, Federal Energy Technology Center: Waste Management Project Contingency Analysis. Organized by Edward L. Parsons Jr, (Center for Acquisition and Business Excellence). Dated year 1999. Available online: http://www.netl.doe.gov/publications/others/techrpts/parsons.pdf
/75/	Brazilian Ministry of City Infrastructure: Diagnóstico do Manejo de Resíduos Sólidos Urbanos – 2010 (translated into English language as “Outlook/diagnostic for municipal/urban solid waste management – year 2010). Dated June 2012. Available online: http://www.snis.gov.br/PaginaCarrega.php?EWRErterterTERTer=93
/76/	Itajaí Biogás e Energia S.A.: Report of meeting for the occurred public audience event dated 2013-07-19. Itajaí Biogás e Energia S.A.: Letters of invitation dated 2013-07-11 for public audience sent to the following entities: - Famai (environmental authority in the municipality of Itajaí) - Ambiental Limpeza Urbana e Saneamento Ltda. - City Hall of Itajaí - Fatma (environmental authority in Santa Catarina State) - Interministerial Commission for the Global Climate Change (DNA of Brazil) - Brazilian Forum of NGO´s; - Brazilian Forum of Climate Change;

	- Federal Public Attorney Office - Federal office in Brasilia; - Federal Public Attorney Office – Santa Catarina State office in Santa Catarina; - Public Attorney Office for Santa Catarina State; - Santa Catarina Public State Attorney Environmental office - Centro de Apoio Operacional do Meio Ambiente (CME); - City Council (local legislative chamber) of Itajaí; - Secretary of Municipal Services and Environment of Itajaí; - COOPERFOZ (Recyclable Waste Collectors Association of the Mouth of the Itajaí River);
/77/	Federative Republic of Brazil / Interministerial Commision in Global Climate Change: Letter of Approval (LoA) for the proposed CDM project activity "Canhanduba Landfill Project". Dated 2014-04-07.
/78/	Federative Republic of Brazil / Interministerial Commision in Global Climate Change: Email communication confirming the issuance of the Letter of Acceptance (LoA) for the proposed CDM project activity “Canhanduba Landfill Project”. Email communication dated 2014-04-11.

Persons interviewed:
A list of persons interviewed as part of the validation assessment is presented in Section 3.2.

ANNEX A: VALIDATION QUESTIONNAIRE AND RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS (LIST OF FINDINGS)

Validation Questionnaire

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
1. APPROVAL				
1.1. Please indicate all project participant (PPs) involved in the CDM project and define the host and the Annex I Country.		MoV: PDD (version 5), CER Excel sheet version 5 and NPV Excel sheet version 5 PP: Itajaí Biogás e Energia S.A. Host country: Brazil No Annex I party has so far been identified.	OK	OK
1.2. Have the DNA of each Party indicated as being involved provided a written letter of approval?	VVS 38	Host country: No. Prior to the submission of the final Validation Report to the CDM Executive Board (CDM-EB), GLC will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation that the proposed CDM project activity assists Brazil towards Sustainable Development.	-	-
1.2.1. Is every Party a Party to the Kyoto Protocol?	VVS 39 a	Host country: Brazil is a Party if the Kyoto Protocol.	OK	OK
1.2.2. Is the participation voluntary?	VVS 39 b	Host country: See 1.2	OK	OK
1.2.3. Does the letter of approval by the DNA of the host Party confirm the contribution of the proposed CDM project activity to the sustainable development of the host party/country? *(Please specify how this requirement was validated*	VVS 39 c + 50	See 1.2	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
e.g. interview with relevant authority and review of the original document)				
1.2.4. Will the project create other environmental or social benefits than GHG emission reductions?		The PDD includes comprehensive description of the project activity's environmental aspects. In the overall evaluation of environmental aspects of the project activity, positive environmental impacts are expected such as: - reduction of risk of explosions - reduction of emissions of particles, - reduction of emissions of volatile organic compounds and ammonia, - reduction of soil and ground water contamination - reduction of odor No relevant negative environmental impacts are expected from the implementation of the project activity.	OK	OK
1.2.5. Is the project title and the version tag of the currently validated PDD identical with the one mentioned in the LoA(s)? *In case a LoA refers to a specific PDD version, the LoA has to be renewed if the PDD version was updated during the validation.*	VVS 39 d	See 1.2	OK	OK
1.2.6. Is the project title of the proposed CDM activity submitted to the UNFCCC for registration in every document correct?		The project title is: "Canhanduba Landfill Project" located at the Canhanduba landfill. The title has been used consistently in the PDD and on the UNFCCC website.	OK	OK
1.3. Are the letters of approval of the DNAs authentic for the proposed CDM project activity? *Please indicate how this has been verified (e.g. review*	VVS 41	See 1.2	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
of the original document and interview with the DNA, was the letter submitted by the DNA directly)				
1.4. Was the letter submitted by the project participants or by the DNA directly?	VVS 43 b	See 1.2	OK	OK
2. PARTICIPATION				
2.1. Are the PPs listed in a tabular form in section A.4 of the PDD?	VVS 46	The PPs are listed in a tabular form in Section A.4.	OK	OK
2.2. Is the listed information in the table consistent with the contact details provided in Appendix I of the PDD?	VVS 46	The PP name "Itajaí Biogás e Energia S.A." was listed consistently in Section A.4 and Annex 1.	OK	OK
2.3. Has the participation of each PP been approved by at least one party involved, either in a letter of approval or in a separate letter?	VVS 45	See 1.2	OK	OK
2.4. Please review whether no other entities other than those approved as PPs are included in these sections of the PDD. Only actual PPs should be listed here.	VVS 47	See 1.2	OK	OK
2.5. Please cross check that approval of participation has been issued by relevant DNA or not?	VVS 48	See 1.2	OK	OK
2.6. Have you received a correctly completed and duly authorized MoC statement?	VVS 54-57, 60	A completed Modalities of Communication (MoC) form for the project activity (signed the project participant on 2013-03-01) was made available to the GLC's validation team by Itajaí Biogás e Energia S.A. (which is the project participant with whom GLC set a contractual agreement for performing the validation assessment). The corporate identity of identified project participant (Itajaí Biogás e Energia S.A.) is included in the MoC statement and were verified to be correct by the GLC's validation team. The corporate identity and name for the focal point are also indicated in	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		the completed MoC form. The GLC's validation team confirmed the validity and authenticity of specimen signatures and engagement (employment) status of authorized person by checking the original version of the following document (which was registered by Malucelli 6ª Serventia Notarial, an accredited notary services office in Curitiba, Brazil): - A written and signed statement from Itajaí Biogás e Energia S.A. (Power of Attorney document) /28/ nominating Mr. Eduardo Covas Barrionuevo as the responsible person for dealing with all issues related to the development of the project as a CDM project activity. The statement also nominates Mr. Barrionuevo as the contact person within the GLC, DNA of Brazil and UNFCCC. The GLC's validation team also confirmed that the completed MoC statement is based on the currently valid form "Modalities of Communication Statement" (F-CDM-MOC form version 02.1). Moreover, the GLC's validation team was also able to confirm that information required by the form (including its Annex 1) is correct. In conclusion, the GLC's validation team confirmed that the completed MoC statement provided by the project participant and supporting related material made available to GLC for review are all in accordance with the applicable		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		requirements and assessment procedures as per the CDM Validation and Verification Standard (VVS).		
3. PROJECT DESIGN DOCUMENT (PDD)				
3.1. Was the PDD prepared in accordance with the latest template and guidance from the EB?	VVS 62	The PDD used the latest template LSC-PDD Version 04.1, (http://cdm.unfccc.int/Reference/PDDs_Forms/PDDs/PDD_form05.pdf) and applied correctly the guidelines for completing PDD released in EB 66 Annex 8 Version 01.0 (http://cdm.unfccc.int/Reference/Guidclarif/pdd/PDD_guid06.pdf)	OK	OK
3.2. Is the PDD in accordance with the applicable CDM requirements for completing PDDs and is the PDD duly completed?	VVS 63	The PDD is duly completed as per the latest applicable guidelines for completing PDD. **CAR 5 (2013-01-13):** **The PDD includes several typo and syntax mistakes in texts and description of parameters.**	~~CAR 5~~	OK
4. PROJECT DESCRIPTION				
4.1. Does the PDD contain a clear description of the project activity that provides the reader with a clear understanding of the precise nature of the project activity and the technical aspects of its implementation?	VVS 64	Yes. The "Canhanduba Landfill Project" currently comprises the construction, operation and maintenance of a landfill gas (LFG) collecting, destruction facility and also an electricity generation facility which uses LFG as fuel yet to be built at the Canhanduba landfill. The project owner is Itajaí Biogás e Energia S.A.. The key purpose of this project is to capture and destroy methane	~~CAR 6~~	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		from the landfill through combustion in high temperature enclosed flare(s) and also generate electricity using LFG as fuel. This project is intended to reduce CH_4 emissions which would have otherwise been released into the atmosphere from the Canhanduba landfill. **CAR 6 (2013-01-13):** **In Section A.1 of the PDD, the landfill name is wrongly indicated as Canhanduba landfill.**		
4.2. Does the information provided on the location of the project activity allow for a clear identification of the site(s)? Coordinates should be given in both possible formats:		Yes. The project location is correctly indicated in decimal degree format.	OK	OK
4.3. How is it ensured and/or demonstrated that the PPs are entitled to implement the project at this site (ownership, licenses, contracts etc.)?		Operational License for Canhanduba landfill has been assessed and GLC identified that the PP has all required licenses. Moreover, the GLC's validation team confirmed the validity and authenticity of specimen signatures and engagement (employment) status of authorized person by checking the original version of the following document (which was registered by Malucelli 6ª Serventia Notarial, an accredited notary services office in Curitiba, Brazil): - A written and signed statement from Itajaí Biogás e Energia S.A. (Power of Attorney document) /28/	~~CAR 7~~	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		nominating Mr. Eduardo Covas Barrionuevo as the responsible person for dealing with all issues related to the development of the project as a CDM project activity. The statement also nominates Mr. Barrionuevo as the contact person within the GLC, DNA of Brazil and UNFCCC. **CAR 7 (2013-01-13):** **As part of the assessment, a completed Modalities of Communication (MoC) form is required to be made available and assessed by the GLC's validation team.**		
4.4. Is the required form for the indication of projected emission reductions correctly applied (please refer to section B.6.4 (for large scale (LSC)) or B.6.4 (for small scale (SSC)) in the PDD) and consistent with page 1 of the PDD?		Yes, the indication of estimated emission reductions is in the correct format.	OK	OK
4.5. Are the figures provided consistent with other data presented in the PDD?		Yes, the figures are mainly consistent.	OK	OK
4.6. Is public funding from an Annex I country used by the project?		No public funding is used.	OK	OK
4.7. If public funding is granted was a written confirmation from the relevant Annex I country DNA provided with the content that such funding does not result in a diversion of official development assistance (ODA)?		No public funding is used, hence not applicable.	OK	OK
4.8. Is the information concerning the diversion of ODA provided in Section A.5. (for LSC) or A.4. (for SCC) of		No public funding is used, hence not applicable.	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
the PDD consistent with Appendix 2?				
4.9. Is the assumed crediting time clearly defined and reasonable		**CAR 1 (2014-01-03):** **While the expected starting date for the crediting period was changed, the *ex-ante* estimates of emission reductions to be achieve by the project activity were not corrected by taking into consideration the new expected starting date of the crediting period.**	~~CAR 1~~	OK
4.10. Please specify whether the current project is realized in existing facilities or utilizes existing equipment (brownfield), as well if it falls within one of the following categories for which a physical site inspection is mandatory and indicate the date of the site visit: ➢ Large scale projects (LSC) ➢ Non-bundled SSC projects with emission reductions exceeding 15,000 tonnes per year; ➢ Bundled SSC projects, each with emission reductions not exceeding 15,000 tonnes per year; in such case the number of physical site visits may however be based on sampling, if the sampling size is appropriately justified through statistical analysis.	VVS 65, 68	The construction phase of the project activity has not yet started (e.g. drilling of new LFG collection wells, conversion of existent passive LFG venting drains into LFG collecting wells, installation of LFG flaring and control equipment, etc.). The project construction phase is planned to be initiated only right after successful registration of the proposed CDM project activity by the CDM-EB, of which is currently expected to occur not before July 2013.	OK	OK
4.11. In case a site inspection has been conducted, does the description in the PDD reflect the proposed CDM activity?		By the time of the conducted on-site visit to the project site, the validation team was able to confirm that the construction of the project activity has not yet started (no work related to construction of new LFG collection wells was initiated). The project construction phase is considered to be initiated only after successful registration of the proposed CDM project activity by the CDM EB. Thus GLC	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		observed the landfill and the description in the PDD clearly matches the observations.		
4.12. In case it is decided that no site visit should be conducted, were designs or feasibility study reports (FSR) available for review? If yes, is the project description consistent with them? If none of these documents was available, please conduct a comparison analysis to equivalent projects (i.e. project type, applied methodology, location,..) ?	VVS 66, 67	Not applicable.	Not applicable.	Not applicable.
4.13. If no physical site inspection was undertaken how the project description was assessed for appropriateness and what is the outcome?	VVS 66	Not applicable.	Not applicable.	Not applicable.
4.14. In case the CDM project activity involves the alteration of an existing installation or process are the differences between the project activity and the pre-project situation clearly defined in the project description?	VVS 68	Not applicable.	Not applicable.	Not applicable.
4.15. Are the CDM project activity process flow charts, illustrative descriptions or comparable documents available and do they contribute to a better understanding of the project activity?		The GLC's validation team reviewed an available draft schematic drawing / layout diagram of the Canhanduba landfill. During interviews performed with the project participant, the GLC's validation team was also informed about the probable design of the project activity (probable location of the project's components within the landfill area: probable distribution of LFG wells, probable location of LFG destruction facility with enclosed high temperature flare(s), etc). **CAR 13 (2013-01-13):** **The schematic diagram of the project activity as presented in Section B.3 of the PDD is sufficiently**	~~CAR 13~~	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		clear.		
5. APPLICABILITY OF BASELINE AND MONITORING METHODOLOGY				
5.1. Does the PDD clearly state the latest and valid version of the methodology (ies) and the tools? Is the methodology or any tool correctly quoted?	VVS 70 , 74	The PDD has been checked and identified that the methodology has been correctly quoted and the version is applicable at time of GSC. **CAR 11 (2013-01-13):** **References about the methodological tool "Project emissions from flaring" (version 02.0.0) are wrongly indicated. This tool is wrongly indicated as being released/published in the EB67 CDM-EB meeting.**	~~CAR 11~~	OK
5.2. Please list all applicability criteria of the approved methodology or any other tool or other methodology component referred to therein.	VVS 72, 76	The applied methodology is ACM0001 version 13 "Flaring or use of landfill gas". The project design meets all applicability requirements of ACM0001 (version 13) and all applicable methodological tools.	OK	OK
5.3. Please review and assess whether the project activity meets these criteria.	VVS 76	The applied methodology is ACM0001 version 13 "Flaring or use of landfill gas". The project design meets all applicability requirements of ACM0001 (version 13) and all applicable methodological tools.	OK	OK
5.4. Please check whether comparable information is available from other sources and if yes cross check	VVS 76	During on-site visit it has been identified that the project activity will be installed at the Canhanduba landfill site. By	OK	OK

QUESTION / REQUIREMENT		Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
	with the PDD in order to assess the applicability of the methodology.		means of a visual inspection of the landfill by the GLC's validation team, it was confirmed that the project is a new project and the LFG collecting and destruction facility has not been build yet. The project activity will comprise collection, flaring of LFG and electricity generation using LFG as fuel.		
5.5.	Is the project activity expected to result in emissions other than those allowed by the methodology?	VVS 82, 84	No, the project activity is not expected to result in emissions other than those allowed by the methodology.	OK	OK
5.6.	Is the project activity a SSC project activity?		The project activity is a large-scale project. Hence, questions 5.7 – 5.11 are not applicable.	OK	OK
5.7.	Does the project activity qualify within the thresholds of the three possible types of SSC project activities? Does it include more than one component; for example, a type III methane recovery component activity and a type I electricity component activity?	VVS 152	Not applicable.	Not applicable.	Not applicable.
5.8.	Does the project activity conforms to one of the approved SSC categories and applies the relevant tool or methodology? Are the SSC methodologies applied in conjunction with the general guidance to the methodologies, which provides guidance on equipment capacity, equipment performance, sampling and other monitoring-related issues?	VVS 152	Not applicable.	Not applicable.	Not applicable.
5.9.	Is the project activity not a debundled component of a LSC project?	VVS 152 c	Not applicable.	Not applicable.	Not applicable.
5.10.	Is an assessment of the environmental impacts of the proposed CDM project activity required by the host Party?	VVS 134	Not applicable.	Not applicable.	Not applicable.

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
If so, is the EIA available and in compliance with the regulations?				
5.11. Please indicate if the proposed SSC project activity meets the requirements of SSC CDM project activities?	VVS 150	Not applicable.	Not applicable.	Not applicable.
5.12. Is any deviation from the methodology, revision of a methodology or clarification required?	VVS 78-81	The validation team confirms that the baseline and monitoring methodology selected by the PP complies with the methodology previously approved by the CDM EB. Further the validation team confirms that the selected methodology is applicable to the project activity and it has been assessed in Question 5.3 – 5.4 whether the PP has correctly applied the selected methodology.	OK	OK
6. PROJECT BOUNDARY				
6.1. Is the delineation of the project boundary in the PDD correct and does it meet the requirements of the selected baseline methodology?	VVS 82	As per PDD version 5 Section B.3 the project boundary is the site of the project activity where the gas is captured, destroyed and used for electricity generation. Also, electricity source for the project activity operation (from grid) is included in the project boundary. The figure in section B.3. correctly indicates the project boundary in line with ACM0001 (version 13)	OK	OK
6.2. Have all sources and GHGs required by the methodology been included within the project boundary?	VVS 82	Yes. As indicated and explained in the PDD, all sources and GHGs required by the methodology are included within the project boundary.	OK	OK
6.3. Is a flow diagram included in the PDD which provides a clear understanding of all sources and GHG?		Yes. A flow diagram which provides a clear understanding	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		of all sources and GHGs is included in the PDD.		
6.4. Does the methodology allow PPs to choose whether a source or gas is to be included within the project boundary?	VVS 84	No, the methodology clearly indicates the GHG sources and gases to be included within the project boundary.	OK	OK
6.5. How was this choice been justified by the PP and is the justification reasonable?	VVS 84	Not applicable.	OK	OK
7. BASELINE IDENTIFICATION				
7.1. Are there any procedures in the methodology to identify the most reasonable baseline scenario?	VVS 89	Yes. ACM0001 (version 13) includes a stepwise approach to determine the baseline scenario.	OK	OK
7.2. Does the applied methodology require the use of tools to establish the baseline scenario?	VVS 89	The applied methodology ACM0001 (version 13) refers to following tool for the determination of the baseline scenario and baseline emissions: • Methodological tool "Emissions from solid waste disposal sites"; • "Combined tool to identify the baseline scenario and demonstrate additionality"; • "Project emissions from flaring"; • "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"; • "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". • "Tool to calculate the emission factor for an electricity	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		system".		
7.3. In case of any inconsistencies between the methodology and a tool please note that the guidance of the methodology supersedes the tool and review whether the PP has correctly applied this principle correctly.	VVS 89	There is no inconsistency between the methodology and the tool. Hence it is not required to supersede the tool with the methodology.	OK	OK
7.4. If the methodology requires to consider several alternative scenarios to identify the most reasonable baseline scenario which were considered by the PP?	VVS 90	See 7.1	OK	OK
7.5. Are the scenarios considered reasonable and justified? Please indicate how this requirement has been assessed. (following 7.4)	VVS 91,92 , 93	See 7.1 **CAR 8 (2013-01-13):** **The application of the stepwise approach for the determination of baseline scenario and demonstration of additionality for the project activity is not sufficiently clear in the specific context of application of STEP 2 (barrier analysis).**	~~CAR 8~~	OK
7.6. Were any reasonable alternative scenarios excluded? If so please list them and validate why they are excluded. (following 7.4)	VVS 90	See 7.1	OK	OK
7.7. Please describe how the validation of baseline scenario determination is done and describe the findings, with details of the assessments regarding the reasonableness, correctness and appropriateness of:	VVS 91	The baseline scenario has been identified by following the stepwise approach of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0)	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
a) assumptions, calculations and rationales used for determining the baseline scenario; b) documents and sources quoted and interpreted in PDD for baseline determination; c) information provided in the PDD for baseline determination, compared to information from other verifiable and credible sources, such as local expert opinion if available.				
7.8. Have all applicable CDM requirements been taken into account in the identification of the baseline scenario for the proposed CDM project activity (including "relevant national and/or sectoral policies and circumstances"; e+/e- rule)?	VVS 93	Yes. All applicable CDM requirements been taken into account in the identification of the baseline scenario for the proposed CDM project activity.	OK	OK
7.9. Does the PDD contain a description of the technology that would be employed in the absence of the CDM project activity?	VVS 92	Atmospheric release of the landfill gas or, eventually, partial capture of landfill gas and destruction to comply with regulations or contractual requirements, or to address safety and other concerns is correctly identified as the only realistic alternative to the implementation of the project activity.	OK	OK
7.10. In case the grid-factor was applied ex-ante to determine the baseline emissions and/or the project emission, please review whether this emission factor is still valid.		The CO_2 emission factor for the National Electricity Grid of Brazil will be determined ex-post.	OK	OK
8. ALGORITHMS AND/OR FORMULAE USED TO DETERMINE EMISSION REDUCTIONS				
8.1. What are the parameters applied in the PDD to determine emission reductions? Are all the required ex-ante parameters and equations	VVS 96	Baseline emissions are determined according to equation 1 and comprise the following sources:	~~CAR 2~~ ~~CAR 3~~ ~~CAR 9~~	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
included in the PDD as required by the applied methodology?		(A) Methane emissions from the SWDS in the absence of the project activity; (B) Electricity generation using fossil fuels or supplied by the grid in the absence of the project activity; (C) Heat generation using fossil fuels in the absence of the project activity; and (D) Natural gas used from the natural gas network in the absence of the project activity. $BE_y = BE_{CH4,y} + BE_{EC,y} + BE_{HG,y} + BE_{NG,y}$ Where: BE_y = Baseline emissions in year *y* (tCO_2e/yr) $BE_{CH4,y}$ = Baseline emissions of methane from the SWDS in year *y* (tCO_2e/yr) $BE_{EC,y}$ = Baseline emissions associated with electricity generation in year *y* (tCO_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* (tCO_2/yr) **Assessment of PDD version 5 vs. methodology and applicable tools:** By means of checking PDD version 5 it has been identified that $BE_{HG,y}$ and $BE_{NG,y}$ are assumed to be zero. --- *Step (A): Baseline emissions of methane from the SWDS ($BE_{CH4,y}$)* Baseline emissions of methane from the SWDS are	~~CAR 10~~ ~~CAR 12~~	

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		determined as follows, based on the amount of methane that is captured under the project activity and the amount that would be captured and destroyed in the baseline (such as due to regulations). In addition, the effect of methane oxidation that is present in the baseline and absent in the project is taken into account: $BE_{CH4,y} = (1 - OX_{top\_layer}) (F_{CH4,PJ,y} - F_{CH4,BL,y}) GWP_{CH4}$ Where: $BE_{CH4,y}$ = Baseline emissions of LFG 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* (tCH_4/yr) $F_{CH4,BL,y}$ = Amount of methane in the LFG that would be flared in the baseline in year *y* (tCH_4/yr) GWP_{CH4} = Global warming potential of CH_4 (tCO_2e/tCH_4) **Assessment of PDD version 5 vs. methodology and applicable tools:** OX_{top_layer} has been listed in Section B.6.2 which is in line with ACM0001. GWP_{CH4} has been listed in Section B.6.2 which is in line with ACM0001. $F_{CH4,BL,y}$ is assessed under Step A.2. ----------		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		As per ACM0001: *Step A.1: Ex post determination of $F_{CH4,PJ,y}$* During the crediting period, $F_{CH4,PJ,y}$ is determined as the sum of the quantities of methane flared and used in power plant(s), boiler(s), air heater(s), kiln(s) and natural gas distribution network, 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* (tCH_4/yr) $F_{CH4,EL,y}$ = Amount of methane in the LFG which is used for electricity generation in year *y* (tCH_4/yr) $F_{CH4,HG,y}$ = Amount of methane in the LFG which is used for heat generation in year *y* (tCH_4/yr) $F_{CH4,NG,y}$ = Amount of methane in the LFG which is sent to the natural gas distribution network in year *y* (tCH_4/yr) **Assessment of PDD version 5 vs. methodology and applicable tools:** ---------- As per ACM0001 (version 13) *Amount of methane destroyed by flaring ($F_{CH4,flared,y}$)* $F_{CH4,flared,y}$ is determined as the difference between the amount of methane supplied to the flare(s) and any		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		methane emissions from the flare(s), as follows: $F_{CH4,flared,y} = F_{CH4,sent\_flare,y} – (PE_{flare,y} / GWP_{CH4})$ Where: $F_{CH4,flared,y}$ = Amount of methane in the LFG which is destroyed by flaring in year *y* (tCH_4/yr) $F_{CH4,sent\ flare,y}$ = Amount of methane in the LFG which is sent to the flare in year *y* (tCH_4/yr) $PE_{flare,y}$ = Project emissions from flaring of the residual gas stream in year *y* (tCO_2e/yr) GWP_{CH4} = Global warming potential of CH4 ($tCO_2e/t\ CH_4$) $F_{CH4,sent\_flare,y}$ is determined directly using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", applying the requirements described above where the gaseous stream the tool shall be applied to is the LFG delivery pipeline to the flare(s). **Assessment of PDD version 5 vs. methodology and applicable tools:** By means of checking PDD version 5 it has been identified that $F_{CH4,sent\_flare,y}$ and $F_{CH4,EL,y}$ will be determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" which is deemed appropriate and in line with ACM0001 (version 13). As per PDD version 5 Option 2 "*Simplified calculation without measurement of the moisture content*" has been chosen. ---------- *As per the "Tool to determine the mass flow of a*		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		greenhouse gas in a gaseous stream" Option 2: $m_{H2O,t,db,SAT} = (p_{H2O,t,Sat} * MM_{H2O}) / (P_t - p_{H2O,t,Sat}) * MM_{t,db}$ 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) Pt = 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) **Assessment of PDD version 5 vs. methodology and applicable tools:** ---------- *As per the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" Option 2*: Parameter $MM_{t,db}$ is estimated using the following equation: $MM_{t,db} = \Sigma_k (v_{k,t,db} * MM_k)$ 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		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		in time interval *t* on a dry basis (m^3 gas k/m^3 dry gas) MM_k = Molecular mass of gas *k* (kg/kmol) k = All gases, except H_2O, contained in the gaseous stream (e.g. N_2, CO_2, O_2, CO, H_2, CH_4, N_2O, NO, NO_2, SO_2, SF_6 and PFCs). 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, the volumetric fraction of only the gases k that are greenhouse gases and are 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. **Assessment of PDD version 5 vs. methodology and applicable tools:** ---------- *As per the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" Option 2*: The parameter $F_{i,t}$ can be determined using Option A, B, C, D, C or F. By means of assessing the PDD version 5, GLC identified that Option C has been chosen. However during on-site visit the project participant identified that Option A C or D are possible scenarios because it is not clear which equipment will be installed (mass or volume based) ----------		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		As per ACM0001 (version 13): $PE_{flare,y}$ shall be determined using the methodological tool "Project emissions from flaring" as follows: Project emissions from flaring of the residual gas ($PE_{flare,y}$) will be calculated based on the mass flow rate of methane in the residual gas stream that is flared. The efficiency of combustion in the flare is calculated from the methane content in the exhaust gas of the flare, corrected for the air used in the combustion process, and the methane content in the residual gas. The project emissions calculation procedure is given in the following steps: STEP 1: Determination of the methane mass flow of the residual gas The "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" shall be used to determine, in kg, the mass flow of methane in the residual gaseous stream in the minute *m*: $F_{CH4,m}$ STEP 2: Determination of the flare efficiency In the present project activity the flare efficiency for minute *m* will be determined by Option B.1 of the methodological tool "Project emissions from flaring", where the flare efficiency is measured in a biannual basis or, if the biannual measurements are not available, Option A of the methodological tool "Project emissions from flaring" will be used. Both options are described below:		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		Option A: Apply a default value for flare efficiency Option B: Measure the flare efficiency Option B.1: Biannual measurement of the flare efficiency The calculated flare efficiency $\eta_{flare,calc,m}$ is determined as the average of two measurements of the flare efficiency made in year *y* ($\eta_{flare,calc,y}$), as follows: $\eta_{flare,calc,y} = 1 - \frac{1}{2} \Sigma_1 (F_{CH4,EG,t}/F_{CH4,RG,t})$ Where: $\eta_{flare,calc,y}$ = Flare efficiency in the year y $F_{CH4,EG,t}$ = Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period t (kg) $F_{CH4,RG,t}$ = Mass flow of methane in the residual gas on a dry basis at reference conditions in the time period t (kg) t = The two time periods in year y during which the flare efficiency is measured, each a minimum of one hour and separated by at least six months $F_{CH4,\ EG,t}$ is measured according to an appropriate national or international standard. $F_{CH4,RG,t}$ is calculated according to Step 1, and consists of the sum of methane flow in the minutes m that make up the time period t. **Assessment of PDD version 5 vs. methodology and applicable tools:**		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		---------- $F_{CH4,\ EG,t}$ has been listed in Section B.6.2 which is in line with ACM0001. $F_{CH4,RG,t}$ is calculated under Step 1. 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: $PE_{flare,y} = GWP_{CH4} * \Sigma_1 F_{CH4,RG,m} * (1- \eta_{flare,m})*10^{-3}$ 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 **Assessment of PDD version 5 vs. methodology and applicable tools:** ---------- GWP_{CH4} has been listed in Section B.6.2 which is in line with ACM0001. $F_{CH4,RG,m}$ is calculated under Step 1.		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		$\eta_{flare,m}$ is calculated under Option B.2 **CAR 10 (2013-01-13):** **Details about application of Step 3: "Calculation of project emissions from flaring" of the methodological tool "Project emissions from flaring" is missing in the context of the determination of project emissions from flaring ($PE_{flare,y}$).** --- *As per ACM0001 (version 13)* *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 (according to equation 2 of the methodology) in order to estimate the emission reductions of the proposed project activity in the CDM-PDD. It is determined as follows: $F_{CH4,PJ,y} = \eta_{PJ} * BE_{CH4,SWDS,y}/GWP_{CH4}$ Where: $F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (t CH_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 methane **Assessment of PDD version 5 vs. methodology and**		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		applicable tools: η_{PJ} has been listed in Section B.6.2. GWP_{CH4} has been listed in Section B.6.2. ---------- $BE_{CH4,SWDS,y}$ is determined using the methodological tool "Emissions from solid waste disposal sites". The following guidance should be taken into account when applying the tool: • f_y in the tool shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for in equation 2 of this methodology; • In the tool, *x* begins with the year that the SWDS started receiving wastes (e.g. the first year of SWDS operation); and • Sampling to determine the fractions of different waste types is not necessary because the waste composition can be obtained from previous studies. As per the tool "Emissions from solid waste disposal sites" the project participant can choose between Application A and Application B. GLC identified by means of checking PDD and interviews during on-site visit that Application A has been applied. Since the project activity mitigates methane emissions from an existing SWDS, GLC identified that Application A has		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		been chosen correctly. The calculation and formula have been thus assessed in line with Application A. ---------- *As per the tool "Emissions from solid waste disposal sites" Application A:* $BE_{CH4,SWDS,y} = \varphi_y * (1 - f_y) * GWP_{CH4} * (1 - OX) * (16/12) * F * DOC_{f,y} * MCF_y * \sum_x \sum_j (W_{j,x} * DOC_j * e^{-kj * (y-x)} * (1-e^{-kj}))$ With x =(1,..,y) Where: $BE_{CH4,SWDS,y}$ = Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year y (tCO_2e/yr) *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 the year y (*x*=*y*) *y* = Year of the crediting period for which methane emissions are calculated (y is 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 (tonnes)		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		φ_y = Model correction factor to account for model uncertanties 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 (= 0 as per the ACM0001 (version 13)) 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 **Assessment of PDD version 5 vs. methodology and applicable tools:** φ_y has been listed in Section B.6.2. f_y has been defined as zero by ACM0001 (version 13) and therefore the parameter does not need to be listed in Section B.6.2 or B.7.1. GWP_{CH4} has been listed in Section B.6.2. OX has been listed in Section B.6.2. F has been listed in Section B.6.2.		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		$DOC_{f,y}$ has been listed in Section B.6.2. MCF_y has been listed in Section B.6.2. $W_{j,x}$ has not been indicated in Section B.6.2 which is in accordance with the applicable tool in case Application A is applied. DOC_j has been listed in Section B.6.2. k_j has been listed in Section B.6.2. **CAR 2 (2013-01-13):** **According to the Section "Global Warming Potential for Given Time Horizon" in table 2.14 of the errata to the contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (based on the effects of greenhouse gases over a 100-year time horizon) the applicable value of Global Warming Potential (GWP) for the GHG methane (CH_4) is different than the value reported in the PDD.** **CAR 3 (2013-01-13):** **The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.** **The symbols for the *ex-ante* determined parameters "Global warming potential of CH_4" and units or descriptions for the *ex-ante* parameters "Efficiency of the LFG capture system that will be installed in the**		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		project activity", "Average technical transmissions and distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either. **Furthermore, the units or descriptions for the ex-post parameters "Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)", "Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis", "Mass flow of LFG in time interval t on a dry basis", "Volumetric flow of LFG stream in time interval *t* on a wet basis", "Volumetric flow of LFG stream in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis", "Amount of electricity consumed by the project activity year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.** --- *As per ACM0001 (version 13)*		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		Step A.2: Determination of $F_{CH4,BL,y}$ This step provides a procedure to determine the amount of methane that would have been captured and destroyed (by flaring) in the baseline due to regulatory or contractual requirements, or to address safety and other concerns (collectively referred to as requirement in this step). The four cases in Table 2 of the methodology are distinguished. The appropriate case should be identified and the corresponding instructions followed. --- *As per ACM0001 (version 13)* *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 "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". When applying the tool: - The electricity sources *k* in the tool correspond to the sources of electricity generated identified in the selection of the most plausible baseline scenario; and - $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated using LFG in year *y*. Specifically for baseline emissions we have: $BE_{EC,y} = \sum_j EC_{BL,k,y} * EF_{EL,k,y} * (1+TDL_{k,y})$		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		Where: $BE_{EC,y}$ = Baseline emissions associated with electricity generation (tCO_2 / yr) $EC_{BL,k,y}$ = Net amount of electricity generated using LFG in year y (MWh) $EF_{EL,k,,y}$ = 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 j in year y k = sources of electricity generated identified in the selection of the most plausible baseline scenario **Assessment of PDD version 5 vs. methodology and applicable tools:** $EC_{BL,k,y}$ has been listed in Section B.7.1. $EF_{EL,k,,y}$ has been listed in Section B.7.1. ---------- *As per ACM0001 (version 13)* *Step C: Baseline emissions associated with heat generation ($BE_{HG,y}$) and* *Step D: Baseline emissions associated with natural gas use ($BE_{NG,y}$)* By means of checking PDD version 5 and interviews during on-site visit, GLC identified that baseline emissions associated with heat generation or natural gas use are not applicable for this project activity.		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		---------- As per methodology ACM0001 (version 13) following *project emissions* need to be considered for this project: $PE_y = PE_{EC,y} + PE_{FC,y}$ Where: PE_y = Project emissions in year *y* (tCO_2/yr) $PE_{EC,y} = PE_{EC,grid,y} + PE_{EC,captive,y}$ $PE_{EC,grid,y}$ = Project emissions from consumption of grid electricity due to the project activity in year y (tCO_2/yr) $PE_{EC,captive,y}$ = Project emissions from consumption of electricity generated by a captive off-grid electricity generator fuelled by fossil fuel (Diesel) in year *y* (tCO_2/yr) $PE_{FC,y}$ = Project emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year *y* ($t\ CO_2/yr$) The project emissions from consumption of electricity by the project activity ($PE_{EC,y}$) shall be calculated using the *"Tool to calculate baseline, project and/or leakage emissions from electricity consumption".* When applying the tool: • Electricity sources j in the tool corresponds to the sources of electricity consumed due to the project activity. This shall include, where applicable, electricity consumed for the operation of the LFG capture system, for any processing and upgrading of the LFG, for transportation of the LFG to the flare or other		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		applications (boilers, power generators), for the compression of the LFG into the natural gas network, etc.; • If in the baseline a proportion of LFG is destroyed ($F_{CH4,BL,y}$> 0), then the electricity consumption in the tool ($EC_{PJ,j,y}$) should refer to the net quantity of electricity consumption (i.e. the increase due to the project activity). The determination of the amount of electricity consumed in the baseline shall be transparently documented in the CDM-PDD. **Assessment of PDD version 5 vs. methodology and applicable tools:** As per PDD version 5, the parameter $PE_{EC,y}$ will be calculated using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." GLC identified that this is in line with ACM0001 (version 13). The use of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" has been assessed as below. According to the PDD version 5, the parameter $PE_{FC,y}$ is not applicable, as the consumption of fossil fuel is not expected. *As per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption:"* $PE_{EC,grid,y} = EC_{PJ,grid,y} * EF_{EL,grid,y} * (1+TDL_{grid,y})$ Where:		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		$PE_{EC,grid,y}$ = Project emissions from consumption of grid electricity due to the project activity in year *y* (tCO_2/yr) $EC_{PJ,grid,y}$ = Quantity of grid electricity consumed by the project activity in year *y* (MWh/yr) (As per ACM0001 (version 13): $EF_{EL,grid,y}$ = Emission factor for grid electricity generation in year *y* (tCO_2/MWh). $TDL_{grid,y}$ = Average technical transmission and distribution losses in the National Grid of Brazil in year *y* $EF_{EL,grid,y}$ is *ex-post* determined as the Combined margin CO_2 emission factor for the National Electricity Grid of Brazil. $EF_{grid,CM,y}$ is determined ($EF_{grid,CM,y}$) (in tCO_2/MWh) by following the applicable guidance of the latest version of the "Tool to calculate the emission factor for an electricity system", as follows: $EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$ Where: $EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (in tCO_2/MWh) $EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (in tCO_2/MWh) w_{OM} = Weighting of operating margin emissions factor		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		(defautl selected value of 50 %) w_{BM} = Weighting of build margin emissions factor (default selected value of 50%) **Assessment of PDD version 5 vs. methodology and applicable tools:** $TDL_{grid,y}$ has been listed in Section B.6.2. $EF_{grid,OM,y}$ has been listed in Section B.7.1. $EF_{grid,BM,y}$ has been listed in Section B.7.1. $EC_{PJ,grid,y}$ has been listed in Section B.7.1. **Assessment of PDD version 5 vs. methodology and applicable tools:** As per PDD version 5, the parameter $PE_{EC,captive,y}$ will be calculated using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." GLC identified that this is in line with ACM0001 (version 13) The use of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" has been assessed as below. As per PDD version 5 the parameter $PE_{FC,y}$ is not applicable, as no consumption of fossil fuel is expected. However, the PDD provides relevant information in case that a backup generator is installed as part of the project activity. *As per the "Tool to calculate baseline, project and/or*		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		leakage emissions from electricity consumption:" $PE_{EC,captive,y} = EC_{PJ,captive,y} * EF_{EL,captive,y} * (1+TDL_{captive,y})$ Where: $PE_{EC,captive,y}$ = Project emissions from consumption of electricity generated by a captive off-grid electricity generator fuelled by fossil fuel (Diesel) in year y (tCO_2/yr) $EC_{PJ,captive,y}$ = Quantity of electricity sourced by the captive electricity generator (fuelled by Diesel) and consumed by the project activity in year *y* (MWh/yr) (As per ACM0001 (version 13): $EF_{EL,captive,y}$ = CO_2 emission factor for electricity sourced by the captive off-grid electricity generator (tCO_2/MWh) $TDL_{captive,y}$ = Average technical transmission and distribution losses for electricity sourced by the captive electricity generator The PDD also provides an alternative approuch for determining the $PE_{EC,captive,y,}$ by following the Option B4 of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", $PE_{EC,captive,y}$ is calculated based on the rated capacity of the installed captive off-grid electricity generator and by assuming a CO_2 emission factor of 1.3 tCO_2/MWh for electricity generated by the captive off-grid electricity generator (which is assumed as being operation of 8,760 hours per year)		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		$PE_{EC,captive,y}$ = 11,400 tCO_2/MWh * $PP_{CP,Diesel\text{-}generator}$ Where: $PP_{CP,Diesel\text{-}generator}$ = Rated capacity of the installed captive off-grid electricity generator (fuelled by Diesel) (in MW) **Assessment of PDD version 5 vs. methodology and applicable tools:** $TDL_{captive,y}$ has been listed in Section B.6.2. $PP_{CP,Diesel\text{-}generator}$ has been listed in Section B.6.2. $EF_{EL,captive,y}$ has been listed in Section B.6.2. $EC_{PJ,captive,y}$ has been listed in Section B.7.1. **CAR 12 (2013-01-13):** **Details about both *ex-ante* determined parameters and parameters which are monitored ex-post which are required for the determination of project emissions due to consumption of electricity sourced by a captive off-grid electricity generator which fuelled by fossil fuel (Diesel) ($PE_{EC,captive,y}$) are not correctly presented in Sections B.6.2 and B.7.1 of the PDD respectively.** **Furthermore, the methodological approach for determining such project emissions is not correctly presented in Section B.6.1 of the PDD either.** ----------		

<table>
<tr><th>QUESTION / REQUIREMENT</th><th>Source</th><th>MEANS AND FINDING OF VALIDATION</th><th>Draft Concl.</th><th>Final Concl.</th></tr>
<tr><td></td><td></td><td>As per methodology ACM0001 (version 13) no leakage effects are accounted for under this methodology.
As per methodology ACM0001 (version 13) emissions 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)
Assessment of PDD version 5 vs. methodology and applicable tools:
As per PDD version 5 the formulae calculating emission reductions have been correctly indicated.</td><td></td><td></td></tr>
<tr><td>8.2. Is an Excel file with a detailed emission reduction calculation in a reproducible format (i.e. indicating the formulae applied and properly linked) provided by the PPs?</td><td></td><td>The emission reduction calculation spreadsheet has been provided by the PP.
The formulae for calculating emission reductions have been properly stated in the spreadsheet.</td><td>OK</td><td>OK</td></tr>
<tr><td>8.3. Have the parameters in the PDD in comparison with those in the selected approved methodology been correctly applied? Please complete the following table for each parameter.</td><td></td><td><table><tr><th>Parameter Checklist</th><th>Yes / No</th></tr><tr><td>Parameter</td><td>OX_{top_layer}</td></tr><tr><td>Title in line with methodology?</td><td>yes</td></tr><tr><td>Data unit correctly expressed?</td><td>yes</td></tr><tr><td>Appropriate description of parameter?</td><td>yes</td></tr></table></td><td>~~CAR 2~~
~~CAR 12~~
~~CAR 16~~</td><td>OK</td></tr>
</table>

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		<table><tr><td>If ex-ante determined, are data sources and assumptions appropriate and calculations correct?</td><td>yes</td></tr><tr><td>If monitored, is the estimation reasonable?</td><td>n.a.</td></tr></table> The PDD version 5 has been crosschecked with the methodology and the applicable tool. The parameter is listed in Section B.6.2 which is correct since a default value can be used as per the methodology. OK.		
		<table><tr><td>Parameter Checklist</td><td>Yes / No</td></tr><tr><td>Parameter</td><td>GWP_{CH_4}</td></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>No</td></tr><tr><td>If ex-ante determined, are data sources and assumptions appropriate and calculations correct?</td><td>Yes</td></tr><tr><td>If monitored, is the estimation reasonable?</td><td>n.a.</td></tr></table> The PDD version 5 has been crosschecked with the methodology. **CAR 2 (2013-01-13): According to the Section "Global Warming Potential for Given Time Horizon" in table 2.14 of the errata to the contribution of Working**		

<table>
<tr><th>QUESTION / REQUIREMENT</th><th>Source</th><th>MEANS AND FINDING OF VALIDATION</th><th>Draft Concl.</th><th>Final Concl.</th></tr>
<tr><td></td><td></td><td>Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (based on the effects of greenhouse gases over a 100-year time horizon) the applicable value of Global Warming Potential (GWP) for the GHG methane (CH_4) is different than the value reported in the PDD.</td><td></td><td></td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Parameter Checklist</th><th>Yes / No</th></tr>
<tr><td>Parameter</td><td>$p_{H2O,t,sat}$</td></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>If ex-ante determined, are data sources and assumptions appropriate and calculations correct?</td><td>n.a.</td></tr>
<tr><td>If monitored, is the estimation reasonable?</td><td>n.a.</td></tr>
</table>
The PDD version 5 has been crosschecked with the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. The parameter is listed in Section B.7.1.
</td><td></td><td></td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Parameter Checklist</th><th>Yes / No</th></tr>
<tr><td>Parameter</td><td>MM_{H2O}</td></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

<table>
<tr><th>QUESTION / REQUIREMENT</th><th>Source</th><th>MEANS AND FINDING OF VALIDATION</th><th>Draft Concl.</th><th>Final Concl.</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>If ex-ante determined, are data sources and assumptions appropriate and calculations correct?</td><td>Yes</td></tr>
<tr><td>If monitored, is the estimation reasonable?</td><td>n.a.</td></tr>
</table>
The PDD version 5 has been crosschecked with the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. The parameter is listed in Section B.6.2.
</td><td></td><td></td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Parameter Checklist</th><th>Yes / No</th></tr>
<tr><td>Parameter</td><td>T_n</td></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>If ex-ante determined, are data sources and assumptions appropriate and calculations correct?</td><td>n.a.</td></tr>
<tr><td>If monitored, is the estimation reasonable?</td><td>n.a.</td></tr>
</table>
The PDD version 5 has been crosschecked with the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. The parameter is listed in Section B.6.2.
</td><td></td><td></td></tr>
</table>

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		<table><tr><th>Parameter Checklist</th><th>Yes / No</th></tr><tr><td>Parameter</td><td>P_t</td></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>If ex-ante determined, are data sources and assumptions appropriate and calculations correct?</td><td>n.a.</td></tr><tr><td>If monitored, is the estimation reasonable?</td><td>n.a</td></tr></table> The PDD version 5 has been crosschecked with the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The parameter is listed in Section B.7.1.		
		<table><tr><th>Parameter Checklist</th><th>Yes / No</th></tr><tr><td>Parameter</td><td>$v_{CH4,t,db}$</td></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>No</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>If ex-ante determined, are data sources and assumptions appropriate</td><td>n.a.</td></tr></table>		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		and calculations correct? | If monitored, is the estimation reasonable? | n.a. The PDD version 5 has been crosschecked with the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The parameter is listed in Section B.7.1. **CAR 3 (2013-01-13):** **The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.** **The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters "Efficiency of the LFG capture system that will be installed in the project activity", "Average technical transmissions and distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological**		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		tools either. **Furthermore, the units or descriptions for the ex-post parameters "Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)", "Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis", "Mass flow of LFG in time interval t on a dry basis", "Volumetric flow of LFG stream in time interval *t* on a wet basis", "Volumetric flow of LFG stream in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis", "Amount of electricity consumed by the project activity year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.**		
		Parameter Checklist / Yes / No Parameter / $V_{CH4,t,wb}$ Title in line with methodology? / Yes Data unit correctly expressed? / No		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		<table><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>If ex-ante determined, are data sources and assumptions appropriate and calculations correct?</td><td>n.a.</td></tr><tr><td>If monitored, is the estimation reasonable?</td><td>n.a.</td></tr></table> The PDD version 5 has been crosschecked with the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The parameter is listed in Section B.7.1. **CAR 3 (2013-01-13):** **The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.** **The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters "Efficiency of the LFG capture system that will be installed in the project activity", "Average technical transmissions and distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume**		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either. **Furthermore, the units or descriptions for the ex-post parameters "Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)", "Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis", "Mass flow of LFG in time interval t on a dry basis", "Volumetric flow of LFG stream in time interval *t* on a wet basis", "Volumetric flow of LFG stream in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis", "Amount of electricity consumed by the project activity year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.**		
		Parameter Checklist | Yes / No		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		Parameter: MM_i Title in line with methodology? No Data unit correctly expressed? No Appropriate description of parameter? No If ex-ante determined, are data sources and assumptions appropriate and calculations correct? No If monitored, is the estimation reasonable? n.a The PDD version 5 has been crosschecked with the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The parameter is listed in Section B.6.2.		
		Parameter Checklist: Yes / No Parameter: $M_{t,db,J}$ Title in line with methodology? No Data unit correctly expressed? Yes Appropriate description of parameter? Yes If ex-ante determined, are data sources and assumptions appropriate and calculations correct? Yes If monitored, is the n.a		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		estimation reasonable?		
		The PDD version 5 has been crosschecked with the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The parameter is listed in Section B.6.2. **CAR 3 (2013-01-13):** **The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.** **The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters "Efficiency of the LFG capture system that will be installed in the project activity", "Average technical transmissions and distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.** **Furthermore, the units or descriptions for the ex-post**		

<table>
<tr><th>QUESTION / REQUIREMENT</th><th>Source</th><th>MEANS AND FINDING OF VALIDATION</th><th>Draft Concl.</th><th>Final Concl.</th></tr>
<tr><td></td><td></td><td>parameters “Molecular mass of the gaseous stream in a time interval t on a dry basis (in kg dry gas/kmol dry gas)”, “Volumetric flow of the gaseous stream j in time interval t on a dry basis”, “Mass flow of LFG in time interval t on a dry basis”, “Volumetric flow of LFG stream in time interval t on a wet basis”, “Volumetric flow of LFG stream in time interval t on a dry basis”, “Volumetric fraction of CH_4 in the collected LFG in time interval t on a dry basis”, “Volumetric fraction of CH_4 in the collected LFG in time interval t on a wet basis”, “Amount of electricity consumed by the project activity year y”, as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.</td><td></td><td></td></tr>
<tr><td></td><td></td><td><table>
<tr><th>Parameter Checklist</th><th>Yes / No</th></tr>
<tr><td>Parameter</td><td>MM_k</td></tr>
<tr><td>Title in line with methodology?</td><td>No</td></tr>
<tr><td>Data unit correctly expressed?</td><td>No</td></tr>
<tr><td>Appropriate description of parameter?</td><td>No</td></tr>
<tr><td>If ex-ante determined, are data sources and</td><td>No</td></tr>
</table></td><td></td><td></td></tr>
</table>

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		assumptions appropriate and calculations correct? | If monitored, is the estimation reasonable? | n.a The PDD version 5 has been crosschecked with the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The parameter is listed in Section B.6.2.		
		Parameter Checklist | Yes / No Parameter | P_n Title in line with methodology? | No Data unit correctly expressed? | No Appropriate description of parameter? | No If ex-ante determined, are data sources and assumptions appropriate and calculations correct? | No If monitored, is the estimation reasonable? | n.a The PDD version 5 has been crosschecked with the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The parameter is listed in Section B.6.2.		
		Parameter Checklist | Yes / No Parameter | Management		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		<table><tr><td></td><td>of SWDS</td></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>If ex-ante determined, are data sources and assumptions appropriate and calculations correct?</td><td>n.a.</td></tr><tr><td>If monitored, is the estimation reasonable?</td><td>n.a.</td></tr></table> The PDD version 5 has been crosschecked with the methodology ACM0001 (version 13). The parameter is listed in Section B.7.1. **CAR 4 (2013-01-13):** **The content of the table presented in Section B.7.3. is not completely in accordance with the information presented in Section B.7.1. nor the provisions of the related methodological tools. The referred units, symbols and/or descriptions do not match with information presented previously. Furthermore, as required by ACM0001 (version 13), monitoring details for the ex-post parameter "Management of SWDS" is missing in Section B.7.3.**		
		<table><tr><td>Parameter Checklist</td><td>Yes /</td></tr></table>		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

	No
Parameter	$V_{t,wb,j}$
Title in line with methodology?	Yes
Data unit correctly expressed?	No
Appropriate description of parameter?	No
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	n.a.
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The parameter is listed in Section B.7.1.

CAR 3 (2013-01-13):
The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.
The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters "Efficiency of the LFG capture system that will be installed in the project activity", "Average technical transmissions and distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either. **Furthermore, the units or descriptions for the ex-post parameters "Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)", "Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis", "Mass flow of LFG in time interval t on a dry basis", "Volumetric flow of LFG stream in time interval *t* on a wet basis", "Volumetric flow of LFG stream in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis", "Amount of electricity consumed by the project activity year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.**		
		Parameter Checklist / Yes / No Parameter / $V_{t,db,j}$		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		<table><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>No</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>If ex-ante determined, are data sources and assumptions appropriate and calculations correct?</td><td>n.a.</td></tr><tr><td>If monitored, is the estimation reasonable?</td><td>n.a.</td></tr></table> The PDD version 5 has been crosschecked with the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The parameter is listed in Section B.7.1. **CAR 3 (2013-01-13):** **The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.** **The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters "Efficiency of the LFG capture system that will be installed in the project activity", "Average technical transmissions and distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume**		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either. **Furthermore, the units or descriptions for the ex-post parameters "Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)", "Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis", "Mass flow of LFG in time interval t on a dry basis", "Volumetric flow of LFG stream in time interval *t* on a wet basis", "Volumetric flow of LFG stream in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis", "Amount of electricity consumed by the project activity year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.**		
		<table><tr><td>Parameter Checklist</td><td>Yes / No</td></tr><tr><td>Parameter</td><td>R_u</td></tr></table>		

<table>
<tr><th>QUESTION / REQUIREMENT</th><th>Source</th><th>MEANS AND FINDING OF VALIDATION</th><th>Draft Concl.</th><th>Final Concl.</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>If ex-ante determined, are data sources and assumptions appropriate and calculations correct?</td><td>Yes</td></tr>
<tr><td>If monitored, is the estimation reasonable?</td><td>n.a.</td></tr>
</table>
The PDD version 5 has been crosschecked with the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. The parameter is listed in Section B.6.2.
<table>
<tr><th>Parameter Checklist</th><th>Yes / No</th></tr>
<tr><td>Parameter</td><td>T_t</td></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>No</td></tr>
<tr><td>If ex-ante determined, are data sources and</td><td>n.a.</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

assumptions appropriate and calculations correct?	
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The parameter has been listed in Section B.7.1.

Parameter Checklist	Yes / No
Parameter	$Op_{j,h}$
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	No
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	n.a
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the methodological tool "Project emissions from flaring". The parameter has been listed in Section B.7.1.

CAR 9 (2013-01-13):
Details for the ex-ante determined parameter Molecular mass of gas *i* (MM_i) are not presented in Section B.6.2

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		as required by the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0). **Furthermore, the selected applicable values for the considered solid waste types are not appropriately identified as part of the details for the ex-ante determined parameter Decay rate for the waste type *j* (k_j).** **Moreover, applied measurement methods and procedures applicable for the monitoring parameter "Operation of the equipment that consumes the LFG" (as presented in Section B.7.1) are not in accordance with the project design.**		

Parameter Checklist	Yes / No
Parameter	$F_{CH4,EG,t}$
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and	n.a

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

assumptions appropriate and calculations correct?	
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with methodological tool “Project emissions from flaring”. The parameter has been listed in Section B.7.1. OK.

Parameter Checklist	Yes / No
Parameter	$T_{EG,m}$
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	n.a
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the methodological tool “Project emissions from flaring”. The parameter has been listed in Section B.7.1. OK.

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

Parameter Checklist	Yes / No
Parameter	$Flare_m$
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	n.a
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the methodological tool "Project emissions from flaring". The parameter has been indicated in Section B.7.1.

Parameter Checklist	Yes / No
Parameter	$Maintenance_y$
Title in line with methodology?	Yes
Data unit correctly	Yes

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

expressed?	
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	n.a
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the methodological tool "Project emissions from flaring". The parameter has been indicated in Section B.7.1.

Parameter Checklist	Yes / No
Parameter	$SPEC_{flare}$
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the methodological tool "Project emissions from flaring". The parameter has been indicated in Section B.7.1.

Parameter Checklist	Yes / No
Parameter	η_{PJ}
Title in line with methodology?	Yes
Data unit correctly expressed?	No
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate	No
Parameter Checklist	Yes / No
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the methodology. The parameter has been listed in Section B.6.2. See CAR 3.

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

Parameter	$\varphi_{default}$
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Emissions from solid waste disposal sites." The parameter has been indicated in Section B.6.2.

Parameter Checklist	Yes / No
Parameter	OX
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate	Yes

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

		and calculations correct?		
		If monitored, is the estimation reasonable?	n.a.	

The PDD version 5 has been crosschecked with the tool "Emissions from solid waste disposal sites." The parameter has been indicated in Section B.6.2.

Parameter Checklist	Yes / No
Parameter	F
Title in line with methodology?	No
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Emissions from solid waste disposal sites." The parameter has been indicated in Section B.6.2.

Parameter Checklist	Yes / No
Parameter	$DOC_{f,def}$

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

	ault
Title in line with methodology?	No
Data unit correctly expressed?	No
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Emissions from solid waste disposal sites." The parameter has been indicated in Section B.6.2. See CAR 3.

Parameter Checklist	Yes / No
Parameter	$MCF_{default}$
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and	Yes

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

assumptions appropriate and calculations correct?	
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Emissions from solid waste disposal sites." The parameter has been indicated in Section B.6.2.

Parameter Checklist	Yes / No
Parameter	DOC_j
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Emissions from solid waste disposal sites." The parameter has been indicated in Section B.6.2.

Parameter Checklist	Yes / No
Parameter	k_j

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Emissions from solid waste disposal sites." The parameter has been indicated in Section B.6.2.

Parameter Checklist	Yes / No
Parameter	w_j
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	No
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	No
If monitored, is the	n.a.

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		estimation reasonable?		

Wj ("Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x (tonnes)")
has not been correctly indicated in Section B.6.2 which is in accordance with the applicable tool in case Application A is applied. As per PDD version 5 parameter wj "Weight fraction of the waste type j" has been indicated in Section B.6.2 which is deemed appropriate since the methodology ACM0001 (version 13) does not require sampling to determine the fractions of different waste types and the tool required an estimated fixed ex-ante value in case Application A is used. As per ACM0001 (version 13) the waste composition can be obtained from previous studies. Default values have been used from IPCC 2006 which is deemed appropriate.

Parameter Checklist	Yes / No
Parameter	$EC_{BL,k,y}$
Title in line with methodology?	No
Data unit correctly expressed?	Yes
Appropriate description of parameter?	No
If ex-ante determined, are	n.a.

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		data sources and assumptions appropriate and calculations correct? | | If monitored, is the estimation reasonable? | Sim The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.7.1. **CAR 3 (2013-01-13):** **The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.** **The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters "Efficiency of the LFG capture system that will be installed in the project activity", "Average technical transmissions and distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological**		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		tools either. **Furthermore, the units or descriptions for the ex-post parameters "Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)", "Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis", "Mass flow of LFG in time interval t on a dry basis", "Volumetric flow of LFG stream in time interval *t* on a wet basis", "Volumetric flow of LFG stream in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis", "Amount of electricity consumed by the project activity year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.** Parameter Checklist / Yes / No Parameter / $EC_{PJ,captive,y}$ Title in line with methodology? / No Data unit correctly expressed? / No Appropriate description of		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

parameter?	
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	n.a.
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.7.1.

CAR 12 (2013-01-13):

Details about both ex-ante determined parameters and parameters which are monitored ex-post which are required for the determination of project emissions due to consumption of electricity sourced by a captive off-grid electricity generator which fuelled by fossil fuel (Diesel) ($PE_{EC,captive,y}$) are not correctly presented in Sections B.6.2 and B.7.1 of the PDD respectively.
Furthermore, the methodological approach for determining such project emissions is not correctly presented in Section B.6.1 of the PDD either.

Parameter Checklist	Yes / No
Parameter	$PP_{CP,Diesel-}$

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

	generator
Title in line with methodology?	No
Data unit correctly expressed?	No
Appropriate description of parameter?	No
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.6.2.

CAR 12 (2013-01-13):

Details about both ex-ante determined parameters and parameters which are monitored ex-post which are required for the determination of project emissions due to consumption of electricity sourced by a captive off-grid electricity generator which fuelled by fossil fuel (Diesel) ($PE_{EC,captive,y}$) are not correctly presented in Sections B.6.2 and B.7.1 of the PDD respectively.
Furthermore, the methodological approach for determining such project emissions is not correctly presented in Section B.6.1 of the PDD either.

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

Parameter Checklist	Yes / No
Parameter	$TDL_{grid,y}$
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	No
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.6.2.

CAR 3 (2013-01-13):
The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.
The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters "Efficiency of the LFG capture system that will be installed in the

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		project activity", "Average technical transmissions and distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either. Furthermore, the units or descriptions for the ex-post parameters "Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)", "Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis", "Mass flow of LFG in time interval t on a dry basis", "Volumetric flow of LFG stream in time interval *t* on a wet basis", "Volumetric flow of LFG stream in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis", "Amount of electricity consumed by the project activity year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

Parameter Checklist	Yes / No
Parameter	$TDL_{captive,y}$
Title in line with methodology?	No
Data unit correctly expressed?	No
Appropriate description of parameter?	No
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.6.2.

CAR 12 (2013-01-13):

Details about both ex-ante determined parameters and parameters which are monitored ex-post which are required for the determination of project emissions due to consumption of electricity sourced by a captive off-grid electricity generator which fuelled by fossil fuel (Diesel) ($PE_{EC,captive,y}$) are not correctly presented in Sections B.6.2 and B.7.1 of the PDD respectively.

Furthermore, the methodological approach for

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

determining such project emissions is not correctly presented in Section B.6.1 of the PDD either.

Parameter Checklist	Yes / No
Parameter	w_{OM}
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.6.2.

Parameter Checklist	Yes / No
Parameter	W_{BM}
Title in line with methodology?	Yes
Data unit correctly	Yes

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

expressed?	
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Yes
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.6.2.

Parameter Checklist	Yes / No
Parameter	$EF_{grid,OM,y}$
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	n.a.

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

If monitored, is the estimation reasonable?	No

The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.7.1.

CAR 16 (2013-06-24):

While the DNA of Brazil has made available more recent data and calculation results for the values of Operation Margin CO_2 emission factor ($EF_{grid,OM,y}$) and Build Margin CO_2 emission factor ($EF_{grid,BM,y}$) (data and calculations valid for year 2012), the project participant manifested its interest on applying more recent data in the context of ex-ante estimates of emission reduction to be achieved by the project activity along the 7-year renewable crediting period. Such more recent data is however not consistently referred in all sections of the PDD and not consistently applied in the context of ex-ante estimates of emission reductions either.

Parameter Checklist	Yes / No
Parameter	$EF_{EL,captive,y}$
Title in line with methodology?	No

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

Data unit correctly expressed?	No
Appropriate description of parameter?	No
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	Sim
If monitored, is the estimation reasonable?	n.a.

The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.7.1.

CAR 12 (2013-01-13):

Details about both ex-ante determined parameters and parameters which are monitored ex-post which are required for the determination of project emissions due to consumption of electricity sourced by a captive off-grid electricity generator which fuelled by fossil fuel (Diesel) ($PE_{EC,captive,y}$) are not correctly presented in Sections B.6.2 and B.7.1 of the PDD respectively.
Furthermore, the methodological approach for determining such project emissions is not correctly presented in Section B.6.1 of the PDD either.

Parameter Checklist	Yes / No

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

Parameter	$EF_{grid,BM,y}$
Title in line with methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description of parameter?	Yes
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	n.a.
If monitored, is the estimation reasonable?	No

The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.7.1.

CAR 16 (2013-06-24):

While the DNA of Brazil has made available more recent data and calculation results for the values of Operation Margin CO_2 emission factor ($EF_{grid,OM,y}$) and Build Margin CO_2 emission factor ($EF_{grid,BM,y}$) (data and calculations valid for year 2012), the project participant manifested its interest on applying more recent data in the context of ex-ante estimates of emission reduction to be achieved by the project activity along the 7-year renewable crediting period. Such more recent data is however not consistently referred in all sections of the PDD and not consistently applied in the context of ex-

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.

ante estimates of emission reductions either.

Parameter Checklist	Yes / No
Parameter	$EC_{PJ,grid,y}$
Title in line with methodology?	No
Data unit correctly expressed?	Yes
Appropriate description of parameter?	No
If ex-ante determined, are data sources and assumptions appropriate and calculations correct?	n.a.
If monitored, is the estimation reasonable?	Yes

The PDD version 5 has been crosschecked with the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption." The parameter has been indicated in Section B.7.1.

CAR 3 (2013-01-13):
The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.
The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters "Efficiency of

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		the LFG capture system that will be installed in the project activity", "Average technical transmissions and distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either. **Furthermore, the units or descriptions for the ex-post parameters "Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)", "Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis", "Mass flow of LFG in time interval t on a dry basis", "Volumetric flow of LFG stream in time interval *t* on a wet basis", "Volumetric flow of LFG stream in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis", "Amount of electricity consumed by the project activity year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.**		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
8.4. In case the methodology provides the selection of different options for equations or parameters, has an adequate justification been provided and were the correct equations and parameters used in accordance with the methodology?	VVS 97	See 8.1.	OK	OK
8.5. Are the formulae required for the determination of leakage emissions correctly presented, enabling a complete identification of parameter to be used and / or monitored?	VVS 98	See 8.1	OK	OK
8.6. Please review and recalculate any equations and indicate whether the calculations are correct. Please provide findings.	VVS 98	For equations used to calculate emission reductions see 8.1. **CAR 1 (2014-01-03):** **While the expected starting date for the crediting period was changed, the ex-ante estimates of emission reductions to be achieve by the project activity were not corrected by taking into consideration the new expected starting date of the crediting period.** **CAR 14 (2013-01-13):** **The ex-ante estimates of emission reductions to be achieved by the project activity were not calculated by applying correct and valid historical solid waste disposal data.**	~~CAR 1~~ ~~CAR 14~~	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
9. ADDITIONALITY OF TH PROJECT ACTIVITY				
9.1. If required by methodology, check whether the latest version of the additionality tool is applied and confirm whether all steps are correctly applied (onwards from Step 2/3; step 1 see section 7).	VVS 103	The PDD version 5 applies the same version of the additionality tool as the methodology ACM0001 (version 13), which refers to the "Combined tool to identify the baseline scenario and demonstrate additionality" for identifying the baseline scenario and demonstrating additionality. Please refer to section 4.8 for assessment of steps taken to demonstrate additionality.	OK	OK
9.2. Please describe how the reliability and credibility of all data, rationales, assumptions, justifications and documentation provided by the PP to support the demonstration of additionality is assessed and validated, e.g. using local knowledge, sectoral and financial expertise and considering other sources of information for cross checks.	VVS 102/ 103	Please refer to section 4.8 for assessment of steps taken to demonstrate additionality.	OK	OK
9.3. Are any tools and documents provided by the EB to demonstrate the additionality of the proposed CDM project activities relevant and have they been correctly considered and applied?	VVS 103	The PDD version 5 applies the same version of the additionality tool as the methodology ACM0001 (version 13), which refers to the "Combined tool to identify the baseline scenario and demonstrate additionality" for identifying the baseline scenario and demonstrating additionality.	OK	OK
9.4. Are any specific complementary or alternative requirements included in the approved CDM methodology and have they been correctly considered and applied? Please list and specify the findings.	VVS 103	Please refer to 9.3	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
9.5. ***Prior consideration of the clean development mechanisms***				
9.5.1. Is the start date of the project activity, reported in the PDD, in accordance with the latest version of the *"Glossary of CDM terms"*? http://cdm.unfccc.int/Reference/glossary.html	VVS 106	By means of interviews during on-site visit and visual inspection at the Canhanduba landfill. GLC identified that the implementation or construction or real action of the CDM project activity has not started yet. As per the PDD version 5, the project starting date is planned to occur after 2014-04-01.	OK	OK
9.5.2. Is the project activity, in accordance with the guidance from the EB, a new project activity (project activities with start date at or after 02 August 2008) or an existing project activity (project activities with starting date before 02 August 2008)?	VVS 106	By means of visual inspection during on-site visit, GLC confirms that the project start date is after 2008-08-02. **CAR 1 (2014-01-03):** **While the expected starting date for the crediting period was changed, the ex-ante estimates of emission reductions to be achieve by the project activity were not corrected by taking into consideration the new expected starting date of the crediting period.**	~~CAR 1~~	OK
9.5.3. In case there is a new project activity (start date at or after 02 August 2008) and for which PDD has not been published for global stakeholder consultation or a new methodology is proposed to the EB before the project activity start date, please ensure by means of confirmation from the UNFCCC secretariat that the PP had informed the host Party DNA and the UNFCCC secretariat by submitting the standardized form F-CDM-prior consideration within 6 months of project start date.	VVS 107	The prior consideration has been published on the UNFCCC website on 2012-10-15. This date could be confirmed by means of crosschecking with the website (http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html). Further as per PDD version 5 the prior consideration has been sent to the host Party DNA on 2012-10-15. Thus GLC confirms that the PP had informed the UNFCCC secretariat and host Party DNA by submitting the standardized form F-CDM-prior consideration within 6	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		months of project start date.		
9.5.4. If there is an existing project activity (project activities with start date before 02 August 2008) for which the start date is prior to the date of publication of the PDD for global stakeholder consultation please verify through document review that PP's prior consideration: Please assess the fulfilment of following requirements: ➢ Awareness of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project. Evidence to support this could include, inter alia, minutes and/or notes related to the consideration of the decision by the Board of Directors, or equivalent, of the project participants, to undertake the project as a proposed project activity. ➢ Demonstration that real and continuing actions were taken to secure CDM status for the project in parallel with its implementation. Evidence to support this could include one or more of the following: contracts with consultants for CDM/PDD/methodology services, draft versions of PDDs and underlying documents such as letters of authorization, and if available, letter of intent, emission reduction purchase agreements(ERPA) term sheets, ERPAs or other documentation related to the potential sale of the certified emission reductions (CERs) (including correspondence with multilateral financial institutions or carbon funds),	VVS 108	The project start date is after 2008-08-02. Not applicable.	n/a	n/a

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
evidence of agreements or negotiations with a DOE for validation services, submission of a new methodology or requests for clarification or revision of existing methodologies to the Board, publication in a newspaper, interviews with the DNA, and earlier correspondence on the project with the DNA or the secretariat.				
9.6. ***Identification of alternatives***				
9.6.1. Does the PDD identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the applied approved methodology prescribes the baseline scenario and no further analysis is required?	VVS 113	Please refer to 7.1.	OK	OK
9.6.2. Does the list of alternatives given in the PDD ensures that: ➢ The list of alternatives includes as one of the options that the project activity is undertaken without being registered as a proposed CDM project activity? ➢ The list contains all plausible alternatives which can be considered to be viable means of supplying the outputs or services that are to be supplied by the proposed CDM project activity? ➢ The alternatives comply with all applicable and enforced legislation?	VVS 114	Please refer to 7.1. **CAR 8 (2013-01-13):** **The application of the stepwise approach for the determination of baseline scenario and demonstration of additionality for the project activity is not sufficiently clear in the specific context of application of STEP 2 (barrier analysis).**	~~CAR 8~~	OK
9.6.3. In case the PDD argues that specific laws are not enforced in the country or region: Is evidence available concerning that statement?	VVS 114	Please refer to 7.1.	OK	OK
9.7. ***Investment Analysis***				

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
9.7.1. Has the investment analysis been used to demonstrate the additionality of the proposed CDM project?	VVS 117	Yes, investment analysis has been used to demonstrate additionality and the approach of proving that the proposed "CDM project activity would not be the most economically or financially attractive alternative" has been used.	OK	OK
9.7.2. Which approach is chosen for investment analysis of the proposed CDM project activity and is it appropriate? a. The proposed CDM project activity would produce no financial or economic benefits other than CDM-related income, and there is at least one alternative which is less costly than the proposed CDM project activity (simple cost analysis); b. The proposed CDM project activity is less economically or financially attractive than at least one other credible and realistic alternative (comparison analysis); c. The financial returns of the proposed CDM project activity would be insufficient to justify the required investment (benchmark analysis).	VVS 119	As per PDD version 5 Section B.5 approach a. was chosen. This approach is deemed appropriate due to following reasons: • the project activity would produce no financial or economic benefits other than CDM-related income (other than revenues from electricity generation) • there is at least one alternative which is less costly than the proposed CDM project activity (continuation of current situation (i.e. atmospheric release of the landfill gas)).	OK	OK
9.7.3. Is an Excel file with detailed calculation of investment analysis indicators available? Are all formulas used in the analysis readable and all relevant cells viewable and unprotected?		An IRR calculation sheet has been provided by the PP. Formulas used are readable and all relevant cells are viewable and unprotected. **CAR 1 (2014-01-03):** **While the expected starting date for the crediting period was changed, the ex-ante estimates of emission**	~~CAR 1~~ ~~CAR 14~~	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		reductions to be achieve by the project activity were not corrected by taking into consideration the new expected starting date of the crediting period. **CAR 14 (2013-01-13):** **The ex-ante estimates of emission reductions to be achieved by the project activity were not calculated by applying correct and valid historical solid waste disposal data.**		
9.7.4. Verify the accuracy of financial calculations carried out for any investment analysis by: ➢ Determine the suitability of the financial indicator selected by the project participants and conduct a thorough assessment of all parameters and assumptions used in calculating such financial indicators, and determine the accuracy and suitability of these parameters using available evidence and applying its expertise in relevant accounting practices; ➢ Cross-check the parameters against third-party or publicly available sources, such as invoices or price indices; ➢ Review, as appropriate, feasibility reports, public announcements and annual financial reports related to the proposed project activity and the project participants;	VVS 120	Please see 9.7.3.	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
➢ Assess the correctness of computations carried out and documented by the project participants; and ➢ Assess, where applicable, the sensitivity analysis by the project participants to determine under what conditions variations in the result would occur, and the likelihood of these conditions.				
9.7.5. In cases where the PPs rely on values from Feasibility Study Reports (FSR) that are approved by national authorities for proposed project activities, describe the means to validate the following requirements: ➢ The FSR is the basis of the decision to proceed with the investment in the project, i.e. that the period of time between the finalization of the FSR and the investment decision is sufficiently short for please confirm that it is unlikely in the context of the underlying project activity that the input values would have materially changed; ➢ The values used in the PDD and associated annexes are fully consistent with the FSR, and where inconsistencies occur please validate the appropriateness of the values; ➢ The input values from the FSR are valid and applicable at the time of investment decision. The DOE shall confirm this on the basis of its specific local and sectoral expertise and by cross-checking or other appropriate means.	VVS 122	The PP does not rely on values from a FSR.	OK	OK
9.7.6. Please confirm the suitability of any benchmark applied	VVS	As per PDD version 5 the NPV has been chosen as	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
in the investment analysis: (a) Determine whether the type of benchmark applied is suitable for the type of financial indicator presented; (b) Ensure that any risk premiums applied in determining the benchmark reflect the risks associated with the project type or activity; (c) Determine whether it is reasonable to assume that no investment would be made at a rate of return lower than the benchmark. Are the type of benchmark (if applicable) chosen (local commercial lending rates or weighted average costs of capital for project IRR; required/expected returns on equity for equity IRR) and the type of financial indicator calculated (e.g. project IRR, equity IRR, etc.) suitable to each other?	121	financial indicator. As a discount rate the default value for return on equity as per the Appendix to EB 62 Annex 5 has been chosen. GLC has identified this approach as appropriate.		
9.7.7. In case the project activity could also be developed by an entity other than the PP, is the benchmark based on publicly available data sources which can be clearly validated? *(Such data sources may include local lending and borrowing rates ,equity indices, or benchmarks determined by relevant national authorities. The DOE's validation of such benchmarks shall also include its opinion of the suitability of the benchmark applied in the context of the underlying project activity)*		For this project activity the benchmark refers to the discount rate i used in the calculation of NPV as follows: $NPV = \sum_t [CF_t/(1+i)^t] - Inv.$ Where: NPV = Net present value CF_t = Project Free Cashflow in time period t i = discount rate Inv.= total investment in year 0 t = time period t with (t=1,…,n) (Source: Titman Sheridan and Martin John D "Valuation – the art & science of corporate investment decisions"	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		(2007), Boston, MA) GLC identified that the project could be developed by an entity other than the PP and therefore parameters that are standard in the market shall be used for determining the discount rate.		
9.7.8. In cases that internal company benchmarks/expected returns are applied, is it verified that there is only one possible project developer and, either the internal company benchmarks/expected returns have been used for similar projects with similar risks developed by the same company or, if the company is brand new, have been used for similar projects in the same sector in the country/region?		The benchmark analysis is based on parameters that are standard in the market. No internal benchmarks will be applied because the project could be developed by an entity other than the PP. Thus this question is not applicable.	OK	OK
9.7.9. Are the risk premiums applied in determining the benchmark reflect the risks associated with the project type or activity?		No risk premiums have been applied because the discount rate has been determined by means of using the default value for return on equity as per the Appendix to EB 62 Annex 5.	OK	OK
9.7.10. Is it reasonable to assume that no investment would be made at a rate of return lower than the benchmark?		Other registered CDM landfill gas to energy projects in Brazil, their benchmarks and IRRs have been assessed: 1. Brazil NovaGerar Landfill Gas to Energy Project (UNFCCC project no 0008 http://cdm.unfccc.int/Projects/DB/DNV-CUK1095236970.6/view?cp=1 Brazilian interest rate for government bonds for 2002: 22% ; IRR < 0% 2. Bandeirantes Landfill Gas to Energy Project – (BLFGE) (UNFCCC project no 0164	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		http://cdm.unfccc.int/Projects/DB/DNV-CUK1134130255.56/view) Brazilian interest rate for government bonds (SELIC) for Dec. 2003 = 23.3% ; IRR = 15.6% 3. São João Landfill Gas to Energy Project (SJ)" (UNFCCC project no 0373 http://cdm.unfccc.int/Projects/DB/DNV-CUK1145141778.29/view) Brazilian interest rate for government bonds (SELIC) for 2003 = 23.29% ; IRR = 13.8% 4. Feira de Santana Landfill Gas Project (UNFCCC project no 1626 http://cdm.unfccc.int/Projects/DB/DNV-CUK1203743009.45/view) Discount rate (SELIC 2007: 11.5% adjusted for inflation): 10% ; IRR < 0% 5. Exploitation of the biogas from Controlled Landfill in Solid Waste Management Central – CTRS / BR.040 (UNFCCC project no 3464 http://cdm.unfccc.int/Projects/DB/SGS-UKL1267696608.78/view) Brazilian interest rate for government bonds (SELIC) for 2008: 12.43% ; IRR = -12.5% By means of background research GLC identified that currently there are only three large LFG projects in Brazil where LFG is used as fuel for electricity generation, i.e. UNFCCC project no. 0008, 0164 and 0373. It should be noted that these projects were registered as CDM project in 2004 (project no. 0008) and 2006 (project no. 0164 and		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		0373) respectively. Due to the change of financial indicators in emerging economies, GLC identified that the discount rate applied for this project is not suitable to be compared to other registered projects in Brazil using benchmark analysis to demonstrate additionality. Based on financial expertise and local and sectoral knowledge, GLC identified that the default value for the return on equity as per the Appendix to EB 62 Annex 5, i.e. 11.75% in real terms (for Brazil for Group 1 "Waste handling and disposal" projects) and, since the investment analysis is carried out in nominal terms. converted to nominal terms as per the "Guidelines on the assessment of investment analysis" (version 5): "In situations where an investment analysis is carried out in nominal terms, project participant can convert the real term values provided (…) to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period. If this information is not available, the target inflation rate of the central bank shall be used. If this information is also not available, then the average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) or the World Bank for the next five years after the start of the project activity shall be used." As the inflation forecast and target inflation rate from the Brazilian Central Bank is only available until 2014, project participant choose the average forecasted inflation rate for the host country		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		published by the IMF (International Monetary Fund World Economic Outlook) from 2013 to 2017, the value of 16.40 % is obtained and GLC has find that the value can be considered conservative.		
9.7.11. If a fair value for the project assets in the end of the assessment period is included, assess whether it is calculated in accordance with the local accounting regulations where available or international best practice.	EB 62 Annex 5	By means of visual inspection during on-site visit GLC confirms that no equipment has been installed which will be used for the project activity. Therefore this question is not applicable.	OK	OK
9.7.12. Does the financial indicator calculation include adding back of the depreciation and other non-cash related items to taxable profits?	EB 62 Annex 5	The NPV has been calculated in line with EB 62 Annex 5. Depreciation has been subtracted from EBITDA so that tax can be calculated on that. Depreciation has been added back to net profits.	OK	OK
9.7.13. In case of project activities for which implementation ceases after the commencement and where implementation is recommenced due to consideration of the CDM, does the investment analysis reflect the economic decision making context at point of the decision to recommence the project?	EB 62 Annex 5	By means of visual inspection and interviews during on-site visit, GLC identified that the implementation of the project activity did not start yet. Therefore this question is not applicable.	n/a	n/a
9.7.14. If project IRR is chosen: Are the costs of financing expenditures (loan repayments and interests) excluded from the calculation of project IRR?	EB 62 Annex 5	By means of checking IRR Excel sheet and by means of interviews during on-site visit, GLC identified that the project is financed by equity. No loan repayments or interests have therefore been included in the calculation of NPV.	OK	OK
9.7.15. If project IRR is chosen and a post-tax benchmark is	EB 62	Please refer to 9.7.14. not applicable.	n/a	n/a

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
applied, is the actual interest payable taken into account in the calculation of income tax, with an reasonable interest rate?	Annex 5			
9.7.16. If equity IRR is chosen: Is the part of the investment costs which is financed by equity considered as net cash outflow? Is the part of investment costs which is financed by debt excluded in net cash outflow?	EB 62 Annex 5	Please refer to 9.7.14. not applicable.	n/a	n/a
9.7.17. Are the results of variation of variables that constitute more than 20% of either total project costs or total project revenues clearly presented in PDD and reproducible with spreadsheet? Are the ranges of variation (eg. 10%) deemed appropriate in the context of the specific project circumstances?	EB 62 Annex 5	The sensitivity analysis has been provided in Section B.5 of PDD version 5. The PP has demonstrated the level of NPV in case the viable de- or increases by 10%. GLC identified that this approach is in line with EB 62 Annex 5 para 21. Further the PP showed how much the variable must increase or decrease so that the NPV turns zero. GLC confirms that the results of variation of variables that constitute more than 20% of either total project costs or total project revenues have been clearly presented in the PDD.	OK	OK
9.8. ***Barrier Analysis***				
9.8.1. Has the barrier analysis been used to demonstrate the additionality of the proposed CDM project?	VVS 124	Yes, Please refer to Section B.5 of the PDD. **CAR 8 (2013-01-13):** **The application of the stepwise approach for the determination of baseline scenario and demonstration of additionality for the project activity is not sufficiently clear in the specific context of application of STEP 2 (barrier analysis).**	~~CAR 8~~	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
9.8.2. Does any issue considered in the barrier analysis have a clear direct impact on the financial returns of the project activity and thus shall be assessed by investment analysis?	VVS 125	As per PDD version 5, no barriers were found in the barrier analysis.	OK	OK
9.8.3. To assess the barrier analysis apply the following two-step process: *a.* Please assess whether the barriers are real: Please assess the available evidence and/or undertake interviews with relevant individuals (including members of industry associations, government officials or local experts if necessary) to determine whether the barriers listed in the PDD exist. b. Do the barriers prevent the implementation of the project activity but not the implementation of at least one of the possible alternatives?	VVS 126	As per PDD version 5, no barriers were found in the barrier analysis.	OK	OK
9.8.4. Is it sufficiently demonstrated that CDM alleviates the identified barriers that prevent the proposed project activity from occurring?		As per PDD version 5, no barriers were found in the barrier analysis.	OK	OK
9.9. ***Common Practise Analysis***				
9.9.1. Is common practice required by the methodology applied by the proposed project activity to demonstrate additionality?	VVS 128	Yes, the common practice analysis is required by the methodology ACM0001 (version 13). Information provided in the PDD version 5 is sufficient to demonstrate the project is not regarded as common practice	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
9.9.2. Is the proposed project activity first-of-its-kind? If so, please specify how this statement is substantiated.	VVS 128	No, it is not first-of-its kind.	n/a	n/a
9.9.3. In case the project activity is not first of its kind, is the geographical scope (e.g. the defined region) of the common practice analysis appropriate for the assessment of common practise related to the project activity's technology or industry type? Please consider that for certain technologies the relevant region for assessment will be local and for others it may be transnational / global. If a region other than the entire host country is chosen, please assess the explanation why this region is more appropriate.	VVS 129 a	As per PDD version 5 the PP chose "Brazil" as geographical scope. As per EB 63 Annex 12 the geographical scope is the host country by default. GLC identified that Brazil is the correct geographical scope for the common practise analysis.	OK	OK
9.9.4. Was an assessment concerning the existence of other similar projects undertaken? Does this include official sources and was local and industry expertise used to determine to what extent similar and operational projects (e.g., using similar technology or practice), other than CDM project activities, exist in the defined region?	VVS 129 b	As per assessment of evidences sourced in the PDD version 5 and by means of local and sectoral knowledge, GLC identified and confirmed that all landfills in Brazil with collection, destruction system (active system) and also with use of LFG as fuel for electricity generation are implemented projects under the CDM. Thus GLC identified that this project activity is not common practise.	OK	OK
9.9.5. If similar and operational projects, other than CDM project activities, are already "widely observed and commonly carried out" in the defined region, what are essential distinctions between the proposed CDM project activity and the other similar activities? *Please specify how the essential distinctions between*	VVS 129 c	Please refer to 9.9.4.	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
the proposed CDM project activity and any similar projects that are widely observed and commonly carried out were assessed)				
10. MONITORING PLAN				
10.1. Does the PDD include a monitoring plan?	VVS 131	Yes, as per PDD version 5 a monitoring plan has been included in the documentation. During on-site visit it was further crosschecked whether the PP has a clear understanding of how monitoring and operation of the CDM project will take place. It was identified that in general the monitoring plan is based on the monitoring methodology. This has been further assessed in 10.2.	OK	OK
10.2. Does the monitoring plan comply with the approved methodology?	VVS 132 a	By means of comparing the PDD version 5 with the methodology ACM0001 (version 13) and applicable tools, GLC confirmed that the monitoring plan of the PDD version 5 is in accordance with the approved methodology. **CAR 3 (2013-01-13):** **The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.** **The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters "Efficiency of the LFG capture system that will be installed in the project activity", "Average technical transmissions and**	~~CAR 3~~ ~~CAR 4~~ ~~CAR 9~~	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either. Furthermore, the units or descriptions for the ex-post parameters "Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)", "Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis", "Mass flow of LFG in time interval t on a dry basis", "Volumetric flow of LFG stream in time interval *t* on a wet basis", "Volumetric flow of LFG stream in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis", "Amount of electricity consumed by the project activity year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		CAR 4 (2013-01-13): **The content of the table presented in Section B.7.3. is not completely in accordance with the information presented in Section B.7.1. nor the provisions of the related methodological tools. The referred units, symbols and/or descriptions do not match with information presented previously. Furthermore, as required by ACM0001 (version 13), monitoring details for the ex-post parameter "Management of SWDS" is missing in Section B.7.3.** **CAR 9 (2013-01-13):** **Details for the ex-ante determined parameter Molecular mass of gas *i* (MM_i) are not presented in Section B.6.2 as required by the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0).** **Furthermore, the selected applicable values for the considered solid waste types are not appropriately identified as part of the details for the ex-ante determined parameter Decay rate for the waste type *j* (k_j).** **Moreover, applied measurement methods and procedures applicable for the monitoring parameter**		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		"Operation of the equipment that consumes the LFG" (as presented in Section B.7.1) are not in accordance with the project design.		
10.3. Are the monitoring arrangements described in the monitoring plan feasible within the project design?	VVS 132 b	The monitoring plan as described in the PDD version 5 is feasible with all characteristics of the project design. **CAR 3 (2013-01-13):** **The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological tool.** **The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters "Efficiency of the LFG capture system that will be installed in the project activity", "Average technical transmissions and distribution losses for providing electricity to the grid", "Weighting of operating margin emissions factor", "Fraction of methane in the SWDS gas (volume fraction)", "Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.**	~~CAR 3~~ ~~CAR 4~~ ~~CAR 9~~	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		Furthermore, the units or descriptions for the ex-post parameters "Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)", "Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis", "Mass flow of LFG in time interval t on a dry basis", "Volumetric flow of LFG stream in time interval *t* on a wet basis", "Volumetric flow of LFG stream in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis", "Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis", "Amount of electricity consumed by the project activity year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either. **CAR 4 (2013-01-13):** **The content of the table presented in Section B.7.3. is not completely in accordance with the information presented in Section B.7.1. nor the provisions of the related methodological tools. The referred units, symbols and/or descriptions do not match with information presented previously. Furthermore, as required by ACM0001 (version 13), monitoring details**		

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
		for the ex-post parameter "Management of SWDS" is missing in Section B.7.3. **CAR 9 (2013-01-13):** **Details for the ex-ante determined parameter Molecular mass of gas *i* (MM_i) are not presented in Section B.6.2 as required by the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0).** **Furthermore, the selected applicable values for the considered solid waste types are not appropriately identified as part of the details for the ex-ante determined parameter Decay rate for the waste type *j* (k_j).** **Moreover, applied measurement methods and procedures applicable for the monitoring parameter "Operation of the equipment that consumes the LFG" (as presented in Section B.7.1) are not in accordance with the project design.**		
10.4. Are the means of implementation of the monitoring plan, including the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved	VVS 132 b	Yes. As per the PDD version 5, all monitored parameters will be measured by an appropriate instrument, and all electronically recorded data will be handled by an	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
by/resulting from the proposed CDM project activity can be reported ex post and verified?		appropriate data logger / data acquisition system.		
11. LOCAL STAKEHOLDER CONSULTATION				
11.1. Were relevant stakeholders invited by the PPs to comment on the proposed CDM project activity prior to the publication of the PDD on the UNFCCC website?	VVS 138	In accordance to Ruling nº.1 and Ruling nº7, of the Inter-ministerial Commission on Global Climate Change (CIMGC), project participant shall send letters to local stakeholder inviting for comments at least 15 days prior start of Global Stakeholder Consultation (GSC). While GSC started on 2012-11-23, GLC confirms that all required parties have been informed about the project activity duly.	OK	OK
11.2. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?		GLC's validation team assessed the letters sent to the local stakeholders dated 2012-10-30 and identified that all stakeholder have been informed within 15 days prior start of GSC. The letters were sent in Portuguese and contained the name and type of proposed CDM project activity. Further the description of the project's contribution to sustainable development was also made available as required. The PDD has been published on the website www.unicarbo.com.br/projetos which has been verified by GLC's validation team. No comments were received. GLC confirms that the local stakeholder process has been carried out adequately and the letters are deemed credible.	OK	OK
11.3. Have appropriate media been used to invite comments by local stakeholders?	VVS 140	Yes. See 11.2	OK	OK
11.4. Is the summary of the received comments complete? *(Please specify how this requirement was verified)*	VVS 139	No comments were received.	OK	OK

QUESTION / REQUIREMENT	Source	MEANS AND FINDING OF VALIDATION	Draft Concl.	Final Concl.
11.5. Have the PPs taken due account of any comments received and have they described this process in the PDD?	VVS 139	No comments were received.	OK	OK
12. ENVIRONMENTAL IMPACTS				
12.1. Have the PPs submitted an analysis of environmental impacts of the project activity? Is such an Environmental Impact Assessment (EIA) mandatory by national legislation?	VVS 134, 135	No EIA has been submitted to GLC. As per PDD version 5 and by means of local and sectoral knowledge, GLC confirmed that and EIA is not required for this project activity.	OK	OK
12.2. Were transboundary environmental impacts identified in the analysis?	VVS 134	Since no EIA has been submitted, this question cannot be answered at this stage.	OK	OK
12.3. Are those impacts considered significant by the project participants or the host Party?	VVS 134	Since no EIA has been submitted, this question cannot be answered at this stage.	OK	OK
12.4. Have the identified environmental impacts been addressed in the project design sufficiently?	VVS 134	Since no EIA has been submitted, this question cannot be answered at this stage	OK	OK
12.5. Does the project comply with environmental legislation in the host country?	VVS 135	Yes. GLC was able to confirm through assessment of the operation license for the landfill that the project activity complies with all regional and specific requirements for this landfill.	OK	OK

Resolution of Corrective Action and Clarification Requests including list of Forward Action Requests

Description of Finding (CAR, CL, FAR)	Summary of the Project Participants Response	GLC's Assessment	Final Conclusion (OK or OPEN)
CAR 1 (2014-01-03): While the expected starting date for the crediting period was changed, the ex-ante estimates of emission reductions to be achieve by the project activity were not corrected by taking into consideration the new expected starting date of the crediting period.	**2014-01-06 (1st round):** As a response to the raised CAR, the ex-ante estimates of emission reductions to be achieve by the project activity were revised by taking into consideration the new expected starting date of the crediting period.	**2014-01-06 (1st round):** OK. As confirmed by the GLC's validation team, the ex-ante estimates of emission reductions to be achieve by the project activity were revised by correctly taking into consideration the new expected starting date of the crediting period. This CAR is closed.	OK
CAR 2 (2013-01-13): According to the Section "Global Warming Potential for Given Time Horizon" in table 2.14 of the errata to the contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (based on the effects of greenhouse gases over a 100-year time horizon) the applicable value of Global Warming Potential (GWP) for the GHG methane (CH_4) is different than the value reported in the PDD.	**2013-02-01 (1st round):** As a response to the raised CAR, project participant corrected the GWP value to 25 in the revised version of the PDD.	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that all changes in the PDD related to the new corrected value of GWP of methane is deemed acceptable and correct. Moreover, revised calculations (by taking into account the revised value of GWP of methane) are also correct. This CAR is closed.	OK
CAR 3 (2013-01-13): The symbol for the ex-post parameter "flare efficiency in minute *m*" as presented in some sections of the PDD is not in accordance with its respective methodological	**2013-02-01 (1st round):** As a response to the raised CAR, project participant corrected the symbol for the flare efficiency, as well as the symbols for the ex-ante determined parameters	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that provided corrections included in the latest version of the PDD are appropriate. This CAR is	OK

tool. The symbols for the ex-ante determined parameters "Global warming potential of CH4" and units or descriptions for the ex-ante parameters “Efficiency of the LFG capture system that will be installed in the project activity”, “Average technical transmissions and distribution losses for providing electricity to the grid”, “Weighting of operating margin emissions factor”, “Fraction of methane in the SWDS gas (volume fraction)”, “Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS”, as presented in some sections of the PDD, are not in accordance with its respective methodological tools either. Furthermore, the units or descriptions for the ex-post parameters “Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas)”, “Volumetric flow of the gaseous stream *j* in time interval *t* on a dry basis”, “Mass flow of LFG in time interval t on a dry basis”, “Volumetric flow of LFG stream in time interval *t* on a wet basis”, “Volumetric flow of LFG stream in time interval *t* on a dry basis”, “Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis”, “Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis”, “Amount of electricity consumed by the project activity	"Global warming potential of CH4" and units or descriptions for the ex-ante parameters “Efficiency of the LFG capture system that will be installed in the project activity”, “Average technical transmissions and distribution losses for providing electricity to the grid”, “Weighting of operating margin emissions factor”, “Fraction of methane in the SWDS gas (volume fraction)”, “Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS”, in the revised version of the PDD. Furthermore, the units or descriptions for the ex-post parameters “Mass flow of LFG in time interval t on a dry basis”, “Volumetric flow of LFG stream in time interval *t* on a wet basis”, “Volumetric flow of LFG stream in time interval *t* on a dry basis”, “Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis”, “Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis”, “Amount of electricity consumed by the project activity year *y*” were also corrected in the revised version of the PDD.	closed.	

year *y*", as presented in some sections of the PDD, are not in accordance with its respective methodological tools either.			
CAR 4 (2013-01-13): The content of the table presented in Section B.7.3. is not completely in accordance with the information presented in Section B.7.1. nor the provisions of the related methodological tools. The referred units, symbols and/or descriptions do not match with information presented previously. Furthermore, as required by ACM0001 (version 13), monitoring details for the ex-post parameter "Management of SWDS" is missing in Section B.7.3.	**2013-02-01 (1st round):** As a response to the raised CAR, related information was corrected in Section B.7.3 in the revised version of the PDD.	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that related information in Section B.7.3 in the revised version of the PDD was appropriately corrected. This CAR is closed.	OK
CAR 5 (2013-01-13): The PDD includes several typo and syntax mistakes in texts and description of parameters.	**2013-02-01 (1st round):** As a response to the raised CAR, all identified typo and syntax mistakes were corrected in different sections of the revised version of the PDD.	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that all identified typo and syntax mistakes were appropriately corrected. This CAR is closed.	OK

CAR 6 (2013-01-13): In Section A.1 of the PDD, the landfill name is wrongly indicated as Canhanduba landfill.	**2013-02-01 (1st round):** As a response to the raised CAR, the name of the landfill where the project activity is to be implemented was corrected in the revised version of the PDD.	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that related information in Section A.1 in the revised version of the PDD was appropriately corrected. This CAR is closed.	OK
CAR 7 (2013-01-13): As part of the assessment, a completed Modalities of Communication (MoC) form is required to be made available and assessed by the GLC's validation team.	**2013-02-01 (1st round):** As a response to the raised CAR, a completed MoC form was made available to the GLC's validation team.	**2013-03-04 (1st round):** OK. As an outcome of its assessment of the received completed MoC form, the GLC's validation team confirmed that this form was correctly completed. This CAR is closed.	OK
CAR 8 (2013-01-13): The application of the stepwise approach for the determination of baseline scenario and demonstration of additionality for the project activity is not sufficiently clear in the specific context of application of STEP 2 (barrier analysis).	**2013-02-01 (1st round):** As a response to the raised CAR, the whole application of the stepwise approach for the determination of baseline scenario and demonstration of additionality for the project activity was revised (including the application of STEP 2 (barrier analysis)).	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that the application of the stepwise approach for the determination of baseline scenario and demonstration of additionality for the project activity is sufficiently clear and correct in the revised version of the PDD. This CAR is closed.	OK

CAR 9 (2013-01-13): Details for the ex-ante determined parameter Molecular mass of gas *i* (MM_i) are not presented in Section B.6.2 as required by the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0). Furthermore, the selected applicable values for the considered solid waste types are not appropriately identified as part of the details for the ex-ante determined parameter Decay rate for the waste type *j* (k_j). Moreover, applied measurement methods and procedures applicable for the monitoring parameter "Operation of the equipment that consumes the LFG" (as presented in Section B.7.1) are not in accordance with the project design.	**2013-02-01 (1st round):** As a response to the raised CAR, related information was corrected in Sections B.6.2 and B.7.1 of the revised version of the PDD.	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that related information was appropriately corrected in Section B.6.2 and B.7.1 of the revised version of the PDD. This CAR is closed.	OK
CAR 10 (2013-01-13): Details about application of Step 3: "Calculation of project emissions from flaring" of the methodological tool "Project emissions from flaring" is missing in the context of the determination of project emissions from flaring ($PE_{flare,y}$).	**2013-02-01 (1st round):** As a response to the raised CAR, previously missing details for the determination of project emissions from flaring were added in the revised version of the PDD.	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that previously missing information was appropriately added in Section B.6.1 of the revised version of the PDD. This CAR is closed.	OK

CAR 11 (2013-01-13): References about the methodological tool "Project emissions from flaring" (version 02.0.0) are wrongly indicated. This tool is wrongly indicated as being released/published in the EB67 CDM-EB meeting.	**2013-02-01 (1st round):** As a response to the raised CAR, correct references to the methodological tool "Project emissions from flaring" (version 02.0.0) were added in the revised version of the PDD. This tool is correctly presented as being published in the EB68 CDM-EB meeting.	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that related information was appropriately corrected in the revised version of the PDD. This CAR is closed. .	OK
CAR 12 (2013-01-13): Details about both ex-ante determined parameters and parameters which are monitored ex-post which are required for the determination of project emissions due to consumption of electricity sourced by a captive off-grid electricity generator which fuelled by fossil fuel (Diesel) ($PE_{EC,captive,y}$) are not correctly presented in Sections B.6.2 and B.7.1 of the PDD respectively. Furthermore, the methodological approach for determining such project emissions is not correctly presented in Section B.6.1 of the PDD either.	**2013-02-01 (1st round):** As a response to the raised CAR, related information was corrected in Sections B.6.1, B.6.2 and B.7.1 of the revised version of the PDD.)	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that related information was appropriately corrected in Sections B.6.1, B.6.2 and B.7.1 of the revised version of the PDD. This CAR is closed.	OK
CAR 13 (2013-01-13): The schematic diagram of the project activity as presented in Section B.3 of the PDD is sufficiently clear.	**2013-02-01 (1st round):** As a response to the raised CAR, the related schematic diagram was corrected.	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that related information was appropriately corrected in Sections B.3 of the revised version of the PDD. This CAR is closed.	OK

CAR 14 (2013-01-13): The ex-ante estimates of emission reductions to be achieved by the project activity were not calculated by applying correct and valid historical solid waste disposal data.	**2013-02-01 (1st round):** As a response to the raised CAR, ex-ante estimates of emission reductions to be achieved by the project activity were re-calculated by applying correct and valid historical solid waste disposal data.	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that revised calculations (as presented in the revised version of the emission reduction calculation spreadsheet). The revised ex-ante estimates of emission reductions to be achieved by the project activity are also correctly reported in the revised version of the PDD. This CAR is closed.	OK
CAR 15 (2013-01-13): Based on assessment of information made available in Sections B.7.1 and B.7.2. of the PDD, the GLC's validation team confirmed that the monitoring requirements for the applied methodological approach for determining the flare efficiency (as per Option B.1 of the methodological tool "Project emissions from flaring" (version 02.0.0) are not appropriately considered in the design of the project's monitoring plan. Furthermore, the description of the flare efficiency determination approach, as presented in Section B.6.1, is not fully in accordance with related provisions of the methodological tool "Project emissions from flaring" (version 02.0.0) either.	**2013-02-01 (1st round):** As a response to the raised CAR, information made available in Sections B.6.1, B.7.1 and B.7.2. of the PDD were revised in order to incorporate the applicable guidance and requirements of Option B.1 of the methodological tool "Project emissions from flaring" (version 02.0.0).	**2013-03-04 (1st round):** OK. It is the opinion of the GLC's validation team that related information was appropriately corrected in Sections B.6.1. B.7.1 and B.7.2 of the revised version of the PDD. This CAR is closed.	OK

CAR 16 (2013-06-24): While the DNA of Brazil has made available more recent data and calculation results for the values of Operation Margin CO_2 emission factor ($EF_{grid,OM,y}$) and Build Margin CO_2 emission factor ($EF_{grid,BM,y}$) (data and calculations valid for year 2012), the project participant manifested its interest on applying more recent data in the context of ex-ante estimates of emission reduction to be achieved by the project activity along the 7-year renewable crediting period. Such more recent data is however not consistently referred in all sections of the PDD and not consistently applied in the context of ex-ante estimates of emission reductions either.	**2013-07-25 (1st round):** As a response to the raised CAR, the PDD and emission reduction calculation spreadsheet were updated by applying and referring to the official value of the Combined margin CO_2 emission factor for the National Electricity Grid of Brazil (as calculated by the DNA of Brazil) valid for year 2012. All references to the vintage of used data were also corrected in the revised version of the PDD.	**2013-07-25 (1st round):** OK. It is the opinion of the GLC's validation team that related information and calculations were appropriately revised in both the PDD and emission reduction calculation spreadsheet with ex-ante estimates of emission reductions to be achieved by the project activity. This CAR is closed.	OK
CAR 17 (2013-06-24): Details about similar initiatives in Brazil promoting utilization of LFG as fuel for electricity generation and registered as CDM project activities is not correct.	**2013-07-25 (1st round):** As a response of the raised CAR, related information was corrected in the revised version of the PDD.	**2013-07-25 (1st round):** OK. It is the opinion of the GLC's validation team that related information was appropriately corrected in the revised version of the PDD. This CAR is closed.	OK
CAR 18 (2013-06-24): Project design information as made available in the PDD does not clearly describe how electricity demand of the project activity will be met.	**2013-07-25 (1st round):** As a response to the raised CAR, further details on how how electricity demand of the project activity will be met was added in the revised version of the PDD. As per the project design, while all net electricity to be generated by the project's electricity generation facility is expected to be exported to the grid, the electricity demand for the equipment consuming electricity other than the ones	**2013-07-25 (1st round):** OK. It is the opinion of the GLC's validation team that explanations provided by the project participant sufficiently clarify how electricity demand of the project activity will be met. Related information was appropriately improved in the revised version of the PDD. This CAR is closed.	OK

	which are part of the project's electricity generation facility (e.g. centrifugal blowers, control system, etc.) is expected to be entirely met by imports of grid electricity under normal circumstances. During eventual temporarily expected or unexpected interruptions of grid electricity supply, a backup captive off-grid electricity generator (fuelled by diesel) will be used to meet the project's electricty demand. Such off-grid captive electricity generator will be installed as part of the project activity and related project emissions will be accounted in the context of the determination of emission reductions to be achieved by the project activity.		
CAR 19 (2013-06-24): The PDD does not include information about the occurred public meeting with local stakeholder for presenting the project activity as required by the DNA of Brazil (as part of the process adopted by the project participant for applying for a Letter of Approval (LoA) within the DNA of Brazil).	**2013-07-25 (1st round):** As a response to the raised CAR, the project participant correctly amended the PDD with information about the occurred public meeting with local stakeholder for presenting the project activity as required by the DNA of Brazil.	**2013-07-25 (1st round):** OK. It is the opinion of the GLC's validation team that previously missing information was sufficiently added in the revised version of the PDD. As required by the DNA of Brazil, a copy of the original minutes of the occurred meeting in Brazilian Portuguese language (which was made available to the GLC's validation team) will be added in the Validation Report as an annex. Furthermore, texts of the minutes of meeting translated into English language will also be added in the Validation Report as an annex for sake of completeness and transparency. This CAR is closed. .	OK

ANNEX B: FINANCIAL PARAMETERS

Parameter	Value applied	Unit	Source	Source for crosscheck	Means and Finding of Validation
Time of investment decision	October 2012	-	/62/ , /63/	Interview with representative of the consultancy service company Unicarbo Energia e Biogás Ltda. (Mr. Nuno Barbosa)	The selected date of investment decision making is in line with the decision to apply for CDM registration for LFG project. The notification of prior consideration was submitted to both the DNA of Brazil and UNFCCC on 15 October 2012. The confirmation by the UNFCCC has been received and published in UNFCCC web site is dated 5 October 2012. The evidence is deemed credible. The time of investment decision making is confirmed to be October 2012. Furthermore, it is also confirmed that the financial input parameters for the NPV calculation are valid and applicable at time of investment decision making.
Nameplate installed capacity for the project's electricity generation component	3,180	kW	/64/	/65/ , /43/ , /2/	The assumed nameplate installed capacity for the project's electricity generation component (3,180 kW) is confirmed to be as per a technical and commercial proposal received from the company in charge of the supply and installation of the engine-generator sets Guascor S.A. /64/. The assumed nameplate installed capacity for the project's electricity generation component is based on following assumptions: • LFG generation (which is the only fuel to be consumed by the project's electricity generation facility) is estimated by applying the methodological guidance of the tool "Emissions from solid waste disposal sites." LFG generation is expected to range from 999 m³/h to 2,316 m³/h. The calculation of *ex-ante* determined LFG generation has been assessed and identified to be credible and in accordance with the applicable tool. • The efficiency of the LFG capture system that will be installed as part of the project activity (η_{PJ}) is estimated to be 92.80%. This value has been sourced from international literature /65/. By means of local and sectoral knowledge, the value is deemed appropriate for *ex-ante* estimation. • The Fraction of methane in the SWDS gas (volume fraction) has been estimated to be 50% (F). The value has been sourced from the methodological tool "Emissions from solid waste disposal sites". The value has been crosschecked with a study from the Inter-American Development Bank /43/ and is deemed appropriate.

Parameter	Value applied	Unit	Source	Source for crosscheck	Means and Finding of Validation
					• The standard electrical efficiency of the biogas engine has been estimated to be 39.40% (η_{elec}) . The value has been sourced from the technical specifications of the biogas engine supplier Guascor S.A. /64/. The source is deemed credible and reliable. • The net calorific value of methane has been estimated to be 50,400 kJ/kg (NCV_{CH4}). The value has been sourced from IPCC report 2006 Volume 2 Chapter 1 Table 1.2 /20/. GLC further identified that the value is in line with ACM0001 (version 13). • The density of methane has been estimated to be 0.7168 kg/m³ (φ_{CH4}). This value is in accordance with the methodological tool "Project emissions from flaring" Summarizing, the potential project's electricity generation capacity is calculated as follows: Electrical capacity (in kWe) = $LFG_{generated}$ /3600 * η_{PJ} * w_{CH4} * NCV_{CH4} * φ_{CH4} The calculation has been checked and identified to be correct and appropriate. The values range from 1,833 kWe to 4,249 kWe /2/. The installed capacity (3,180 kW) is thus deemed appropriate for this project activity. The value has been correctly indicated in the PDD (Section B.5) /1/ and in the investment analysis spreadsheet /2/.
Net annual electricity generation	14,469	MWh/yr	/64/	Values applied in other similar CDM Project activities: UNFCCC no. 0008 UNFCCC no. 0164 UNFCCC no. 0373 UNFCCC no. 1626	The average net electricity generation to be promoted by the project's electricity generation component ranges from 3,946 MWh – 15,785 MWh during the expected 20-year project's lifetime with an average net electricity generation of 14,469 MWh and a total net electricity generation of 101,283 MWh from year 2014 to 2021. The values have been calculated based on the installed capacity and generated LFG as follows: Net electricity generation = MIN (Electrical capacity, Installed capacity) * engines' availability * 365 * 24. The engine-generator sets' availability has been estimated to be 85%. The value has been sourced from the technical specifications of the biogas engine supplier Guascor S.A. /64/. Since project engineering and equipment are project specific, the applied 85% is deemed appropriate. Further the source for the 85% availability of the biogas engine /64/ is deemed reliable and credible. The calculation of net electricity generation has been checked and identified to be correct and appropriate.

Parameter	Value applied	Unit	Source	Source for crosscheck	Means and Finding of Validation
Electricity sale price	102.41	BRL/MWh	/64/	/67/ UNFCCC no. 1626 UNFCCC no. 3464	The electricity sale price has been estimated to be 102.41 BRL/MWh and the value is sourced from a press release from the Brazilian Ministry of Energy (EPE) /66/. The press release (Leilão de Energia A3/2011) has been published on 17.08.2011. The Ministry of Energy (EPE) released these prices based on a study on future electricity demand and supply in Brazil. The prices are valid for electricity supply from 3 years upon auction date (2011). Hence electricity is deemed to be delivered from 2014 onwards. According to the Leilão de Energia A3/2011, the auction has been carried out to identify which energy power company will supply electricity on the lowest price. The final auction price for electricity from biomass is 102.41 BRL/MWh. The value has been crosschecked with the Leilão de Energia de Reserva (Energy Reserve Auction) /67/, published on 2011-08-18, estimating an electricity sale price of 100.4 BRL for electricity from biomass. It should be noted that in each auction the electricity sale price from biomass is the highest compared to other sources, such as wind, hydro or natural gas. Further of both sources Leilão de Energia /66/ and Leilão de Energia de Reserva /67/, the highest value has been chosen which is deemed conservative. The electricity sale price has been crosschecked with other registered CDM landfill gas to energy projects in Brazil: 1. UNFCCC registration number 1626 (http://cdm.unfccc.int/Projects/DB/DNV-CUK1203743009.45/view); electricity sale price = 71.9 USD/MWh (= 139.87 BRL/MWh with average yearly exchange rate for 2007) 2. UNFCCC registration number 3464 (http://cdm.unfccc.int/Projects/DB/SGS-UKL1267696608.78/view); electricity sale price = 137.32 BRL/MWh (sourced from electricity auction 2007) Hence it can be confirmed that the price from the electricity auction published by Brazilian Ministry of Energy (EPE) /66/ is a credible and reliable source. GLC identified that the electricity sale price of 102.41 BRL/MWh is appropriate and the value is valid and applicable at time of investment decision. The value has been correctly indicated in PDD /1/ and Financial Excel Sheet /2/.
Total investment capital	2,164,945	€	/68/ /64	UNFCCC no. 1626	The total investment has been estimated to be 2,164,945 € and the value is sourced from financial proposals by equipment suppliers /56/ /68/.The total investment cost are a summary of the cost of

Parameter	Value applied	Unit	Source	Source for crosscheck	Means and Finding of Validation
expenditure			/56/	UNFCCC no. 3464	wells /68/, cost of pipes /56/, and cost of the power plant /64/. GLC assessed that cost for the flaring system and sophisticated monitoring equipment (which is not used for a project activity without being registered under the CDM). The proposals by equipment supplier Guascor S.A., Biotecnogas S.r. I. have been assessed and sources are deemed credible and reliable. Further the specific total investment cost (i.e 680 €/kW for this project activity) have been compared to other registered CDM landfill gas to electricity projects: 1. UNFCCC registration number 1626 (http://cdm.unfccc.int/Projects/DB/DNV-CUK1203743009.45/view); specific Investment cost = 1,680 USD/kW (= 1,228 €/kW with average yearly exchange rate for 2007) 2. UNFCCC registration number 3464 (http://cdm.unfccc.int/Projects/DB/SGS-UKL1267696608.78/view); specific Investment cost = 1018 €/kW Although it could be noted that required investment may vary considerably depending on the size, geography, etc., nevertheless, the project investment cost could be assessed as plausible. In light of the above checks and cross-checks the total investment cost could be deemed acceptable. Concluding the total required investment (2,164,945 €) has been crosschecked by means of background research and identified to be appropriate. It is valid and applicable at time of investment decision. The value has been correctly indicated in PDD Section B.5 /1/ and Financial Excel Sheet /2/.
O&M cost (variable)	20.20	€/MWh	/64/	UNFCCC no. 1626 UNFCCC no. 3464	The variable O&M cost for the operation of the power plant has been sourced from the technical and financial proposal of biogas engine supplier Guascor S.A. /64/. Hence the O&M cost can be calculated as 52.40 BRL/h which is 49.43 BRL/MWh. With an exchange rate of 2.45 BRL/€, the O&M cost for the operation of the biogas engines have been correctly indicated as 20.20 €/MWh. The O&M cost for electricity generation have been crosschecked with other registered CDM landfill gas to energy projects in Brazil: 1. UNFCCC registration number 1626 (http://cdm.unfccc.int/Projects/DB/DNV-CUK1203743009.45/view); O&M cost (power plant) = 23 USD/MWh (= 16.8 €/MWh with average yearly exchange rate for 2007) 2. UNFCCC registration number 3464 (http://cdm.unfccc.int/Projects/DB/SGS-

Parameter	Value applied	Unit	Source	Source for crosscheck	Means and Finding of Validation
					UKL1267696608.78/view); O&M cost (power plant) = 25 €/MWh Although the crosscheck has been made based on 2007 reports, the O&M cost are deemed appropriate as these costs are likely to increase over period of time. The value for O&M cost for the power plant (20.20 €/MWh) has been identified to be appropriate. The source /64/ is deemed credible and the value valid and applicable at time of investment decision. The value has been correctly indicated in PDD /1/ and Financial Excel Sheet /2/.
O&M cost (fixed)	195,357	€/yr	/71/	/2/	The total fixed O&M cost for the operation of the project's LFG destruction + electricity generation facility is estimated based on following assumptions: • The maintenance of the LFG collection system: 6% of gas collecting system cost /71/ • Direct manpower: 4 people receiving each 7500 BRL/mth for 13.33 month/yr. /71/ Based on local and sectoral knowledge, GLC identified these O&M cost to be appropriate for a landfill operation in Brazil. The value (195,357 €/yr) is valid and applicable at time of investment decision. The value has been correctly indicated in both the PDD (Section B.5) /1/ and the investment analysis spreadsheet /2/.
Exchange rate	2.45	BRL/€	http://fxtop.com	www.oanda.com	The exchange rate (2.45 BRL/€) has been calculated based on the average exchange rate valid from October 2011 to September 2012. The value is sourced from http://fxtop.com which is deemed a credible source for retrieving historical exchange rate. The value has been crosschecked with historical exchange rates retrieved from www.oanda.com and GLC identified the value to be correct. The time period is deemed appropriate. The value is valid and applicable at time of investment decision. The value has been correctly indicated in PDD /1/ and Financial Excel Sheet /2/.
Lifetime of the equipment	20	yrs	/64/	UNFCCC no. 648 UNFCCC no. 5947 UNFCCC no. 0164 UNFCCC no.	The lifetime of the biogas engine has been estimated to be 20 years. The value is sourced from the technical and financial proposal by engine supplier Guascor S.A. /64/. By means of background research it has been identified that most landfill gas to energy projects in Brazil using investment analysis to demonstrate additionality have applied a project lifetime of 20 years (e.g. UNFCCC project no 5947, 0164, 0373, 0052). By means of local and sectoral knowledge, GLC identified that the applied value is appropriate and the source is deemed credible. The value is valid and applicable at time of investment

Parameter	Value applied	Unit	Source	Source for crosscheck	Means and Finding of Validation
				0373 UNFCCC no. 0052	decision. The value has been correctly indicated in PDD /1/ and Financial Excel Sheet /2/.
Depreciation period	10	yrs	/31/	-	The depreciation rate 10% straight-line has been sourced from Deloitte (2011) "International Tax and Business guide – Brazil" /31/. The value is applicable for machineries, equipment and fixtures. The NPV calculation has been checked and GLC identified that depreciation has been correctly subtracted from EBITDA so that tax can be calculated on that. Depreciation has been correctly added back to net profits in accordance with EB 62 Annex 5 para 5. By means of financial expertise and local and sectoral knowledge, GLC identified that the applied value is appropriate and the source is deemed credible. The value is valid and applicable at time of investment decision. The value has been correctly indicated in PDD /1/ and Financial Excel Sheet /2/.
Corporate tax	34%	-	/32/	-	The corporate tax rate (34%) has been sourced from Deloitte (2011) "Corporate tax rate 2011 – International tax" /32/. By means of financial expertise and local and sectoral knowledge, GLC identified that the applied value is appropriate and the source is deemed credible. The value is valid and applicable at time of investment decision. The value has been correctly indicated in PDD /1/ and Financial Excel Sheet /2/.
Sales tax	9.25%	-	/31/	-	The sales tax (9.25%) is the sum of profit participation contribution (PIS) (1.65%) and social security financing contribution (COFINS) (7.6%) sourced from Deloitte (2011) "International Tax and Business guide – Brazil" /31/. The NPV calculation has been checked and GLC identified that the value has been correctly deducted from electricity sales. By means of financial expertise and local and sectoral knowledge, GLC identified that the applied value is appropriate and the source is deemed credible. The value is valid and applicable at time of investment decision. The value has been correctly indicated in PDD Section B.5 /1/ and Financial Excel Sheet /2/.
Discount rate	16.40%	-	EB 62 Annex 5 /17/	http://www.bcb.gov.br/?COP	The discount rate was determined as 16.40 %. The value has been sourced from the "Guidelines on the assessment of investment analysis" (EB 62 Annex 5) /17/. The value has been chosen

Parameter	Value applied	Unit	Source	Source for crosscheck	Means and Finding of Validation
				OMJUROS UNFCCC no. 5947 UNFCCC no. 0164 UNFCCC no. 0373 UNFCCC no. 0052	correctly for the Host country Brazil and Group 1. As the value provided in the EB guidance is based on real terms and the investment analysis is carried out in nominal terms, GLC identified that it is more conservative add the inflation rate to make the discount rate nominal as explained in paragraph 7 of EB 62 Annex 5. "*In situations where an investment analysis is carried out in nominal terms, project participants can convert the real term values provided (…) to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period. If this information is not available, the target inflation rate of the central bank shall be used. If this information is also not available, then the average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) or the World Bank for the next five years after the start of the project activity shall be used.*" As the inflation forecast and target inflation rate from the Brazilian Central Bank is only available until 2014, project participant chose the average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) from 2013 to 2017 that presents an average value of 4.6472. Thus the utilization of the discount rate of 11.75% + 4.6472% = 16.40%, by project participant is deemed correct and acceptable. Moreover the value has been crosschecked with third party and publicly available sources as follows: Other registered CDM landfill gas to energy projects in Brazil have applied following discount rate: 1. UNFCCC project no 0008: 22% (Source: SELIC 2002) 2. UNFCCC project no 0164: 23.3% (Source: SELIC Dec. 2003) 3. UNFCCC project no 0373: 23.29% (Source: SELIC 2003) 4. UNFCCC project no 1626: Discount rate: 10% (Source: SELIC 2007 (11.5%) adjusted for inflation) 5. UNFCCC project no 3464: 12.43% (Source: SELIC 2008) By means of financial expertise and local and sectoral knowledge, GLC identified that the applied

Parameter	Value applied	Unit	Source	Source for crosscheck	Means and Finding of Validation
					value is appropriate and the source is deemed credible. The value is valid and applicable at time of investment decision. The value has been correctly indicated in PDD Section B.5 and Financial Excel Sheet.
NPV	-1,102,883 (LFG 1 + E1)	€	/2/	/45/	The net present value was correctly calculated and presented in the Financial Excel sheet /2/. The formula for the NPV was correctly applied as follows: $NPV = \sum_t [CF_t/(1+i)^t] - Inv.$ Where: NPV = Net present value CF_t = Project Free Cashflow in time period t i = discount rate Inv.= total investment in year 0 t = time period t with (t=1,…,n) (Source: Titman Sheridan and Martin John D "Valuation –the art & science of corporate investment decisions" (2007), Boston, MA) /45/ In addition the "discounted cash flow" was calculated "manually" without using the Excel NPV formula and it was identified that the sum of the "discounted cash flow" is equal to the value applying the NPV formula. Thus GLC confirms that the calculated NPV is correct. The NPV for this project activity without the revenues of the CDM is negative which further justifies that the proposed CDM project activity is less economically or financially attractive than at least one other credible and realistic alternative (the continuation of current practise (NPV =0)). Further the NPV with CDM was calculated (-512,611 €) based on a CER sales price of 2€/CER /2/.
For crosschecking: IRR	2.11% (without CERs) 9.57% (with CERs)	-	/2/	-	For crosschecking purposes the IRR was compared to the discount rate. The IRR for this project activity without the revenues from CDM is: 2.11%. /2/ The applied discount rate (benchmark) is: 16.40%. Concluding, GLC identified that the IRR is below the benchmark proving that the project activity is not financially feasible. The IRR with CDM revenue was calculated to be: 9.57% (based on a CER sales price of 2€/CER).

Parameter	Value applied	Unit	Source	Source for crosscheck	Means and Finding of Validation
					Further the IRR was compared to similar registered CDM landfill gas to energy projects in Brazil: 1. UNFCCC project no 0008: IRR < 0% 2. UNFCCC project no 0164: IRR = 15.6% 3. UNFCCC project no 0373: IRR = 13.8% 4. UNFCCC project no 1626: IRR < 0% 5. UNFCCC project no 3464: IRR = -12.5% Hence it can be confirmed that the calculated IRR for this project activity is well in the range of similar projects. The calculations have been assessed and identified to be correct and in accordance with EB 62 Annex 5.

ANNEX C: CERTIFICATES OF COMPETENCE

Certificate

Name : Mr. Marco Aurelio Ratton (M.Sc.)
Certificate No. : 009

This document certifies that Mr. Marco Aurelio Ratton, citizen of Brazil, is assigned as CDM assessment team leader, validator/verifier, reviewer and expert by Germanischer Lloyd Certification GmbH.

Mr. Marco Aurelio Ratton fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)		Validity date:
SS 1:	**Energy Industries (renewable / non-renewable sources)**	
	TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	
	TA 1.2: Energy generation from renewable energy sources	
SS 2:	**Energy Distribution**	
	TA 2.1: Electricity distribution	
	TA 2.2: Heat distribution	
SS 3:	**Energy Demand**	
	TA 3.1: Energy demand	
SS 4:	**Manufacturing industries**	
	TA 4.1: Cement sector	
	TA 4.2: Aluminium	
	TA 4.3: Iron and steel	
	TA 4.4: Refinery	
SS 5:	**Chemical industry**	
	TA 5.1: Chemical process industries	
SS 7:	**Transport**	
	TA 7.1: Transport	
SS 8:	**Mining/mineral production**	
	TA 8.1: Mining and mineral processes, excluding those included in TA 8.2 below	
	TA 8.2: Oil and gas industry, coal mine methane recovery and use	
SS 10:	**Fugitive Emissions from Fuels**	
	TA 10.1: Mining and mineral processes (excluding those included in TA 10.2)	
	TA 10.2: Oil and gas industry, coal mine methane recovery and use	
SS 13:	**Waste Handling and Disposal**	
	TA 13.1: Waste handling and disposal	2009-08-13
	TA 13.2: Animal waste management	
SS 15:	**Agriculture**	
	TA 15.1: Agriculture	
	TA 15.2: Animal waste management	

Mr. Marco Aurelio Ratton fulfils GLC's competence requirements to validate financial analysis of CDM project activities. Validity date: 2009-08-13

Hamburg 2012-07-26
Date

GLC Management

Germanischer Lloyd Certification
Code: DC-GHG 009_E, Rev. 05
Date: 2012-06-04; MN
Attention: This form is controlled electronically and shall only be printed out for using as a record

Certificate

Name : Mr. Benedikt Maibaum (Dipl.)
Certificate No. : 044

This document certifies that Mr. Benedikt Maibaum, citizen of Germany, is assigned as CDM validator/verifier and expert by Germanischer Lloyd Certification GmbH.

Mr. Benedikt Maibaum fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)		Validity date:
SS 1:	**Energy Industries (renewable / non-renewable sources)**	
TA 1.1:	Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	2011-08-01
TA 1.2:	Energy generation from renewable energy sources	
SS 2:	**Energy Distribution**	
TA 2.1:	Electricity distribution	
TA 2.2:	Heat distribution	
SS 3:	**Energy Demand**	
TA 3.1:	Energy demand	
SS 4:	**Manufacturing industries**	
TA 4.1:	Cement sector	
TA 4.2:	Aluminium	
TA 4.3:	Iron and steel	
TA 4.4:	Refinery	
SS 5:	**Chemical industry**	
TA 5.1:	Chemical process industries	
SS 7:	**Transport**	
TA 7.1:	Transport	
SS 8:	**Mining/mineral production**	
TA 8.1:	Mining and mineral processes, excluding those included in TA 8.2 below	
TA 8.2:	Oil and gas industry, coal mine methane recovery and use	
SS 10:	**Fugitive Emissions from Fuels**	
TA 10.1:	Mining and mineral processes (excluding those included in TA 10.2)	
TA 10.2:	Oil and gas industry, coal mine methane recovery and use	
SS 13:	**Waste Handling and Disposal**	
TA 13.1:	Waste handling and disposal	2011-08-01
TA 13.2:	Animal waste management	2013-01-07
SS 15:	**Agriculture**	
TA 15.1:	Agriculture	
TA 15.2:	Animal waste management	2013-01-07

Hamburg 2013-01-07
Date

GLC Management

Germanischer Lloyd Certification
Code: DC-GHG 009_E, Rev. 05
Date: 2012-06-04; MN
Attention: This form is controlled electronically and shall only be printed out for using as a record

Certificate

Name : Mrs. Anu Chaudhary (M.Sc.)
Certificate No. : 010

This document certifies that Mrs. Anu Chaudhary, citizen of India, is assigned as CDM assessment team leader, validator/verifier, reviewer and expert by Germanischer Lloyd Certification GmbH.

Mrs. Anu Chaudhary fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)		Validity date:
SS 1:	**Energy Industries (renewable / non-renewable sources)**	
TA 1.1:	Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	
TA 1.2:	Energy generation from renewable energy sources	2013-02-19
SS 2:	**Energy Distribution**	
TA 2.1:	Electricity distribution	
TA 2.2:	Heat distribution	
SS 3:	**Energy Demand**	
TA 3.1:	Energy demand	
SS 4:	**Manufacturing industries**	
TA 4.1:	Cement sector	
TA 4.2:	Aluminium	
TA 4.3:	Iron and steel	
TA 4.4:	Refinery	
SS 5:	**Chemical industry**	
TA 5.1:	Chemical process industries	
SS 7:	**Transport**	
TA 7.1:	Transport	
SS 8:	**Mining/mineral production**	
TA 8.1:	Mining and mineral processes, excluding those included in TA 8.2 below	
TA 8.2:	Oil and gas industry, coal mine methane recovery and use	
SS 10:	**Fugitive Emissions from Fuels**	
TA 10.1:	Mining and mineral processes (excluding those included in TA 10.2)	
TA 10.2:	Oil and gas industry, coal mine methane recovery and use	
SS 13:	**Waste Handling and Disposal**	
TA 13.1:	Waste handling and disposal	2009-09-22
TA 13.2:	Animal waste management	
SS 15:	**Agriculture**	
TA 15.1:	Agriculture	
TA 15.2:	Animal waste management	

Mrs. Anu Chaudhary fulfils GLC's competence requirements to validate financial analysis of CDM project activities. Validity date: 2009-09-23

Hamburg 2013-02-19
Date

GLC Management

Germanischer Lloyd Certification
Code: DC-GHG 009_E, Rev. 05
Date: 2012-06-04; MN
Attention: This form is controlled electronically and shall only be printed out for using as a record

Certificate

Name : Mr. Markus Weber (Dipl.)
Certificate No. : 001

This document certifies that Mr. Markus Weber, citizen of Germany, is assigned as CDM assessment team leader, validator/verifier and expert by Germanischer Lloyd Certification GmbH.

Mr. Markus Weber fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)		Validity date:
SS 1:	**Energy Industries (renewable / non-renewable sources)**	
	TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	
	TA 1.2: Energy generation from renewable energy sources	2011-09-09
SS 2:	**Energy Distribution**	
	TA 2.1: Electricity distribution	
	TA 2.2: Heat distribution	
SS 3:	**Energy Demand**	
	TA 3.1: Energy demand	
SS 7:	**Transport**	
	TA 7.1: Transport	
SS 10:	**Fugitive Emissions from Fuels**	
	TA 10.1: Mining and mineral processes (excluding those included in TA 10.2)	
	TA 10.2: Oil and gas industry, coal mine methane recovery and use	
SS 13:	**Waste Handling and Disposal**	
	TA 13.1: Waste handling and disposal	2008-12-15
	TA 13.2: Animal waste management	

Hamburg 2011-09-09
Date

GLC Management

Germanischer Lloyd Certification
Code: DC-GHG 009_E, Rev. 03
Date: 2011-04-27; Tris

Attention: This form is controlled electronically and shall only be printed out for using as a record

ANNEX D: MINUTES (REPORT) OF MEETING FOR THE OCCURRED PUBLIC AUDIENCE DATED 2013-07-19 WITH THE GOAL OF PRESENTING THE PROPOSED CDM PROJECT ACTIVITY CANHANDUBA LANDFILL PROJECT TO THE GENERAL PUBLIC AND TO SELECTED LOCAL STAKEHOLDER (+ TRANSLATION INTO ENGLISH LANGUAGE)

Note: this Annex was added in order to address a requirement of the DNA of Brazil.

Itajaí, 19 de Julho de 2013.

Reunião Pública Presencial do Projeto de MDL da Itajaí Biogás- Projeto de Valorização Energética do Biogás do Aterro Sanitário de Canhanduba.

Ata de Reunião

As 14h do dia dezenove de julho do ano de 2013, foi aberta a reunião com a presença das pessoas citadas na lista de presenças, foi dada a palavra ao Sr. Bruno Francisco Muehlbauer que fez uma apresentação do projeto aos participantes, explicando no que consiste o projeto e destacando os impactos positivos e negativos que o mesmo trará para a comunidade e para o meio ambiente.

Em seguida foi possibilitado aos participantes que expressassem suas opiniões, fizessem os seus questionamentos e apresentassem sugestões.

A Srª Graziela ressaltou como o Aterro vai passar a ser um bom local de visitação. Srº Francisco citou que o Aterro já é uma referência no estado e tende a melhorar com a implantação do projeto. O Srº Eduardo citou que a conclusão da obra está prevista para Dezembro/13 ou Janeiro/14. Foi comentado pelo Srº Francisco sobre o grande número de empresas que procuram os órgãos públicos oferecendo soluções para geração de energia a partir do lixo, ressaltando a importância de se conversar sempre com a concessionária responsável. Srº Eduardo destacou que muitas dessas soluções, principalmente as relacionadas ao processamento de resíduos, enfrentam dificuldades econômicas frente a atual realidade brasileira. Srº Wagner questionou se a necessidade de cadastramento na ANEEL, Eduardo disse que este processo já está sendo realizado em paralelo aos demais procedimentos. Srº Wagner destacou que este será um documento necessário para emissão da licença ambiental de operação.

Sem mais manifestações declarou encerrada a reunião as 15h, e solicitou a secretária que lavra-se a presente ata, que vai assinada por mim, Juliana Ramos, e por todos os presentes.

Nome	Instituição	Assinatura
Juliana Ramos	Ambiental Limpeza Urbana e Saneamento Ltda	
Francisco do Nascimento	Famai	
Rogéria Gregório	Famai	
Marco Antônio Avila	Ambiental Limpeza Urbana e Saneamento Ltda	
Holdemar Alves	Itajaí Biogás	
Bruno Francisco Muehlbauer	Ambiental Limpeza Urbana e Saneamento Ltda	
Graziela Ramos	Prefeitura Municipal de Itajaí	
Wagner Fonseca	Fatma	
Eduardo Cabral Covas	Itajaí Biogás	

Itajaí, 19th July 2013

Public Audience for CDM Project of Itajaí Biogás – Canhanduba Landfill Project.

Minutes of meeting
At 14 hours of the day July 19st 2013, the meeting was opened with the presence of the persons named in attendance list. Mr. Bruno Francisco Muehlbauer made a presentation of the project participants, explaining what the project encompasses and highlighting the positive and negative impacts that the implementation of the project will bring to the community and to the environment.
The participants were asked to express their opinions and to present their questions and suggestions.
Ms. Graziela stressed as the landfill is going to be a good place to visit. Mr. Francisco mentioned that the landfill is already a reference in the State and tends to improve with the implementation of the project.
Mr. Eduardo mentioned that the completion of the work is expected to December 2013 or January 2014. It was commented by Mr. Francisco on the large number of companies seeking public agencies offering solutions for power generation from waste, emphasizing the importance of talking about the concessionaire responsible. Mr. Eduardo pointed out that many of these solutions, especially those related to waste processing, face economic difficulties facing the current Brazilian reality. Mr. Wagner questioned the necessity of registration on ANEEL, Eduardo said that this process is already being done in parallel to other procedures. Mr. Wagner said that this will be a document required for issuing the environmental license of operation.
Without any other manifestations from presented people, the meeting was declared as closed at 15 hours and it was requested to the Secretary to sign up the minutes, which is signed by me, Juliana Ramos and also by all present people.

Name	Company
Juliana Ramos	Ambiental Limpeza Urbana e Saneamento Ltda.
Francisco do Nascimento	Famai
Rogéria Gregório	Famai
Marco Antônio Ávila	Ambiental Limpeza Urbana e Saneamento Ltda.
Holdemar Alves	Itajaí Biogás
Bruno Francisco Muehlbauer	Ambiental Limpeza Urbana e Saneamento Ltda.
Graziela Ramos	Prefeitura Municipal de Itajaí
Wagner Fonseca	Fatma
Eduardo Cabral Covas	Itajaí Biogás