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# VALIDATION REPORT

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## “EMBRALIXO/ARAÚNA - BRAGANÇA LANDFILL GAS PROJECT (EABLGP)” IN BRAZIL

REPORT No. 2005-1496

REVISION No. 02

DET NORSKE VERITAS



## VALIDATION REPORT

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### Summary:

Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” in Brazil on the basis of UNFCCC criteria for the CDM, 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 by the CDM Executive Board.

The validation consisted of the following three phases: i) a desk review of the project design and the baseline and monitoring plan, ii) follow-up interviews with project stakeholders and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion. This validation report summarizes the findings of the validation.

In summary, it is DNV's opinion that the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)”, as described in the revised PDD of 26 June 2006, meets all UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring methodology ACM0001. Hence, DNV will request the registration of the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” as CDM project activity. Prior to the submission of this validation report to the CDM Executive Board, DNV will have to receive the written approval of the DNA of Brazil, including confirmation that the project assists in achieving sustainable development.

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## [Appendix A Validation Protocol](#)



## ***Abbreviations***

AF	Adjustment Factor
B <sub>0</sub>	Maximum methane producing capacity
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CETESB	Environmental Agency for the State of São Paulo
CH <sub>4</sub>	Methane
CL	Clarification request
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
INMETRO	Metrology National Institute
IPCC	Intergovernmental Panel on Climate Change
LFG	Landfill gas
MP	Monitoring Plan
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change



## 1 INTRODUCTION

Araúna Participações e Investimentos Ltda and Embralixo - Empresa Bragantina de Varrição e Coleta de Lixo Ltda have commissioned Det Norske Veritas Certification Ltd. (DNV) to perform a validation of the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)”, located in the Bragança Paulista municipality, São Paulo State, Brazil.

This report summarises the findings of the validation of the project, performed based on UNFCCC criteria for CDM projects, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The validation team consists of the following personnel:

Mrs. Cintia Dias	DNV Rio de Janeiro	Team leader
Mr. Luis Filipe Tavares	DNV Rio de Janeiro	Waste management sector expert
Mr. Vicente San Valero	DNV Rio de Janeiro	CDM auditor
Mr. Michael Lehmann	DNV Oslo	Technical reviewer

### 1.1 Validation Objective

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

### 1.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is 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 baseline and monitoring methodology ACM0001. The validation team has, based on the recommendations in the Validation and Verification Manual /7/ employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

The validation is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

### 1.3 Description of Proposed CDM Project

The “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” is located in the Bragança Paulista municipality, São Paulo State, Brazil. Municipal solid waste has been disposed at the Bragança Paulista landfill since 1990 and the landfill is expected to be closed in 2015. The daily average of solid waste received in 2005 is 164 tons. Historical average is 144 tons.

Up to the project's start in 2006, landfill gas (LFG) will be collected only through a passive system, and the collected LFG will be vented to the atmosphere (no flaring).



The “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” plans to install a LFG collection and flaring system. By connecting new vertical drains and by flaring the collected landfill gas, the project is expected to increase the LFG collection efficiency to 70% and to flare 98% of the LFG collected. The estimated amount of GHG reduction from the project is 464 791 tonnes of CO<sub>2</sub>e during the first renewable crediting period of 7 years starting on 01 July 2007 (66 399 tonnes of CO<sub>2</sub>e per year on the average).

## 2 METHODOLOGY

The validation consisted of the following three phases:

- I a desk review of the project design, baseline and monitoring plan;
- II follow-up interviews with project stakeholders;
- III the resolution of outstanding issues and the issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customised for the project, according to the Validation and Verification Manual /7/. The protocol shows in transparent manner criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of three tables. The different columns in these tables are described in Figure 1.

The completed validation protocol for the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” in Brazil is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. *Corrective Action Requests* (CAR) is issued, where:

- i) mistakes have been made with a direct influence on project results;
- ii) validation protocol requirements have not been met; or
- iii) There is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The term request for *Clarification* (CL) may be used where additional information is needed to fully clarify an issue.



<b>Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities</b>			
<b>Requirement</b>	<b>Reference</b>	<b>Conclusion</b>	<b>Cross reference</b>
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>This is either acceptable based on evidence provided (<b>OK</b>), a <b>Corrective Action Request (CAR)</b> of risk or non-compliance with stated requirements or a request for <b>Clarification (CL)</b> where further clarifications are needed.</i>	<i>Used to refer to the relevant checklist questions in Table 2 to show how the specific requirement is validated. This is to ensure a transparent Validation process.</i>

  

<b>Validation Protocol Table 2: Requirement Checklist</b>				
<b>Checklist Question</b>	<b>Reference</b>	<b>Means of verification (MoV)</b>	<b>Comment</b>	<b>Draft and/or Final Conclusion</b>
<i>The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in seven different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.</i>	<i>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.</i>	<i>This is either acceptable based on evidence provided (<b>OK</b>), or a <b>Corrective Action Request (CAR)</b> due to non-compliance with the checklist question (See below). A request for <b>Clarification (CL)</b> is used when the validation team has identified a need for further clarification.</i>

  

<b>Validation Protocol Table 3: Resolution of Corrective Action Requests and Requests for Clarification</b>			
<b>Draft report corrective action requests and requests for clarifications</b>	<b>Ref. to Table 2</b>	<b>Summary of project participants' response</b>	<b>Final conclusion</b>
<i>If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.</i>	<i>Reference to the checklist question number in Table 2 where the Corrective Action Request or Clarification Request is explained.</i>	<i>The responses given by the project participants during the communications with the validation team should be summarised in this section.</i>	<i>This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".</i>

**Figure 1 Validation protocol tables**



## 2.1 Review of Documents

The Project Design Document (PDD) /1/ submitted by Araúna Participações e Investimentos Ltda and Embralixo - Empresa Bragantina de Varrição e Coleta de Lixo Ltda on 31 October 2005 was assessed by DNV. A revised version of the PDD /3/ was submitted on 13 March 2006 to address DNV's initial validation findings and was assessed by DNV. Finally, a new version of PDD, vs.4 of 26 of June 2006, was assessed /4/. In addition, spreadsheets containing calculations of expected future LFG generation at the landfill and associated expected emission reductions were assessed.

Other documents such as the Installation and Working Licences were reviewed during the follow-up interviews.

## 2.2 Follow-up Interviews

On 23 January 2006 DNV performed interviews with representatives of Araúna Participações e Investimentos Ltda and Embralixo - Empresa Bragantina de Varrição e Coleta de Lixo Ltda, to confirm and to resolve issues identified in the document review.

The main topics of the interviews were as follows:

- Management System
  - authority and responsibilities
  - training
  - maintenance
  - monitoring, measurement and calibration of monitoring equipment
  - records maintenance
  - internal audits
  - corrective actions
- Environmental or social benefits created by the GHG emission reduction project
- Environmental controls
- Environmental licenses compliance.

## 2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation was to resolve any outstanding issues which need to be clarified for DNV's positive conclusion on the project design.

The initial validation of the project identified 2 (two) *Corrective Action Requests* and 1 (one) request for *Clarification*. The *Corrective Action Requests* and request for *Clarification* were discussed during the follow-up interviews. In order to respond to these requests, Araúna Participações e Investimentos Ltda submitted a revised version of the PDD /2/. The revised PDD and the response provided by Araúna Participações e Investimentos Ltda addressed the *Corrective Action Requests* and request for *Clarification* to DNV's satisfaction. To guarantee the transparency of the validation process, the concerns raised and the response provided are documented in Table 3 of the validation protocol in Appendix A.





### 3 VALIDATION FINDINGS

The findings of the validation of the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

The initial validation findings relate to the project design as documented and described in the PDD of 13 March 2006.

#### 3.1 Participation Requirements

The project participants are Embralixo - Empresa Bragantina de Varrição e Coleta de Lixo Ltda and Araúna Participações e Investimentos Ltda. The host Party Brazil meets all relevant participation requirements. No participating Annex 1 Party is yet identified.

Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including confirmation that the project assists it in achieving sustainable development.

#### 3.2 Project Design

The “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” involves a reduction of emissions of greenhouse gases by avoiding methane emissions originating from the landfill. This objective will be achieved through installing an interconnected vertical drain system which is connected to the suction and flaring equipment. The LFG will be burned in a flaring system.

The technology employed by the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” comprises the following components:

- Biogas flare with 98% efficiency;
- Continuous and automated pilot, using LPG/LFG;
- Ignition and control panel with a Logistic Processing Central (CLP – Central Logística de Processamento);
- Hydraulic seal in the base;
- Flaring monitored by flow through thermal-pairs which will measure the gas speed through temperature difference in its passage;
- Monitoring systems according to the monitoring plan;
- Gas filtering and drying system through decanting or separation.

The project boundary is limited by the area currently occupied by the Bragança Paulista Landfill.

The “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” will have positive impacts towards sustainable development by donating 2% of the CERs to selected communitarian projects near the landfill and by creating jobs and training people to operate the new installations.

Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including confirmation that the project assists it in achieving sustainable development.



The project will be funded by the sales of CERs and the validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Brazil.

A 7-year renewable crediting period is selected (with the potential of being renewed twice), starting on 01 July 2007. The expected operational lifetime of the project is 21 years. .

The project's estimated emission reductions are 464 791 tCO<sub>2</sub>e (66 399 tCO<sub>2</sub>e /year on average) over the first 7-year renewable crediting period.

### 3.3 Baseline Determination

The project correctly applies the approved consolidated baseline methodology *ACM0001* – “Consolidated baseline methodology for landfill gas project activities” /8/. To calculate the emission factor due to electricity consumption, the project applies the approved consolidated baseline methodology *ACM0002* “Consolidated Methodology for Grid-Connected Power Generation from Renewable Sources” /10/.

The chosen baseline methodology *ACM0001* is applicable for the proposed project as the baseline scenario is the partial or total atmospheric release of the gas, and the project activity consists of gas collection and flaring.

There are no regulations or contract requirements that oblige the methane destruction at landfills in Brazil. *ACM0001* considers that a value of an Adjustment Factor (AF) has to be considered when a specific system for collection and destruction of methane is mandated by regulatory or contractual requirements or a specific percentage is specified in the contract or mandated by regulations. Both cases are not applicable for the Bragança landfill, thus the selected value for AF of 10% is deemed appropriate and conservative.

### 3.4 Additionality

In accordance with *ACM0001* the additionality of the project is demonstrated by using of “*Tool for demonstration and assessment of additionality*”/11/ which includes the following steps:

*Step 0. Preliminary screening based on the starting date of the project activity:* The project activity will start on 01 October 2006 and the first crediting period is forecasted to start on 01 July 2007, after the registration of the project.

Step 0 is thus not applicable as the crediting period starts after the registration of the project.

*Step 1. Identification of alternatives to the project activity consistent with current laws and regulations*

The possible baseline scenarios are: a) The landfill operator would invest in LFG capture and flaring not undertaken as a CDM project activity, b) the landfill operator would maintain the present activities according to the common practice of not flaring the landfill gas from its landfill operations and c) the landfill operator would invest in LFG capture and utilization to produce electricity or utilize LFG for other commercial purposes. All scenarios are in compliance with applicable legal and regulatory requirements and only the second one is deemed realistic as a likely baseline.

*Step 2 - Investment analysis:*



The project consists only of flaring the captured LFG and is thus not generating financial or economics benefits. Hence, option I – simple cost analysis – was chosen. It is demonstrated that utilization of LFG is not likely to create sufficient financial returns. The baseline alternative that the landfill operator would invest in LFG capture and utilization to produce electricity or utilize LFG for other commercial purposes is thus not further considered.

There is no legislation in Brazil obliging landfills to flare the collected gas. Under non-CDM conditions, Embralixo would not have to make the investments to increase collection and to flare LFG. The installation of a LFG capture and flaring system, even an inefficient one, would require costs for the landfill operator with no sort of financial compensation, compromising its business viability. DNV acknowledges that the project does thus not present an economically attractive course of action.

*Step 3. Barrier analysis:* Not selected (Step 2 is selected)

*Step 4 - Common practice analysis*

There are no similar activities to EABLGP, without considering CDM benefits, being carried out in Brazil at the moment. DNV was able to confirm that the investment to install systems to capture and flare LFG is not common practice in Brazil.

*Step 5 - Impact of CDM registration*

As there is no income from the project, the sale of CERs will present the only revenue for the project and will significantly alleviate the economic and financial hurdles of the project.

Given the above and in particular the results of the investment analysis, it is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions are additional.

### 3.5 Monitoring Plan

The “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” applies the approved consolidated monitoring methodology ACM0001 – “*Consolidated monitoring methodology for landfill gas project activities*” Version 03. /9/

ACM0001 is applicable to project activities that reduce greenhouse gas emissions through landfill gas capture and destruction of the methane by flaring and/or generation of electricity. In the case of the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)”, such destruction will occur only through flaring.

The monitoring plan applies the relevant elements of the monitoring methodology ACM0001 that are used to determine the amount of methane to be destroyed. More specifically, the following elements will be monitored:

- Captured and flared LFG;
- Flare availability;
- Methane content, pressure and temperature of the LFG;
- LFG sent to the flare;
- Flare efficiency and flare operating hours;
- Electricity used to run the capture and flaring equipment;



- Regulatory requirements.

Details of the data that will be collected, the frequency of data recording and its certainty, and format and storage location was clearly described in the PDD (Annex 4). The recording frequency of the data is appropriate for the project. Algorithms and formulas used have also been clearly presented and the definition of how long archived data is kept is defined.

### 3.6 Calculation of GHG Emissions

Emission reductions will be directly monitored and calculated *ex-post*, using the approach indicated in *ACM0001*.

Expected future LFG generation and thus emission reductions were estimated ex-ante using the IPCC first order decay model. The parameters  $L_0$  and  $k$  were chosen in a conservative manner, using a  $L_0 = 117 \text{ kg CH}_4/\text{ton}$  and  $k=0.1 \text{ (1/yr)}$ . The flare availability is considered to be 96% (recommended by manufacturer) with an efficiency factor of 98% (recommended by manufacturer), i.e. only less than 6% of the LFG will not be destroyed. The AF was considered 10% and the justification of the selected AF is reasonable.

Electricity consumption will be monitored and a Combined Margin Emission Factor for the South-Southeast-Midwest (S-SE-CO) grid will be used to calculate the project emissions originating from the project's electricity consumption. The values obtained are  $EF_{OM, \text{ simple\_ajusted } 2002-2004} = 0.4310 \text{ tCO}_2\text{e/ MWh}$  (Operating Margin),  $EF_{BM, 2004} = 0.0962 \text{ tCO}_2\text{e/MWh}$  (Build Margin) and  $EF_{\text{electricity}} = 0.2636 \text{ tCO}_2\text{e/MWh}$  (Combined Margin), considering  $w_{OM} = w_{BM} = 0.5$  and applying an average  $\lambda$  of 0.5135. Emissions associated with the project's electricity consumption are expected to be 70 tCO<sub>2</sub>e per year.

The calculation of the Combined Margin Emission Factor is in accordance with *ACM0002*. Electricity generation data provided by the Brazilian Electricity Agency (ANEEL) and the National Electricity System Operator (ONS) for the electricity generated in the South-Southeast-Midwest (S-SE-CO) grid in the years 2002-2004 was applied, including the guidance provided by the EB at its 22<sup>nd</sup> and 23<sup>rd</sup> meetings for the determination of the BM.

### 3.7 Environmental Impacts

Bragança Paulista landfill has presented an Installation and Working Licence which was issued after the project's Environmental Impact Assessment was evaluated by the Environmental Agency.

The project has not yet obtained a licence for flaring the landfill gas and that licence must be obtained when the project is implemented. Given that the flaring of the landfill gas has little adverse environmental impacts, it is likely that the licence will be obtained when the project is implemented. The first periodical verification of the project must verify that this licence was eventually obtained.

### 3.8 Comments by Local Stakeholders

Comments by local stakeholders were invited in accordance with the requirements of Resolution 1 of the Brazilian DNA. Invited local stakeholders include the Municipal Government, the state and municipal agencies, the Brazilian forum of NGOs, neighbouring communities and the office



of the attorney general. The invitations to comment on the project were sent on 03 November 2005 /1/.

Comments were also invited on the websites [www.grupoarauna.com.br](http://www.grupoarauna.com.br) and [www.greendomus.com](http://www.greendomus.com) sites. DNV received information and evidences of the letters sent. Two positive comments were received and Embralixo - Empresa Bragantina de Varrição e Coleta de Lixo Ltda appropriately has taken them into account.

#### **4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS**

The PDD of 31 October 2005 was made publicly available on DNV's climate change website ([www.dnv.com/certification/climatechange](http://www.dnv.com/certification/climatechange)) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 03 November 2005 to 02 December 2005. No comments were received.



## 5 VALIDATION OPINION

*Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” at Bragança Paulista municipality, São Paulo State, Brazil. The validation was performed on the basis of UNFCCC criteria for CDM project activities and relevant Brazilian criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.*

*The project participants are Embralixo - Empresa Bragantina de Varrição e Coleta de Lixo Ltda and Araúna Participações e Investimentos Ltda. The host Party Brazil meets all relevant participation requirements. No participating Annex 1 Party is yet identified.*

*The project proposes to collect and flare landfill gas (LFG) captured at the Bragança Paulista Landfill. By flaring LFG, the project results in the reduction of CH<sub>4</sub> emissions that is real, measurable and gives long-term benefits. Given that the project is implemented as designed, the project is likely to achieve the estimated amount of emission reductions.*

*The project is not expected to have considerable environmental impacts. The Bragança Paulista’s landfill has an Operation Environmental Licence. The Environmental License for LFG recovery and flaring has not yet been obtained. Given that the flaring of landfill gas has little adverse or no different environmental impacts, it is likely that the licence will be obtained when the project is implemented. The first period verification of the project must confirm that this licence was eventually obtained.*

*By promoting environment improvement, the project is in line with the current sustainable development priorities of Brazil.*

*The project applies the approved baseline and monitoring methodology ACM0001, i.e. “Consolidated baseline and monitoring methodology for landfill gas projects activities”. The baseline methodology has been applied correctly and the assumptions made for the selected baseline scenario are sound. 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.*

*The monitoring plan sufficiently specifies the monitoring requirements of the main project indicators.*

*Local stakeholder comments were invited according to the Brazilian DNA Resolution 1 and Parties, stakeholders and NGOs were invited to comment on the validation requirements. Two comments have been received by local stakeholders and Embralixo - Empresa Bragantina de Varrição e Coleta de Lixo Ltda has taken them into account.*

*In summary, it is DNV’s opinion that the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” as described in the revised and resubmitted project design document of 26 June 2006, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring methodology ACM0001. Hence, DNV will request the registration of the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” as CDM project activity.*



*Prior to the submission of this validation report to the CDM Executive Board, DNV will have to receive the written approval of the DNA of Brazil including confirmation that the project assists in achieving sustainable development.*





## REFERENCES

*Documents provided by the project proponent that relate directly to the project:*

- /1/ Araúna Participações e Investimentos Ltda: *Project Design Document for the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)”*, Version 01 of 31 October 2005.
- /2/ Araúna Participações e Investimentos Ltda: *Project Design Document for the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)”*, Version 02 of 13 March 2006.
- /3/ Araúna Participações e Investimentos Ltda: *Project Design Document for the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)”*, Version 03 of 18 April 2006.
- /4/ Araúna Participações e Investimentos Ltda: *Project Design Document for the “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)”*, Version 04 of 26 June 2006.
- /5/ Araúna Participações e Investimentos Ltda: *Spreadsheets for calculating expected LFG generation and associated emission reductions (PlanilhaCO2e-Bragançav02.xls)*.
- /6/ *Spreadsheets for calculating ONS-Emission factors SSECO 2002-2004-2006.03.09*

*Background documents related to the design and/or methodologies employed in the design or other reference documents:*

- /7/ International Emission Trading Association (IETA) & the World Bank’s Prototype Carbon Fund (PCF): *Validation and Verification Manual*. <http://www.vvmanual.info>
- /8/ CDM Executive Board: *Approved Baseline Methodology ACM0001 - “Consolidated baseline methodology for landfill gas project activities”*. Version 03 of 19 May 2006.
- /9/ CDM Executive Board: *Approved Monitoring Methodology ACM0001 - “Consolidated monitoring methodology for landfill gas project activities”*. Version 03 of 19 May 2006.
- /10/ CDM Executive Board: *Approved Baseline Methodology ACM0002 - “Consolidated Methodology for Grid-Connected Power Generation from Renewable Sources”*. Version 06 of 19 May 2006.
- /11/ CDM Executive Board: *“Tool for the demonstration and assessment of additionality”*. Version 02 of 28 November 2005.

*Persons interviewed during the validation, or persons who contributed with other information that are not included in the documents listed above:*

- /12/ Nino Sergio Bottini – Arauna/Embralixo
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## **APPENDIX A**

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### **CDM VALIDATION PROTOCOL**

**Table 1 Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities**

Requirement	Reference	Conclusion	Cross Reference / Comment
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3	Kyoto Protocol Art.12.2	Not applicable	Table 2, Section E.4.1 No participating Annex I Party is yet identified.
2. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a		Table 2, Section A.3 Prior to the submission of this validation report to the CDM Executive Board, DNV will have to receive the written confirmation by the DNA of Brazil that the project assists in achieving sustainable development.
3. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC	Kyoto Protocol Art.12.2.	OK	Table 2, Section E.4.1
4. The project shall have the written approval of voluntary participation from the designated national authority of each party involved	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a		Prior to the submission of this validation report to the CDM Executive Board, DNV will have to receive the written confirmation by the DNA of Brazil that the project assists in achieving sustainable development.
5. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change	Kyoto Protocol Art. 12.5b	OK	Table 2, Section E
6. Reduction in GHG emissions shall be additional to any that would occur in absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	OK	Table 2, Section B.2
7. In case public funding from Parties included in Annex I is	Decision 17/CP.7,	OK	The validation did not reveal any

Requirement	Reference	Conclusion	Cross Reference / Comment
used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	CDM Modalities and Procedures Appendix B, § 2		information that indicates that the project can be seen as a diversion of ODA funding towards Brazil
8. Parties participating in the CDM shall designate a national authority for the CDM	CDM Modalities and Procedures §29	OK	The Brazilian designated national authority for the CDM is the “Comissão Interministerial de Mudança Global do Clima”.
9. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol	CDM Modalities §30/31a	OK	Brazil ratified the Kyoto Protocol on 23 August 2002
10. The participating Annex I Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	Not applicable	No participating Annex I Party is yet identified.
11. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7	CDM Modalities and Procedures §31b	Not applicable	No participating Annex I Party is yet identified.
12. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received	CDM Modalities and Procedures §37b	OK	Table 2, Section G The invitations to comments by local stakeholders have been sent on 3 November 2005 to the entities listed in the PDD.
13. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	OK	Table 2, Section F The Environmental Licence for LFG recovery and flaring will need to be verified during the first periodic verification.
14. Baseline and monitoring methodology shall be previously approved by the CDM Executive Board	CDM Modalities and Procedures §37e	OK	Table 2, Section B.1.1 and D.1.1
15. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP	CDM Modalities and Procedures §37f	OK	Table 2, Section D

Requirement	Reference	Conclusion	Cross Reference / Comment
16. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available	CDM Modalities and Procedures §40	OK	The PDD was presented for public comments in the period of 03 November 2005 to 02 December 2005 on <a href="http://climatechange.dnv.com">climatechange.dnv.com</a> and comments were invited via the UNFCCC CDM website. No comments were received.
17. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances	CDM Modalities and Procedures §45c,d	OK	Table 2, Section B.2
18. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure	CDM Modalities and Procedures §47	OK	Table 2, Section B.2
19. The project design document shall be in conformance with the UNFCCC CDM-PDD format	CDM Modalities and Procedures Appendix B, EB Decision	OK	PDD is in accordance with CDM-PDD (version 02 of 01 July 2004).

**Table 2 Requirements Checklist**

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<b>A. General Description of Project Activity</b> <i>The project design is assessed.</i>					
<b>A.1. Project Boundaries</b> <i>Project Boundaries are the limits and borders defining the GHG emission reduction project.</i>					
A.1.1. Are the project's spatial (geographical) boundaries clearly defined?	/1/	DR	Yes. The “Embralixo/Araúna - Bragança Landfill Gas Project (EABLGP)” is located in the Bragança Paulista municipality, São Paulo State, Brazil, within the area of Bragança Paulista Landfill.		OK
A.1.2. Are the project's system (components and facilities used to mitigate GHGs) boundaries clearly defined?	/1/	DR	The project boundary is limited by the area currently occupied by Bragança Paulista Sanitary Landfill and includes the landfill gas capture as well as the flaring system.		OK
<b>A.2. Technology to be employed</b> <i>Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.</i>					
A.2.1. Does the project design engineering reflect current good practices?	/1/	DR	The project design engineering reflects good practice through a landfill gas recovery and flaring system.		OK
A.2.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used	/1/	DR	Common practice in Brazil is a sanitary landfill without an active landfill gas recovery system and LFG flaring only for		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
technologies in the host country?			safety reasons.		
A.2.3. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	/1/	DR	The project is unlikely to be substituted by other more efficient technologies.		OK
A.2.4. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period?	/1/	DR	The project needs expertise for the operation of the gas collection and treatment system. The supplier of the flaring system will be responsible for assisting the pre-commissioning, training of operators and starting up of the plant. It will also provide technical assistance and consulting, including all the specialized engineering services also related to the Biogas System.		OK
A.2.5. Does the project make provisions for meeting training and maintenance needs?	/1/	DR	See A.2.4.		OK
<b>A.3. Contribution to Sustainable Development</b> <i>The project's contribution to sustainable development is assessed.</i>					
A.3.1. Is the project in line with relevant legislation and plans in the host country?	/1/	DR	Yes, the landfill has been granted an Installation License number 000783, dated 19/09/1995 and a Working License number 000675, dated 18/12/1997, issued by CETESB.		OK
A.3.2. Is the project in line with host-country specific CDM requirements?	/1/	DR	The project follows the Resolution 1 of the “Comissão Interministerial de Mudança Global do Clima”.		OK
A.3.3. Is the project in line with sustainable development policies of the host country?	/1/	DR	Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including confirmation that the project		

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
			assists it in achieving sustainable development.		
A.3.4. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR	The project will, indirectly, create a motivation for another landfill gas projects, bringing new investors to the Brazilian market. The project will donate 2% of the CERs to communitarian projects nearby the landfill.		OK
<b>B. Project Baseline</b> <i>The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.</i>					
<b>B.1. Baseline Methodology</b> <i>It is assessed whether the project applies an appropriate baseline methodology.</i>					
B.1.1. Is the baseline methodology previously approved by the CDM Executive Board?	/1/	DR	The project applies the approved baseline methodology ACM0001 “Consolidated Baseline Methodology for Landfill Gas Project Activities”.		OK
B.1.2. Is the baseline methodology the one deemed most applicable for this project and is the appropriateness justified?	/1/	DR	Yes, the chosen baseline methodology ACM0001 is applicable for the proposed project as the baseline scenario is the partial or total atmospheric release of the gas, and the project activity consists of gas collection and flaring.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<b>B.2. Baseline Determination</b> <i>The choice of baseline will be validated with focus on whether the baseline is a likely scenario, whether the project itself is not a likely baseline scenario, and whether the baseline is complete and transparent.</i>					
B.2.1. Is the application of the methodology and the discussion and determination of the chosen baseline transparent?	/1/	DR	<p>The chosen baseline methodology ACM0001 is applicable for the proposed project where the baseline scenario is the partial atmospheric release of the gas, and the project activity consists of the collection and flaring of the gas.</p> <p>Nonetheless, the AF of 0% and the project specifications approved by the environmental agency has to be analyzed.</p>	<del>CL</del> 1	OK
B.2.2. Has the baseline been determined using conservative assumptions where possible?	/1/	DR	<p>The assumption in the baseline determination shows that, when it was possible, conservative values were selected.</p> <p>Nonetheless, the AF of 0% and the project specifications approved by the environmental agency has to be analyzed.</p>	<del>CL</del> 1	OK
B.2.3. Has the baseline been established on a project-specific basis?	/1/	DR	The baseline methodology was applied taking into account project specific circumstances, such as the project specific requirements contained in the license for operating the landfill and a project specific financial analysis.		OK
B.2.4. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political	/1/	DR	Environment regulation in Brazil is more concerned with waste disposal in an adequate way (landfill) and no changes are		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
aspirations?			foreseen regarding new requirements to LFG recovery and destruction.		
B.2.5. Is the baseline determination compatible with the available data?	/1/	DR	The baseline emissions are estimated based on IPCC's First Decay Order Methodology, the literature “A Landfill Gas to Energy Handbook for Landfill Owners e Operators” (December 1994), part 1, pages 2-9” and United States Environmental Protection Agency (USEPA).		OK
B.2.6. Does the selected baseline represent the most likely scenario among other possible and/or discussed scenarios?	/1/	DR	The PDD presents, according to the “Tool for demonstration and assessment of additionality”, three scenarios. See B.2.7		OK
B.2.7. Is it demonstrated/justified that the project activity itself is not a likely baseline scenario?	/1/	DR	<p>The PDD, on section B.3 includes a series of questions according to the “Tool for demonstration and assessment of “additionality” to justify why the project is not a likely baseline scenario.</p> <p>Step 0 does not apply as the project's crediting period will start after the project's registration date.</p> <p>Step 1a. Three possibilities for the baseline scenario were proposed: a)The landfill operator would invest in LFG capture and flaring not undertaken as a CDM project activity, b)The landfill operator would maintain the present activities according to the common practice of not flaring the landfill gas from its landfill operations i.e. the baseline scenario and c) the landfill operator would invest in LFG capture and utilization to produce electricity or for commercial purposes. All alternatives are in compliance</p>		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
			<p>with all applicable legal and regulatory requirements.</p> <p>Step 1.b. No legal requirement is likely to be implemented with respect to capture and destruction of LFG</p> <p>Step 2. Option I, simple cost analysis, was chosen as there are no economic benefits other than the CDM related incomes. The analysis considers all the costs related to the CDM project and demonstrates that the proposed project is not economically attractive (without the revenue from the sale of CERs) and that the continuation of the current practice is the most likely baseline scenario. Utilization of LFG is not likely to create sufficient financial returns. It is demonstrated that the baseline alternative that the landfill operator would invest in LFG capture and utilization to produce electricity or utilize LFG for other commercial purposes is thus not further considered.</p> <p>Step 3 is not selected</p> <p>Step 4. A common practice analysis demonstrates that the collection and flaring of LFG is not common practice in Brazil (with the exception of some few projects proposed as CDM project activities).</p> <p>Step 5. As there is no income from the project, the sale of CERs will present the only revenue for the project and will significantly alleviate the economic and financial hurdles of the project.</p>		

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.2.8. Have the major risks to the baseline been identified?	/1/	DR	The risks to the baseline could include the possibility of legislation requiring the flaring of landfill gas for landfills such as Embralixo. However, no changes are foreseen regarding new requirements to LFG recovery and destruction.  In any case and in accordance with ACM0001, the regulatory requirements will be monitored on an annual basis.		OK
B.2.9. Is all literature and sources clearly referenced?	/1/	DR	Yes.		OK
<b>C. Duration of the Project/ Crediting Period</b> <i>It is assessed whether the temporary boundaries of the project are clearly defined.</i>					
C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable?	/1/	DR	The project is foreseen to start on 01 October 2006 and the project's expected operational lifetime is 21 years.		OK
C.1.2. Is the assumed crediting time clearly defined (renewable crediting period of seven years with two possible renewals or fixed crediting period of 10 years with no renewal)?	/1/	DR	A renewable 7-year crediting period (with the potential of being renewed twice) was selected, starting on 01 July 2007.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<b>D. Monitoring Plan</b> <i>The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed ((Blue text contains requirements to be assessed for optional review of monitoring methodology prior to submission and approval by CDM EB).</i>					
<b>D.1. Monitoring Methodology</b> <i>It is assessed whether the project applies an appropriate baseline methodology.</i>					
D.1.1. Is the monitoring methodology previously approved by the CDM Executive Board?	/1/	DR	The project applies the approved monitoring methodology ACM0001 “Consolidated monitoring methodology for landfill gas project activities”.		OK
D.1.2. Is the monitoring methodology applicable for this project and is the appropriateness justified?	/1/	DR	Yes, the monitoring methodology ACM0001 is applicable to the proposed project as the baseline scenario is partial or total atmospheric release of the gas and the project activity includes situations such as in the proposed project: The captured gas will be flared.		OK
D.1.3. Does the monitoring methodology reflect good monitoring and reporting practices?	/1/	DR	The project applies all relevant requirements of ACM0001, including the scope of instruments, kind and expected efficiency of each one, and other details that comply with all ACM0001 requirements.		OK
D.1.4. Is the discussion and selection of the monitoring methodology transparent?	/1/	DR	Yes. The following parameters are measured:		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
			<ul style="list-style-type: none"> <li>- landfill gas captured and flared</li> <li>- methane content and volume</li> <li>- flare efficiency and flare operating hours</li> <li>- electricity used to run the capture equipment</li> <li>- regulatory requirements</li> </ul> <p>Collection and archiving of data is in paper form and the data will be archived for two years following the end of the crediting period.</p>		
<b>D.2. Monitoring of Project Emissions</b> <i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>					
D.2.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/	DR	<p>Yes. The project measures directly the emission reductions. The only project emissions are those related to the electricity use to run the capture and flaring equipment.</p> <p>The national grid CO<sub>2</sub> coefficient is fixed ex-ante for the entire crediting period and is calculated to be 0.2636 tCO<sub>2</sub>e/MWh. The collection and archiving of the electricity usage is provided for in the monitoring plan.</p>		OK
D.2.2. Are the choices of project GHG indicators reasonable?	/1/	DR	Yes.		OK
D.2.3. Will it be possible to monitor / measure the specified project GHG indicators?	/1/	DR	Yes.		OK
D.2.4. Will the indicators give opportunity for real measurements of project emissions?	/1/	DR	Yes.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
D.2.5. Will the indicators enable comparison of project data and performance over time?	/1/	DR	Yes.		OK
<b>D.3. Monitoring of Leakage</b> <i>It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.</i>					
D.3.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR	No leakage needs to be accounted for as per ACM0001.		OK
<b>D.4. Monitoring of Baseline Emissions</b> <i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>					
D.4.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR	Yes, the project chooses to directly monitor the emission reductions through the use of on site metering equipment and laboratory analysis at the landfill gas site and the collection and archiving of data is established according to the methodology.		OK
D.4.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/	DR	See 4.1.		OK
D.4.3. Will it be possible to monitor / measure the specified baseline indicators?	/1/	DR	See 4.1.		OK
D.4.4. Will the indicators give opportunity for real measurements of baseline emissions?	/1/	DR	See 4.1.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<b>D.5. Monitoring of Sustainable Development Indicators/ Environmental Impacts</b> <i>It is checked that choices of indicators are reasonable and complete to monitor sustainable performance over time.</i>					
D.5.1. Does the monitoring plan provide the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	Neither ACM0001 nor the Brazilian DNA requires monitoring of sustainable development indicators.		OK
<b>D.6. Project Management Planning</b> <i>It is checked that project implementation is properly prepared for and that critical arrangements are addressed.</i>					
D.6.1. Is the authority and responsibility of project management clearly described?	/1/	DR	Procedures established for QA/QC and the operation and management structure that the project proponent will implement when starting up the project can be considered adequate. The implementation of these procedures and the operation and management structure should be verified during the first period verification of emission reductions.		OK
D.6.2. Is the authority and responsibility for registration, monitoring, measurement and reporting clearly described?	/1/	DR	The project is not yet implemented; the implementation and operation process planning for the project will be elaborated. The authority and responsibility for monitoring and reporting should be verified during the first period verification of emission reductions. In the PDD, only the aim and goal for the QA/QC procedures were described.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
D.6.3. Are procedures identified for training of monitoring personnel?	/1/	DR	It will be the supplier's responsibility.		OK
D.6.4. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR	The quality guarantee measures will include procedures for treating and correcting non-conformities in the implementation of the project and in the operation and maintenance of the system. It should be verified during the first period verification of emission reductions.		OK
D.6.5. Are procedures identified for calibration of monitoring equipment?	/1/	DR	The calibration of the measurement equipment and/or monitoring will be done periodically, according to the requirements of INMETRO (Metrology National Institute), norms applied to ABNT and the precision requirements established in the used equipment maintenance plan. It should be verified during the first period verification of emission reductions.		OK
D.6.6. Are procedures identified for maintenance of monitoring equipment and installations?	/1/	DR	A maintenance plan will be elaborated and it should be verified during the first period verification of emission reductions.		OK
D.6.7. Are procedures identified for monitoring, measurements and reporting?	/1/	DR	It should be verified during the first period verification of emission reductions.		OK
D.6.8. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR	See D.6.7		OK
D.6.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	/1/	DR	It should be verified during the first period verification of emission reductions.		OK
D.6.10. Are procedures identified for review of reported results/data?	/1/	DR	It should be verified during the first period verification of emission reductions.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
D.6.11. Are procedures identified for internal audits of GHG project compliance with operational requirements where applicable?	/1/	DR	It should be verified during the first period verification of emission reductions.		OK
D.6.12. Are procedures identified for project performance reviews before data is submitted for verification, internally or externally? See D.6.2	/1/	DR	It should be verified during the first period verification of emission reductions.		OK
D.6.13. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR	It should be verified during the first period verification of emission reductions.		OK
<b>E. Calculation of GHG Emissions by Source</b> <i>It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.</i>					
<b>E.1. Project GHG Emissions</b> <i>The validation of ex-ante estimated project GHG emissions focuses on transparency and completeness of calculations.</i>					
E.1.1. Are all aspects related to direct and indirect GHG emissions captured in the project design?	/1/	DR	IPPC's first order decay model has been applied to estimate expected LFG generation based on the historic and expected future waste volume. Based on the LFG generation rate, the CH <sub>4</sub> emissions avoided by the project are directly estimated.  According to ACM0001, CO <sub>2</sub> emissions related to the electricity and/or other energy carriers used in the project for gas pumping	CAR-1	OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
			shall be accounted for if the project does not involve electricity generation. Although the project calculates the project emissions related to the consumption of the electricity required to pump the LFG and calculates a combined margin emission coefficient according to ACM0002, this calculation does not consider the guidance provided by the EB at its 22 <sup>nd</sup> meeting.		
E.1.2. Are the GHG calculations documented in a complete and transparent manner?	/1/	DR	<p>The expected collection efficiency of the LFG recovery system and the assumed methane fraction in LFG is mentioned. However, the methane density used in the calculation was not the value that should be used in accordance to the ACM0001 methodology.</p> <p>The figures k and L<sub>0</sub> considered in the First Order Decay model were verified and considered applicable. The k and L<sub>0</sub> was calculated by using the literature “A Landfill Gas to Energy Handbook for Landfill Owners e Operators” (December 1994). The values used in the calculations are conservative.</p>	CAR-2	OK
E.1.3. Have conservative assumptions been used to calculate project GHG emissions?	/1/	DR	See E.1.2	CAR-2	OK
E.1.4. Are uncertainties in the GHG emissions estimates properly addressed in the documentation?	/1/	DR	No major uncertainties are foreseen.		OK
E.1.5. Have all relevant greenhouse gases and source categories listed in Kyoto Protocol Annex A been evaluated?	/1/	DR	The project considers all GHG gases presented in the project.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<b>E.2.Leakage</b> <i>It is assessed whether there leakage effects, i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project, have been properly assessed and estimated ex-ante.</i>					
E.2.1. Are potential leakage effects beyond the chosen project boundaries properly identified?	/1/	DR	No leakage must be considered as per ACM0001.		OK
<b>E.3.Baseline Emissions</b> <i>The validation of ex-ante estimated baseline GHG emissions focuses on transparency and completeness of calculations.</i>					
E.3.1. Have the most relevant and likely operational characteristics and baseline indicators been chosen as reference for baseline emissions?	/1/	DR	<p>The first order decay model is used for the estimation of LFG production and collection rate.</p> <p>The following input data are clearly presented in the PDD:</p> <p>Lo = methane generated potential</p> <p>R = waste received on average annually during the useful life</p> <p>K = methane generated rate</p> <p>c = landfill closing time</p> <p>t = time since initial disposal</p>		OK
E.3.2. Are the GHG calculations documented in a complete and transparent manner?	/1/	DR	See E.3.1		OK
E.3.3. Have conservative assumptions been used when calculating baseline emissions?	/1/	DR	Yes..		OK
E.3.4. Are uncertainties in the GHG emission estimates	/1/	DR	The first order decay models have an inherent uncertainty of up to 50%.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
properly addressed in the documentation?			Nonetheless, the project's parameters are considered justified and the stated emission reductions of a total 464 791 tCO <sub>2</sub> for the first 7 years crediting period are estimated using reasonable assumptions.		
E.3.5. Have the project baseline(s) and the project emissions been determined using the same appropriate methodology and conservative assumptions?	/1/	DR	Actual emission reductions will be directly measured.		OK
<b>E.4.Emission Reductions</b> <i>Validation of ex-ante estimated emission reductions.</i>					
E.4.1. Will the project result in fewer GHG emissions than the baseline scenario?	/1/	DR	The project is expected to reduce CO <sub>2</sub> emissions to the extent of 464 791 tCO <sub>2</sub> e (66 399 tCO <sub>2</sub> e/year on average) during the first renewable 7-year crediting period.		OK
<b>F. Environmental Impacts</b> <i>Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.</i>					
F.1.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/	DR	The project has an Installation and Working Licenses that demonstrate the project is in accordance with the regulations of the State of Sao Paulo /1/. The Environmental License for the LFG recovery and flaring has not been issued yet. The process to obtain this license will ensure that all possible environmental impacts are identified and mitigated. The license must be verified during the first verification.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
F.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1/	DR	Yes, the Brazilian and São Paulo State environmental legislation requires an impact assessment in order to issue necessary licences.		OK
F.1.3. Will the project create any adverse environmental effects?	/1/	DR	No significant negative impacts are anticipated for the above project.		OK
F.1.4. Are transboundary environmental impacts considered in the analysis?	/1/	DR	Not foreseen.		OK
F.1.5. Have identified environmental impacts been addressed in the project design?	/1/	DR	The project does not have any negative impacts on the environment.		OK
F.1.6. Does the project comply with environmental legislation in the host country?	/1/	DR	Not yet. It can only be verified during the initial verification.		OK
<b>G. Stakeholder Comments</b> <i>The validator should ensure that a stakeholder comments have been invited and that due account has been taken of any comments received.</i>					
G.1.1. Have relevant stakeholders been consulted?	/1/	DR	The consultations of local stakeholders were done according to the requirements of the Brazilian DNA Resolution. Relevant stakeholders were invited to comment on the project through letters sent on 3 of November to relevant entities. Appropriate media has been used.		OK
G.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	See G.1.1.		OK
G.1.3. 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?	/1/	DR	See G.1.1.		OK
G.1.4. Is a summary of the stakeholder comments	/1/	DR	See G.1.1.		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
received provided?					
G.1.5. Has due account been taken of any stakeholder comments received?	/1/	DR	See G.1.1.		OK

**Table 3 Resolution of Corrective Action and Clarification Requests**

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
<p>CAR 1</p> <p>Although the project calculates the project emissions related to the consumption of the electricity required to pump the LFG using a combined margin emission coefficient calculated according to ACM0002, this calculation does not consider the guidance given by the EB at its 22<sup>nd</sup> meeting.</p>	E.1.1	<p>The leakage of electricity consumption was calculated considering the SSECO 2002-2004 grid emission factor</p>	<p>The emission factor of electricity consumption was calculated according to the guidance of meeting of the EB22. This CAR is therefore closed.</p>
<p>CAR 2</p> <p>In the calculations of Emission Reduction, the project uses a methane density of 0.0068493 tCH<sub>4</sub>/m<sup>3</sup>CH<sub>4</sub>. In accordance with ACM0001, the standard value is 0.0007168 tCH<sub>4</sub>/m<sup>3</sup>CH<sub>4</sub>. This value must be used on calculate of Emission Reduction.</p>	E.1.2	<p>The calculation was reviewed with correct figure</p>	<p>The revised calculations are according to the methane density given in the baseline methodology ACM0001 V3. This CAR is therefore closed.</p>
<p>CL 1</p> <p>The AF of 0% and the project specifications approved by the environmental agency has to be analyzed during the site visit.</p>	B.2.1 B.2.2	<p>The PDD was revised considering an AF of 10%.</p>	<p>The justification of an AF of 10% given in the revised PDD is considered adequate. This CL is therefore closed.</p>

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