



---

# VALIDATION REPORT

---

## BRAZIL MARCA LANDFILL GAS TO ENERGY PROJECT

REPORT No.2004-0632

REVISION No. 03

DET NORSKE VERITAS



## VALIDATION REPORT

Date of first issue: 2004-05-20	Project No.: 28624550 (07)
Approved by: Einar Telnes Technical Director	Organisational unit: DNV Certification, International Climate Change Services
Client: EcoSecurities	Client ref.: Pablo Fernandez

DET NORSKE VERITAS AS

DNV Certification

Veritasveien 1,  
1322 HØVIK, Norway  
Tel: +47 67 57 99 00  
Fax: +47 67 57 99 11  
http://www.dnv.com  
Org. No: NO 945 748 931 MVA

## Summary:

DNV has performed a validation of the “Brazil MARCA Landfill Gas to Energy Project” in Brazil, on the basis of UNFCCC and host Party criteria for CDM projects, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to the Kyoto Protocol criteria and the modalities and procedures for CDM project activities as agreed in the Marrakech Accords. This validation report summarizes the findings of the validation.

The validation consists 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.

In summary, the “Brazil MARCA Landfill Gas to Energy Project”, as described in the project design document of March 2004, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the approved baseline and monitoring methodologies AM0003. Hence, DNV will request the registration of the “Brazil MARCA Landfill Gas to Energy Project” 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 voluntary participation from the DNA of the participating Parties, including confirmation by the DNA of Brazil that the project assists in achieving sustainable development.

Report No.: 2004-0632		Subject Group: Environment	
Report title: Brazil MARCA Landfill Gas to Energy Project			
Work carried out by: Luis Filipe Aboim Tavares, Susanne Haefeli			
Work verified by: Michael Lehmann			
Date of this revision: 2005-05-24	Rev. No.: 03	Number of pages: 16	

<b>Indexing terms</b>	
Key words Climate Change Kyoto Protocol Validation Clean Development Mechanism	Service Area Verification
	Market Sector
	Process Industry
<input checked="" type="checkbox"/> No distribution without permission from the client or responsible organisational unit	
<input type="checkbox"/> free distribution within DNV after 3 years	
<input type="checkbox"/> Strictly confidential	
<input type="checkbox"/> Unrestricted distribution	

© 2002 Det Norske Veritas AS

All rights reserved. This publication or parts thereof may not be reproduced or transmitted in any form or by any means, including photocopying or recording, without the prior written consent of Det Norske Veritas AS.



<b><i>Table of Content</i></b>	<b><i>Page</i></b>
1 INTRODUCTION .....	1
1.1 Objective	1
1.2 Scope	1
1.3 GHG Project Description	2
2 METHODOLOGY .....	2
2.1 Review of Documents	4
2.2 Follow-up Interviews	4
2.3 Resolution of Clarification and Corrective Action Requests	4
3 VALIDATION FINDINGS .....	5
3.1 Participation Requirements	5
3.2 Project Design	5
3.3 Baseline	5
3.4 Monitoring Plan	6
3.5 Calculation of GHG Emissions	6
3.6 Leakage	6
3.7 Environmental Impacts	7
3.8 Comments by Local Stakeholders	7
4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS .....	8
5 VALIDATION OPINION .....	14
6 REFERENCES.....	16

## [Appendix A Validation Protocol](#)

***Abbreviations***

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
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)
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MWh <sub>e</sub>	Mega watt hour equivalent
MVP	Monitoring and Verification Plan
N <sub>2</sub> O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
UNFCCC	United Nations Framework Convention for Climate Change
GWP	Global Warming Potential



## 1 INTRODUCTION

EcoSecurities Brazil Ltd. and Marca Ltd. have commissioned Det Norske Veritas Certification Ltd. (DNV) to validate the “Brazil MARCA Landfill Gas to Energy Project”, at Cariacica Municipality; Espírito Santo State, Brazil (hereafter called “the project”).

This report summarises the findings of the validation of the project, performed on the basis of UNFCCC and host Party 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:

Mr Luis Filipe Aboim Tavares	DNV Rio de Janeiro	Team leader, Waste sector expert
Mrs Susanne Haefeli	DNV Oslo	GHG auditor
Mr Michael Lehmann	DNV Oslo	Technical reviewer

### 1.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, the 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 Kyoto Protocol criteria for the CDM, the CDM rules and modalities as agreed in the Marrakech Accords and relevant decisions by the CDM Executive Board. The validation team has, based on the recommendations in the Validation and Verification Manual /3/, and 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 corrective actions may provide input for improvement of the project design.



### 1.3 GHG Project Description

The “Brazil MARCA Landfill Gas to Energy Project”, located at Cariacica Municipality, Espírito Santo State, Brazil, involves the capture and burning or flaring of landfill gas emitted from solid municipal waste of the metropolitan area of Vitória and the municipalities of Cariacica, Serra and others. More waste will be added to the Marca Landfill site until the planned closing of the site in 2017.

The project activity consists of the installation, operation and maintenance of a landfill gas capturing and flaring system. Additionally, one pilot generation set of 1 MW utilising landfill gas is being installed by 2004-2005, followed by the installation of additional gas engines and power generator sets of up to 11 MW.

Combustion and flaring combined are expected to reduce emissions of 4 859 503 tonnes of CO<sub>2</sub>e over the next 21 years. No emission reductions arising from the displacement of electricity will be claimed by the project.

## 2 METHODOLOGY

The validation consists of the following three phases:

- I a desk review of the project design and the baseline and monitoring methodology
- 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 /3/. The validation protocol consists of three tables as described in Figure 1.

The protocol shows, in a 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 completed validation protocol for the “Brazil MARCA Landfill Gas to Energy Project” is enclosed in Appendix A to this report.



<b>Validation Protocol Table 1: Mandatory Requirements</b>			
<b>Requirement</b>	<b>Reference</b>	<b>Conclusion</b>	<b>Cross reference</b>
The requirements the project must meet.	Gives reference to the legislation or agreement where the requirement is found.	This is either acceptable based on evidence provided ( <b>OK</b> ), or a <b>Corrective Action Request (CAR)</b> of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Validation report.	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.

  

<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>
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.	Gives reference to documents where the answer to the checklist question or item is found.	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.	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.	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). <b>Clarification</b> is used when the validation team has identified a need for further clarification.

  

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

Figure 1 Validation protocol tables



## 2.1 Review of Documents

The initial PDD of February 2004 /1/ and revised PDD of March 2004 /2/ submitted by EcoSecurities were reviewed. Additional background documents related to the project design and the baseline, including the approved baseline and monitoring methodology AM0003 /4/, were also consulted.

## 2.2 Follow-up Interviews

On 19 March 2004, DNV performed interviews with Marca Ltda at the landfill site at Cariacica Municipality, Espírito Santo State, Brazil, to confirm and to resolve issues identified in the document review. Moreover, the Environmental Licences, conditionings and Environmental Impact Assessment were reviewed during the site visit in order to assure the accuracy of relevant information.

The main topics of the interviews were:

- Environmental impacts & their management;
- Presence of Environmental licenses;
- Cogeneration systems;
- Calibration requirements, and;
- Quality procedures.

## 2.3 Resolution of Clarification and Corrective Action Requests

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

- i) mistakes have been made with a direct influence on project results;
- ii) CDM or host Party 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 *Clarification* may be used where additional information is needed to fully clarify an issue.

The initial validation identified three *Corrective Action Requests* and four requests for *Clarification*. In their response to these requests, the project participants sufficiently addressed all concerns raised by DNV.

To guarantee the transparency of the validation process, the concerns raised and responses given are documented in more detail in Table 3 of the validation protocol in Appendix A.





### 3 VALIDATION FINDINGS

The findings of the validation 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.

#### 3.1 Participation Requirements

The project participants are Marca Ltda of Brazil, EcoSecurities Brasil Ltda of Brazil and EcoSecurities Ltd. of the United Kingdom. The participating Parties are Brazil as the host Party and the United Kingdom as the Annex I Party. Brazil and the United Kingdom meet all relevant participation requirements.

#### 3.2 Project Design

The Brazil MARCA Landfill Gas to Energy Project has the objective to capture landfill gas emitted from the large quantities of degrading solid municipal waste of metropolitan area of Vitória, Cariacica, Serra and surrounding municipalities, which have already been deposited at the Marca landfill and which are to be added yet until the planned closing of the landfill site in 2017.

The project activity consists of the installation, operation and maintenance of the landfill gas capturing and flaring system including a pilot gas engine / generation set of 1 MW, followed by the installation of additional gas engines & power generator sets of up to 11 MW after 2005.

The project design engineering reflects good practice through the installation of several wells and a collecting system for landfill gas exhausts and leachate drainage. The gas will be burned in an adequate flaring system, or used in a generator set with a cogeneration capacity of 1 MW<sub>e</sub> during the first phase (2004-2005), expandable to 11 MW<sub>e</sub> in a second phase (from 2005). The electricity will be used internally and fed into the grid.

The project has the capacity to reduce emissions of 1 193 499 tonnes of CO<sub>2</sub>e over the first 7 years crediting period. The starting date of the project activity is 1 July 2004. A renewable crediting period of 7 years has been selected. The expected operational lifetime of the project is 21 years.

The project is expected to bring social (employment, health, and labor conditions), environmental (air quality) and economic benefits, including social activities programs like Ecological Brooms, Ecological Bricks and Nursery of Seedling Programs, thus contributing to the sustainable development objectives of the Brazilian Government.

The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Brazil.

#### 3.3 Baseline

The project applies the approved baseline methodology “Simplified Financial Analysis for Landfill Gas Capture Projects” (AM0003) /4/.

The proposed baseline uses an Internal Rate of Return (IRR) calculation to assess conservatively the financial attractiveness of the project. A set of questions justifies the assumptions that the



project is not the baseline and that the most economic course of action is the Business as Usual (BAU) scenario.

The baseline selection seems adequate and a possible change of the economic attractiveness of the project was discussed to evidence continual applicability of the baseline approach.

As required by the baseline methodology, the amount of methane destroyed in the absence of the project is captured by the Effectiveness Adjustment Factor (EAF), which is 20% by default in the methodology. The project establishes 10% instead and justifies its choice by a discussion of the closing method used on cell 1, where marble industry residue was used. This closing method could be verified during the site visit. Moreover, there is currently no Brazilian legislation requiring the recovery of landfill gas and such legislation is not likely to be implemented in the near future. Hence, the justification for applying an EAF of 20% seems reasonable. However, the EAF must be reviewed at renewal of the crediting period.

### 3.4 Monitoring Plan

The project applies the approved monitoring methodology “Simplified Financial Analysis for Landfill Gas Capture Projects” (AM0003) /4/.

The methodology considers directly monitoring the emission reductions through measurements of flared gas and the electricity generated (applying the Generator Heat rate index of 0.0357 GJ/m<sup>3</sup>CH<sub>4</sub>).

Details of the data to be collected, the frequency of data recording, its certainty, and format and storage location are described. The recording frequency of the data seems appropriate for the project. Algorithms and formulae used have also been clearly established.

The Quality Control and Quality Assurance datasheet identifies several monitoring routines, including auditing, corrective actions and data review procedures. Finally, the site’s ISO 9001 certification is expected to for year end 2004.

The number of jobs involved in Ecological Brooms, Ecological Bricks and Nursery of Seedling Programs will be monitored as sustainable development indicators of the project.

### 3.5 Calculation of GHG Emissions

The emission reductions are directly monitored and calculated, using the two-step approach of the approved methodology: Methane combustion in electricity generators and methane combustion in flares.

The calculation assures conservativeness by using the EAF of 10% and a 75% effectiveness rate for the capture equipment capacity. The figures appear to be consistent and reliable. The EAF factor will be reviewed upon renewal of the crediting period.

### 3.6 Leakage

According to the chosen methodology, the only potential source of leakage is from the emissions resulting from generating electricity used to pump the landfill gas inside the collection system. It is expected that sufficient electricity is generated with the recovered landfill gas to operate the landfill gas capture equipment. Hence, no leakage is expected.



### 3.7 Environmental Impacts

The project has an Environmental License (LP GCA 002/2003 issued on 16 January 2002 by IEMA, valid for 1460 days) and an Environmental Impact Assessment (EIA/RIMA) to install and operate the landfill gas capture equipment. During the site visit, these documents were reviewed.

Leachate of the landfill is treated. However during the site visit an effluent with very high concentration of suspended matter could be observed, which is not in compliance with environmental legislation. The main cause for this was expected be the absence of aeration units and a biofilter. An aeration unit and a biofilter to reduce the concentration of suspended matter in the leachate was foreseen to be installed until mid 2004. However, the construction was not carried out as planned.

In March 2005, Marca and EcoSecurities informed DNV that a new Previews License (LP SL 247/2004 issued on 29 December 2004 valid for 1460 days) was issued by the Environment and Hydro Resources State Institute (IEMA) for the Cariacica Landfill. This license includes a condition requiring that the installation plants for an adequate leachate treatment system must be presented until 30 April 2005. According to the register of IEMA, this plan was sent to IEMA on 5 April 2005. The project is thus in compliance with environmental legislation. However, the actual implementation of the leachate treatment system must be verified during the first periodic verification of emission reductions.

### 3.8 Comments by Local Stakeholders

The project considered the requirements of Resolution 1 of the Brazilian DNA to invite local stakeholders' comments, like the Municipal Government, the state and municipal agencies, the Brazilian forum of NGOs, neighbouring communities and the office of the attorney general.

No comments were received during the consultation period.



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

DNV Certification published the PDD of December 2004 on the DNV Climate Change web site\* and stakeholders were through the UNFCCC CDM web site invited to provide comments within a 30 days period from 24 May 2004 to 23 June 2004.

Three comments were received in this period. The comments (in unedited form) are given the below text boxes and it is described how DNV has taken due account of the comments received.

**Comment by:** Daniel B. Jones, Center for Climate Change Mitigation, Inc.

**Inserted on:** 2004-06-04

**Subject:** Landfill Gas Monitoring Methodology

**Comment:**

1. Monitoring should include continuous measurement of flame temperature in the flare. A proper temperature is a good indicator of proper flare operation and, hence, of methane destruction. Temperature measurement and recording is very easy and cheap. If the temperature is maintained within the flare manufacturer's recommended operating range, I do not believe semi-annual sampling of flare gas would be needed. In any case, a sample of gas sent to a laboratory for analysis provides only a "snapshot" of the flare performance. So it is of questionable value in any case.

If the flare temperature falls below the recommended range, the flow of gas to the flare should not be credited toward emission reductions, unless it is demonstrated that the lower temperature provides a documented partial destruction efficiency that would then be used to modify the calculation of emission reductions.

In practice, the temperature signal from the flare is often used to control the gas blower. If temperature falls below the normal operating range, the blower is turned off. This provision is not mentioned in the PDD. It would ensure that gas flow is measured to be zero when the flame is not on or is not as hot as it should be. Continuous recording of flare temperature would provide a backup method of ensuring that, even if gas continues to flow and to be measured, emission reductions are not inappropriately credited.

2. The use of "continuous" landfill gas composition measurements is inappropriate. "Continuous" measurement of methane concentration is extremely expensive. While metering systems can be installed to provide intermittent and frequent measurement, even this degree of measurement frequency is not needed. Landfill gas quality tends to change slowly, over the course of days. Normally, a daily measurement would be more than sufficient to provide adequate reliability. In rare instances, a sudden change such as a break in a pipe or "breakthrough" in the gas field that allows air to enter the collection wells, could result in a sudden change in methane concentration. Daily measurements would pick up this signal quickly enough to avoid serious miscalculation. For example if methane concentration were measured to be 50% at 10 AM yesterday and 30% at 10 AM today, applying a value of 40% for the 24 hour period from yesterday to today would not yield unacceptable errors. When a significant change is detected, prudent operators would begin

\* <http://www.dnv.com/certification/climatechange/Projects/ProjectDetails.asp?ProjectId=80>



taking more frequent measurements; e.g., hourly. They would do this as a normal course of business in seeking the cause of the sudden change and remedying it.

So, daily measurement of methane concentration should be acceptable with the proviso that more frequent measurements be taken if there are large sudden changes.

I would further argue that if the gas composition has been stable for several weeks it should be okay to go to weekly measurement of methane concentration. However, it may be appropriate in that case to require that if the methane concentration changes, the lower value (whether it is the reading immediately preceding the change or the reading immediately following the change) should be applied for the entire period between the two readings. This will provide a conservative estimate of emission reductions and allow the operator to sample gas at a frequency it determines to be most appropriate.

If the reference to "continuous" measurement is retained in PDD's, the project developer should be required to specify exactly what this term means. I find it hard to believe that they really intend to take multiple readings per second, which is what "continuous" temperature and flow meters do.

***How DNV has taken due account of the comment:***

The project correctly applies the approved monitoring methodology AM0003. Hence, no changes to the monitoring plan are required.

**Comment by:** Sudhir Sharma, Asian Institute of Technology

**Inserted on:** 2004-06-23

**Subject:** Application of methodology

**Comment:**

- (i) B2: the section should justify the applicability conditions mentioned in the AM003.
- (ii) AM003 provides four steps for identification of baseline scenario and additionality. Present PDD should use these four steps, as it purports to use AM003.
- (iii) The possible alternatives list is not exhaustive. One of the possibilities is processing of biodegradable waste prior to disposing MSW in landfill site. In absence of any reference to the policy document on MSW in Brazil it is difficult to see whether such an option is regulatory requirement or not. Also the requirement of regulation is summarily dismissed.
- (iv) IRR should be calculated using incremental investment. The PDD doesn't explain clearly whether there will be any investment for collecting and flaring gas in baseline for safety reasons. The PDD should explain the contractual conditions for the landfill operating organization. There is no transparency in this matter.
- (v) The PDD doesn't provide sufficient information on parameters of IRR estimation. Appendix 1 also has only limited information.
- (vi) The electricity tariff used for the IRR estimations is simply mentioned without adequate justification.



(vii) No reference is provided for source of information on Government bonds. It is also not adequately represented that this is the most conservative IRR. The type of bond and maturity period should be mentioned for referred Bond interest rates. Also an attempt should be made to report commercial interest rates for projects of similar nature, for example the commercial loan the project itself will avail to construct the facility.

(viii) In a number of country the governments provide subsidised interest rates for environmental projects, or capital subsidies. The project should mention what is the policy of Brazil in this regard.

***How DNV has taken due account of the comment:***

The project participants provided the below response to the comments made by Sudhir Sharma. In DNV's opinion, this response sufficiently addressed the comments made.

The response given by the project participants is given below:

*(i) Approach 48 appears to be most appropriate to investment projects. The proposed project involves a significant investment in gas collection and power generation that must compete with other such investments. It is therefore appropriate to assume that the decision between alternative baseline scenarios is based on an investment calculus. This justifies an investment or financial analysis as an appropriate baseline methodology for this type of project situation.*

*(ii) Step 1 and 2: Possible and plausible baseline scenarios*

*Alternative 1: The landfill operator could continue the current business as usual practice of not collecting and flaring landfill gas from his waste operations. In this case, no power would be generated at the sites and the Brazilian power system would remain unaffected.*

*Alternative 2: The landfill operator would invest in some LFG collection and flaring but not in power generation. The Brazilian power system would remain unaffected.*

*Alternative 3: The landfill operator would invest in a landfill gas collection system of high effectiveness, as well as a high efficiency flaring system and in LFG power generation equipment (the proposed project activity). The operation would marginally reduce the generation of power for other grid-connected sources.*

*According to the National GHG Emissions Inventory conducted by CETESB in 1994, Brazil had over 6,000 waste deposition sites, receiving over 60,000 tonnes of waste per day (please note this study is currently being updated). According to the same study, 84% of Brazil's methane emissions came from the deposition of waste in uncontrolled rubbish dumps.*

*Currently, 76% of the total waste generated in Brazil is disposed in 'rubbish dumps' ("lixões") with no management, gas collection, or water treatment whatsoever. The remaining 24% of waste is disposed in 'controlled' landfills (as opposed to 'sanitary' landfills, as planned by the project), and subject to regulation by the environmental authorities.*

*Current Brazilian legislation does not require that landfills collect and dispose of landfill gases. So far, only two landfills in Brazil, Salvador and Tremembé, located in State of Bahia and State of São Paulo respectively have been designed to collect and utilize (or even flare) the full amount of gas generated. Both landfills were financially supported by the sale of Carbon Credits.*





*In the few cases where gases are collected, this is done for safety reasons (to avoid explosions), and it is often the case that the amounts effectively collected are very low, due to high levels of leachate (which is often not drained or treated, as well) blocking the drainage pipes.*

*The implementation of environmental protection legislation in Brazil has a relatively long lead-time, and the Ministry of the Environment has no immediate plans to introduce legislation requiring the collection and flaring of landfill gas from landfill sites. Historically in Brazil there also tends to be a gulf between stated regulations and practice with regards to the implementation of environmental protection legislation.*

*Given the regulatory situation in Brazil and the location and conditions of the landfill, the realization of alternative 2 is not required and would also not be an economically attractive course of action for the landfill owner and/or operator. It is therefore not considered a plausible alternative.*

*This reduces the list of plausible alternatives to Alternative 1 (i.e. BAU) and Alternative 3 (the proposed project).*

#### *Steps 3, 4 and 5: Financial analysis and selection of baseline scenario*

*Given that the main potential financial returns derived from the collection of gas is the sale of electricity, the feasibility of this project is, thus, dependent on factors related to energy sector and to the decentralization of electricity generation in Brazil. It is necessary to conduct a financial analysis to determine whether the project is an economically attractive course of action.*

*Energy sector and electricity market: Hydro electricity accounts for an average of 81,42 per cent of national electricity production in Brazil. This high proportion in Brazil's electricity generation technology matrix was a consequence of a policy addressed at increasing Brazilian energy independence, as the country had few oil reserves and very poor coal reserves, but rich hydrology resources. In the mid 1980's, Brazil's power sector went through a serious financial crisis, leading to the interruption of construction of many power plants - mostly hydro. In 1993 decentralization of the power sector started which added to delays in implementing planned projects.*

*The current Brazilian 10-year expansion plan 2004/2012 reduces the importance of hydro in the short-term, but emphasizes its role again at the end of the period. However it is unclear how the large-scale investments will be financed, particularly in view of the trend towards decentralization of the sector. During 2001 power shortages occurred, caused by a scarcity of hydrological resources. It is unclear how this will affect the National Expansion Plan data. However, in the past couple of years there has been a push towards the introduction of thermal power to avoid future blackouts, and therefore a greater reliance on fossil fuels.*

*Historically, tariff levels have been relatively low due to a centralized pricing structure fixed by the government. While tariff increases may be expected in locations where there is a large growth in demand for electricity, such as Espirito Santo, the ability to capture such tariffs are still uncertain due to the risks of a still incipient free electricity market in Brazil.*

*In parallel to the risks related to the sale of electricity, the exact amounts of landfill gas and the performance of the plants also concerns landfill operators. Given that currently there isn't a single landfill site in Brazil generating electricity, this is seen as 'unproven' technology by local investors.*



*Financial analysis conducted for the Project using assumptions that are conservative from an investment decision point of view. The results obtained show that the Internal Rate of Return of the project without carbon finance is negative and even with the best possible conditions the MARCA project is still not an economically attractive course of action.*

*The only remaining plausible baseline scenario is Alternative 1, i.e. the continuation of the status quo (BAU) without any LFG treatment.*

*(iii) There are no regulatory requirements for MSW in Brazil. Of course there are many alternatives but vis a vis the current economic conditions of the City of Cariacica, Espirito Santo State, Brazil, the alternatives listed above are the only possible*

*(iv) Brazilian current legislation does not requires any collection of the gas collected through the project. No investment for collecting and flaring gas in baseline for safety reasons has been provided. Therefore the incremental investment is the investment considered.*

*(v) Further details on the IRR analysis were provided and validated by DNV:*

*(vi) Historically, tariff levels have been relatively low due to a centralized pricing structure fixed by the government. While tariff increases may be expected in locations where there is a large growth in demand for electricity, such as Espirito Santo, the ability to capture such tariffs are still uncertain due to the risks of a still incipient free electricity market in Brazil. Therefore, the obtention of a suitable PPA depends on several pre conditions which varies from time to time. A R\$ 120,00 tariff over the 21 year period was assumed as the most likely on the circumstances.*

*(vii) Just for reference, an extremely conservative fund of a first line bank in Brazil, based upon interbanks certificate deposits yields 23,5% per annum.*

*(viii) There is not such policy in Brazil*





**Comment by:** Luis R. Mejia, Simapro, S. A

**Inserted on:** 2004-06-23

**Subject:** Monitoring Methodology

**Comment:**

The project's activity has been very well documented for the Monitoring Methodology. The three basic elements of sustainable development have been contemplated: social aspect, economical aspect and the environmental aspect. The technical description is very appropriate for the monitoring. The technical details of the landfill's design have been presented very properly, so that the potential environmental impacts of the landfill operation can be diminished.

For the leachate, a system treatment has been proposed by lagoon. It is also necessary the monitoring of the ground waters and surface waters.

Because of the characteristics of the collected LFG, and the emissions that haven't been released to the atmosphere, these can be directly monitored.

***How DNV has taken due account of the comment:***

The monitoring of ground waters and surface waters is included as a requirement on the Environment License.



## 5 VALIDATION OPINION

*Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the “Brazil MARCA Landfill Gas to Energy Project” at Cariacica, Espírito Santo State, Brazil (hereafter called “the project”). 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 Marca Ltda of Brazil, EcoSecurities Brasil Ltda of Brazil and EcoSecurities Ltd. of the United Kingdom. The participating Parties Brazil and the United Kingdom meet all relevant participation requirements.*

*The project proposes to collect and combust or flare landfill gas (LFG) captured at the Marca Landfill. The electricity generated from landfill gas also reduces CO<sub>2</sub> emissions associated with the use of grid electricity. However, emission reductions from displacing electricity from the regional grid will not be claimed by the project.*

*The project is not expected to have considerable environmental impacts. An Environmental Impact Study as required by Brazilian law has been carried out and the project has received an environmental licence for Capture and Treatment of Landfill Gas by IEMA (Instituto Estadual de Meio Ambiente). However, leachate is not yet treated adequately and IEMA required that a plan for installing the necessary aeration units and biologic filter is presented within April 2005. According to the register of IEMA, such a plan was sent to IEMA on 5 April 2005. The project is thus in compliance with environmental legislation. However, the actual implementation of the leachate treatment system must be verified during the first periodic verification of emission reductions.*

*The project applies the approved baseline and monitoring methodology AM0003, i.e. “Simplified financial analysis for landfill gas capture projects”. 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 project applies an Effectiveness Adjustment Factor (EAF) of 10% instead of the methodologies default value of 20%. The provided justification with regard to the current closing conditions of the landfill sufficiently justifies the selected EAF.*

*By flaring or combustion of landfill gas (methane), the project results in the reduction of CH<sub>4</sub> emissions that are real, measurable and give long-term benefits to the mitigation of climate change. Given that the project is implemented as designed, the project is likely to achieve the estimated amount of emission reductions.*

*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. However no comments were received.*

*In summary, the Brazil MARCA Landfill Gas to Energy Project, as described in the project design document of February 2004, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring*



*methodologies AM0003. Hence, DNV will requests the registration of the “Brazil MARCA Landfill Gas to Energy Project” 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 voluntary participation from the DNA of the participating Parties, including confirmation by the DNA of Brazil that the project assists in achieving sustainable development.*



## 6 REFERENCES

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

- /1/ PDD of the Brazil MARCA Landfill Gas to Energy Project (Version February 2004).
- /2/ PDD of the Brazil MARCA Landfill Gas to Energy Project (Version March 2004).

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

- /3/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. <http://www.vvmanual.info>
- /4/ Approved baseline and monitoring methodology AM 0003: *Simplified Financial Analysis for Landfill Gas Capture Projects* (Version 01, 12 January 2004).

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

- /a/ Sergio Almenara Ribeiro – Manager, Marca Construtora e Serviços.
- /b/ Pablo Fernandes – EcoSecurities Brasil Ltda,
- /c/ Mirela Chiapani Souto –Project Manager, Marca Construtora e Serviços
- /d/ Breno Castilioni Marchiori - Effluent Manager, Marca Construtora e Serviços

- o0o -

## **APPENDIX A**

---

### **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	OK	Table 2, Section E.4
2. The project shall assist non-Annex I Parties in achieving sustainable development and the project shall have obtained confirmation by the host country that the project assists in achieving sustainable development	Kyoto Protocol Art. 12.2, Marrakesh Accords, CDM Modalities §40a	-	Prior to the submission of this validation report to the CDM Executive Board, DNV will have to receive 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
4. The project shall have the written approval of voluntary participation from the designated national authorities of each party involved	Kyoto Protocol Art. 12.5a, Marrakesh Accords, CDM Modalities §40a	-	Prior to the submission of this validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of the participating Parties.
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, Marrakesh Accords, CDM Modalities §43	OK	Table 2, Section B.2
7. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance	Marrakech Accords	OK	
8. Parties participating in the CDM shall designate a national	Marrakech Accords,	OK	The DNA of Brazil is the

REQUIREMENT	Reference	CONCLUSION	Cross Reference / Comment
authority for the CDM	CDM Modalities §29		Comissão Interministerial de Mudança Global do Clima. The DNA of the UK is The Department for Environment, Food and Rural Affairs
9. The host country shall be a Party to the Kyoto Protocol	Marrakech Accords, CDM Modalities §30	OK	Brazil has ratified the Kyoto Protocol on 23 August 2002. The UK ratified the Kyoto Protocol on 31 May 2002.
10. The participating Annex I Party's assigned amount shall have been calculated and recorded	Marrakech Accords, CDM Modalities §31b	OK	The UK's assigned amount is 92% of the emissions in 1990.
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	Marrakech Accords, CDM Modalities §31b	OK	The UK has in place a national registry and reported on 15 April 2004 its national GHG inventory for the years 1990-2002.
12. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received	Marrakech Accords, CDM Modalities §37b	OK	Table 2, Section G
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.	Marrakech Accords, CDM Modalities §37c	OK	Table 2, Section F
14. Baseline and monitoring methodology shall be previously approved by the CDM Methodology Panel	Marrakech Accords, CDM Modalities §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	Marrakech Accords, CDM Modalities §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	Marrakech Accords, CDM Modalities, §40		DNV Certification published the PDD of December 2004 on the DNV Climate Change web site and stakeholders were through the UNFCCC CDM web site invited to provide comments within a 30 days period from 24 May 2004 to 23 June 2004. Three comments were received in this period.
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	Marrakech Accords, CDM Modalities, §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	Marrakech Accords, CDM Modalities, §47	OK	Table 2, Section B.2
19. The project design document shall be in conformance with the UNFCCC CDM-PDD format	Marrakech Accords, CDM Modalities, Appendix B, EB Decisions	OK	PDD was received before July 2004 and confirms with version 01 of the CDM-PDD of 29 August 2002.



**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	The project is located at Cariacica Municipality, in the Espírito Santo State, Brazil		OK
A.1.2. Are the project's system (components and facilities used to mitigate GHGs) boundaries clearly defined?	/1/	DR	The project system boundaries are limited to the geographic area of Marca Landfill site which includes landfill gas capture and flaring system, gas engines and power generator sets.		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 the use top and bottom cover landfill, land fill gas recovery and electric energy production through use of landfill gas.		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 technologies in the host country?	/1/	DR	Yes, the common practice in Brazil is sanitary landfill without landfill gas treatment or only safety flaring.		OK
A.2.3. Is the project technology likely to be substituted	/1/	DR	The project is unlikely to be substituted by other		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
by other or more efficient technologies within the project period?			more efficient technologies, at least within the first seven year commitment period, due difficult of environment difficult on existing landfills.		
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 will require minimal additional training for project operation and maintenance.		OK
A.2.5. Does the project make provisions for meeting training and maintenance needs?	/1/	DR	The project documentation mention on QC/QA provisions for training		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	The project has not environment licences yet; A Environment Impact Assessment will be conducted but was not approved yet.	CAR1	OK
A.3.2. Is the project in line with host-country specific CDM requirements?	/1/	DR	The stakeholders consult according Resolution 1 of Interministerial Committee for Climate Change was not provided.	CAR2	OK
A.3.3. Is the project in line with sustainable development policies of the host country?	/1/	DR	The project is in line with current sustainable development priorities in Brazil.		OK
A.3.4. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR	Only for environmental benefits.	CL 1	OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<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 Methodology Panel?	/1/	DR	The project applies the approved baseline methodology called "Simplified financial analysis for landfill gas capture projects" (AM0003).		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 project fulfils the condition under which AM 0003-rev is applicable.		OK
<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	The chosen baseline considered the similar BAU scenario in Brazil including, legal framework, business environment, type, scope, etc.		OK
B.2.2. Has the baseline been determined using conservative assumptions where possible?	/1/	DR	The baseline considers IRR evaluation, and according comments of CDM EB for AM003 the project analyse with overestimated financial parameters.		OK
B.2.3. Has the baseline been established on a project-specific basis?	/1/	DR	Yes, baseline used has been already approved by the CDM Executive board and is applicable to		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			this project (See B.1.1)		
B.2.4. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR	Yes, the baseline methodology comprises seven steps including relevant information review as sectoral policies, environment legislation, and financial considerations.		OK
B.2.5. Is the baseline determination compatible with the available data?	/1/	DR	Yes, according calculation of IRR and related details available on complementary datasheet..		OK
B.2.6. Does the selected baseline represent the most likely scenario among other possible and/or discussed scenarios?	/1/	DR	Yes		OK
B.2.7. Is it demonstrated/justified that the project activity itself is not a likely baseline scenario (e.g. through (a) a flow-chart or series of questions that lead to a narrowing of potential baseline options, (b) a qualitative or quantitative assessment of different potential options and an indication of why the non-project option is more likely, (c) a qualitative or quantitative assessment of one or more barriers facing the proposed project activity or (d) an indication that the project type is not common practice in the proposed area of implementation, and not required by a Party's legislation/regulations)?	/1/	DR	Yes, the PDD on section B.3 includes a series of questions that justify why the project is not a likely baseline scenario, by means of an investment analysis.		OK
B.2.8. Have the major risks to the baseline been identified?	/1/	DR	Yes, Electric Energy Policy for small producers, economic and financial conditions reverting IRR attractive, for what was established review by expert each renew period.		OK
B.2.9. Is all literature and sources clearly referenced?	/1/	DR	Yes		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<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	Yes, the project start date is 2004-07-01 with an expected operation lifetime 21 years.		OK
C.1.2. Is the assumed crediting time clearly defined and reasonable (renewable crediting period of max. two x 7 years or fixed crediting period of max. 10 years)?	/1/	DR	7 years crediting period starting 2004-08-01 has been chosen with the potential for renewal twice.		OK
<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 Methodology Panel?	/1/	DR	The project applies the approved monitoring methodology called "Simplified financial analysis for landfill gas capture projects" (AM0003).		OK
D.1.2. Is the monitoring methodology applicable for this project and is the appropriateness justified?	/1/	DR	Yes, The emission reduction could be measured directly unless the baseline is not practically.		OK
D.1.3. Does the monitoring methodology reflect good monitoring and reporting practices?	/1/	DR	Yes, the monitoring considers the measurements on electric energy production and calculates the used LFG/CH4 and measurements of LFG/CH4	CAR 3	OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			burn on flare. As defined by AM003 methodology, the project considers reduction with Effectiveness Adjustment Factor. However the methodology consider as default for EAF 20%. The project considers 10%. DNV request more explanation to justify.		
D.1.4. Is the discussion and selection of the monitoring methodology transparent?	/1/	DR	Yes		OK
<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	The monitoring plan includes the main figures of emissions on electric generation and LFG flaring except for pressure and temperature, what was mentioned by AM 003. Also no comment is available about electric energy to exhaust LFG.	CL2	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 achieved emission reductions?	/1/	DR	Yes		OK
D.2.5. Will the indicators enable comparison of project data and performance over time?	/1/	DR	Yes		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<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	There is not leakage addressed in the baseline, Other emission not attributable to the project is insignificant.		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 foresees the assessment of Effectiveness Adjustment Factor and Assessment of Electric Generation becoming an attractive course of action.		OK
D.4.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/	DR	Yes		OK
D.4.3. Will it be possible to monitor the specified baseline indicators?	/1/	DR	Yes		OK
<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	<p>Although the PDD mentioned several and environmental initiatives, no social indicators were observed.</p> <p><i>Final Conclusion:</i> Annex 8 of the revised PDD (Version of March 2004 sent at 15/04/2004) identify three social programs which was</p>	CL1	OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			confirmed during validator team site visit.		
D.5.2. Is the choice of indicators for sustainability development (social, environmental, economic) reasonable?	/1/	DR	As in D.5.1		
D.5.3. Will it be possible to monitor the specified sustainable development indicators?	/1/	DR	As in D.5.1		
D.5.4. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR	As in D.5.1		
<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	Marca Ltda. Is not clearly identified.	CL3	OK
D.6.2. Is the authority and responsibility for registration, monitoring, measurement and reporting clearly described?	/1/	DR	Yes, as indicated in the QC/QA procedures		OK
D.6.3. Are procedures identified for training of monitoring personnel?	/1/	DR	Yes, as indicated in the QC/QA procedures		OK
D.6.4. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR	No GHG emission relevant emergency situations are expected to occur.		OK
D.6.5. Are procedures identified for calibration of monitoring equipment?	/1/	DR	Yes, as indicated in the QC/QA procedures		OK
D.6.6. Are procedures identified for maintenance of monitoring equipment and installations?	/1/	DR	Yes, as indicated in the QC/QA procedures		OK
D.6.7. Are procedures identified for monitoring, measurements and reporting?	/1/	DR	Yes, as indicated in the QC/QA procedures		OK
D.6.8. Are procedures identified for day-to-day records	/1/	DR	Yes, as indicated in the QC/QA procedures		OK

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



CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
handling (including what records to keep, storage area of records and how to process performance documentation)					
D.6.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	/1/	DR	Yes, as indicated in the QC/QA procedures		OK
D.6.10. Are procedures identified for review of reported results/data?	/1/	DR	Yes, as indicated in the QC/QA procedures		OK
D.6.11. Are procedures identified for internal audits of GHG project compliance with operational requirements where applicable?	/1/	DR	Yes, as indicated in the QC/QA procedures		OK
D.6.12. Are procedures identified for project performance reviews before data is submitted for verification, internally or externally?	/1/	DR	Yes, as indicated in the QC/QA procedures		OK
D.6.13. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR	Yes, as indicated in the QC/QA procedures		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. Predicted Project GHG Emissions</b>					
<i>The validation of predicted 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	The methodology considers reduction emissions direct measurement/calculation. The project consider only source of fugitive		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			emissions from landfill and has been assumed 75% efficiency collection of LFG.		
E.1.2. Are the GHG calculations documented in a complete and transparent manner?	/1/	DR	Yes		OK
E.1.3. Have conservative assumptions been used to calculate project GHG emissions?	/1/	DR	The project considers EAF = 10% in disagreement with AM 003. DNV request more justification.	CAR 3	OK
E.1.4. Are uncertainties in the GHG emissions estimates properly addressed in the documentation?	/1/	DR	Yes, it was assumed that the gas collection system will collect 75% of the total amount of gas produced by the landfill.		OK
E.1.5. Have all relevant greenhouse gases and source categories listed in Kyoto Protocol Annex A been evaluated?	/1/	DR	Only methane has been considered.		OK
<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.</i>					
E.2.1. Are potential leakage effects beyond the chosen project boundaries properly identified?	/1/	DR	There is no leakage addressed in the baseline		OK
<b>E.3.Baseline Emissions</b> <i>The validation of predicted 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	Not applicable, because emission reduction are directly calculated		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<b>E.4.Emission Reductions</b> Validation of baseline GHG emissions will focus on methodology transparency and completeness in emission estimations.					
E.4.1. Will the project result in fewer GHG emissions than the baseline scenario?	/1/	DR	Yes. The project is expected to abate during life time emissions around of 4,19 10 <sup>6</sup> tCO <sub>2</sub> .		
<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	Yes		OK
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, EIA was presented for Environment Licence issue, however it is not approved and the licence was not issued.	CAR 1	OK
F.1.3. Will the project create any adverse environmental effects?	/1/	DR	The main impact of landfill is leachate, what has a treatment station included on project. However during site visit was verified effluent with high suspend matter contend, due no aeration unit and biologic filter had been installed yet.	CL4	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	Yes		OK
F.1.6. Does the project comply with environmental legislation in the host country?	/1/	DR	As in F.1.2	CAR 1	OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<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	Not Yet.	CAR 2	OK
G.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	As in G.1.1		
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	As in G.1.1		
G.1.4. Is a summary of the stakeholder comments received provided?	/1/	DR	As in G.1.1		
G.1.5. Has due account been taken of any stakeholder comments received?	/1/	DR	As in G.1.1		

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

**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
<b>CAR 1</b> The project has not environment licences yet. A Environment Impact Assessment will be conducted, but was not approved yet.	<b>A.3.1/F.1.2/ F.1.6</b>	All the licenses were checked by the valuator and also disposable in annex 6 from PDD (pages 58 and 59).	OK. Annex 6 of the revised PDD (Version of March 2004 sent on 15/04/2004) gives sufficient evidence on environment licences.
<b>CAR 2</b> The stakeholders consultation according Resolution 1 of Interministerial Committee for Climate Change was not provided.	<b>A.3.2/G.1.1</b>	The stakeholders consult was already done, and no comments were received during the 30 days period. All the steps and procedures are described in chapter G (pages 35 and 36)	OK. Section G1 of the revised PDD (Version of March 2004 sent on 15/04/2004) gives sufficient evidence of stakeholders consultation.
<b>CAR 3</b> The methodology consider as default for EAF 20%. The project considers 10%. DNV request more explanation to justify.	<b>D.1.3/E.1.3</b>	The estimation of the adjustment factor for this project was based on the regulatory requirements imposed on MARCA (the landfill operator) at the time they signed a contractual agreement with the Municipal waste management company to operate the landfill and by the practices that MARCA have been doing before the MDL project proposal.. In essence, MARCA is not required to flare any amount of the gas that it currently emits. There is no legislation or contractual terms that require the flaring of landfill gas. Currently, cell 1 of the site, the unique totally project before the MDL project proposal, doesn't even have gas collection wells, while Cell 2 has 12 wells (very insufficient) just for safety purpose, and Cells 3 and 4 will also have wells for safety purposes only. Currently, the company has already a small flare in Cell 2, as a pilot for the gas collection and emissions measurements of the project that will be implemented with carbon finance. When a cell is full, and the activities are closing,	OK: The methodology to close the landfill cell, using marble waste, and what was been verified during validation team site visit, can be considered effective to avoid methane permeation, and the justify the LFG of 10%.

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
		<p>MARCA seals the cell with marble industry residue dust layer, then a clay layer and finally vegetation recovering the entire cell. With these actions the oxygen disposable to the cell will be very small, hindering spontaneous combustion and methane oxidation. For this reason, the adjustment factor for the project was fixed at 10%.</p> <p>The effectiveness adjustment factor will need to be revised at the time of each baseline revision (at the end of each baseline crediting period), by estimating the amount of GHG flaring taking place as part of common industry practices at that point in the future (For more details see pages 14, 15, 21 and 22).</p>	
<p><b>CL 1</b> No social indicators were observed</p>	<p><b>A.3.4/D.5.1</b></p>	<p>During the visit, the valuator observed some social projects and activities related with the landfill activities. The description of social indicators are in annex 8 (pages 61-64).</p>	<p>Annex 8 of revised PDD (Version March 2004 sent on 15/04/2004) identifies three social programs (Ecological brooms, Ecological Bricks, Nursery of seedlings) which were verified during site visit and could be considered good evidence for social commitment.</p>
<p><b>CL 2</b> The monitoring plan includes the main figures of emissions on electric generation and LFG flaring except for pressure, what was mentioned by CDM-EB on NM0005 approve</p>	<p><b>D.2.1</b></p>	<p>The section D.3 indicates all the data to be collected, including pressure and temperature of landfill gas to flares (see pages 23-25)</p>	<p>OK. Section D3 of the revised PDD (Version of March 2004 sent on 15/04/2004) show inclusion of complementary monitoring parameters and comply with methodology.</p>
<p><b>CL 3</b> Marca Ltda. Is not clearly identified as responsible of project management.</p>	<p><b>D.6.1</b></p>	<p>In section A.3, called "Project Participants", is clearly defined MARCA as the responsible for the project management and as the credit owner (see pages 5 and 6)</p>	<p>OK. Section A3 of the revised PDD (Version of March 2004 sent on 15/04/2004) gives sufficient information.</p>

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
<b>CL 4</b> The main impact of landfill is leachate, what has a treatment station included on project. However during site visit was verified effluent with high suspend matter contend, due no aeration unit and biologic filter had been installed yet.	<b>F.1.3</b>	The biologic filter are being installed, according Project and environment register n° 2901/04.	OK. The installation of biologic filter and effectiveness of leachate treatment should be confirmed at verification process.
<b>CL4 (continued)</b> The installation of biologic filter and effectiveness of leachate treatment should be confirmed at verification process.		In March 2005, Marca and EcoSecurities informed DNV that a new Previews License (LP SL 247/2004 issued on 29 December 2004 valid for 1460 days) was issued by the Environment and Hydro Resources State Institute (IEMA) for the Cariacica Landfill. This license includes a condition requiring that the installation plants for an adequate leachate treatment system must be presented until 30 April 2005.	OK. According to the register of IEMA, the plan requested by LP 247 was sent to IEMA on 5 April 2005. The project is thus in compliance with environmental legislation. However, the actual implementation of the leachate treatment system must be verified during the first periodic verification of emission reductions

- o0o -