CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Organoeste Dourados & Andradina Composting Project
PDD Version Number 03
25/08/2009 (DD/MM/YYYY)

A.2. Description of the small-scale project activity:

The Organoeste Dourados & Andradina Composting Project (hereafter, the "Project") developed by Organoeste Franchising Ltda. (hereafter referred to as the "Project Developer") is a composting of organic waste project in Dourados City, State of Mato Grosso do Sul and Andradina City, State of São Paulo, in Brazil, hereafter referred to as the "Host Country".

The Project Developer is a Brazilian company that was created to deal with environmental projects, mainly in the waste management area. This company is increasing its operations and will, in the future, be able to manage projects encompassing environmental rehabilitation, conservation and education as well as the various stages of waste management.

This project activity intends to aerobically compost organic waste from nearby companies, mainly agro-industrial residues but may include urban solid waste. This waste will be transformed into organic fertilizers to be sold for use in agriculture, on its own, or in conjunction with chemical fertilizer, therefore not being disposed in a landfill/solid waste disposal site or subjected to any other type of anaerobic condition, consequently not resulting in methane emission. The Project Developer will use a Patented Biotechnological Extract (Biotechnological Catalyst Extract HSNI) in order to decompose the organic matter faster than under conventional composting.

As with many developing countries, the destination of this waste in the majority of Brazil's cities is its landfills. And as there is no Brazilian regulation obliging landfill gas capture, most of these landfills do not take any methane emissions avoidance measures. In the two landfills just beside the project activity, there is no system for capture and destruction of methane, thus, in the baseline, the biomass composted would be sent to a landfill, generating methane that would be directly released to the atmosphere.

The project has a forecasted average daily input of around 230 tonnes per day of organic waste, reaching about 85,000 tonnes of organic waste processed per year. This amount is expected to generate about 68,000 tonnes of product (compost) per year. The composting process will avoid the displacement of waste in the landfill, avoiding the generation of a big amount of methane, thus reducing the GHG (Greenhouse Gas) emissions.

The main benefit of this Project, both environmental and social, is to provide an alternative treatment solution for waste that was going to be dumped in landfills. The compost also replaces fertilized soil (where soil is mixed with animal feces, mainly from chicken and cattle) which is commonly used as a fertilizer instead, making this soil available for other uses.

Moreover, the project is helping the Host Country fulfill its goals of promoting sustainable development. Specifically, the project:

- Prevents uncontrolled GHG emissions from waste that would have been disposed of at a landfill;
- Reduces the amount of land used for waste dumping and improves public sanitation by eliminating the problem of disposal of organic wastes in surrounding areas;

- Prevents water and air pollution;
- Provides a product that can be used in organic agriculture (resulting in more healthy agro-products) and can minimize or battle against soil degradation;
- Increases employment opportunities in the area where the project is located, both temporary (during installation works) and permanent (to operate the composting plant);
- It will strengthen Brazil's economy by contributing to additional employment, waste disposal alternatives and tax revenues;
- It will demonstrate replicable clean and efficient technology, and conserves natural resources.

A.3. Project participants:

Name of Party involved (*)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant
Brazil (host)	Organoeste Franchising Ltda.	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities International Limited	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

EcoSecurities International Limited is the official contact for the CDM project activity. Further contact information for the project participants are provided in Annex 1 of this document.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Brazil (host country)

A.4.1.2. Region/State/Province etc.:

Dourados: Mid-West Region, State of Mato Grosso do Sul
Andradina: Southeast Region, State of São Paulo

A.4.1.3. City/Town/Community etc:

Dourados City (State of Mato Grosso do Sul) & Andradina City (Bairro Zona Rural, State of São Paulo)

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project is located at two of the Organoeste Franchising Ltda.'s sites, one located in Avenida Quatro, s/n, Lotes E/F, Quadra 12, Caixa Postal 1001, CEP 79.830-970, in the municipality of Dourados (Coordinates: 22°18'39"S, 54°46'37"W), State of Mato Grosso do Sul; the other located in Estrada Municipal do Jaó, Km 05 + 300 m, s/nº, Estância Nossa Senhora Aparecida, Bairro Zona Rural, CEP 16900-000, in the municipality of Andradina, (Coordinates: 20°53'07 "S, 51°19'14"W), State of São Paulo. See below for the maps of the respective states.

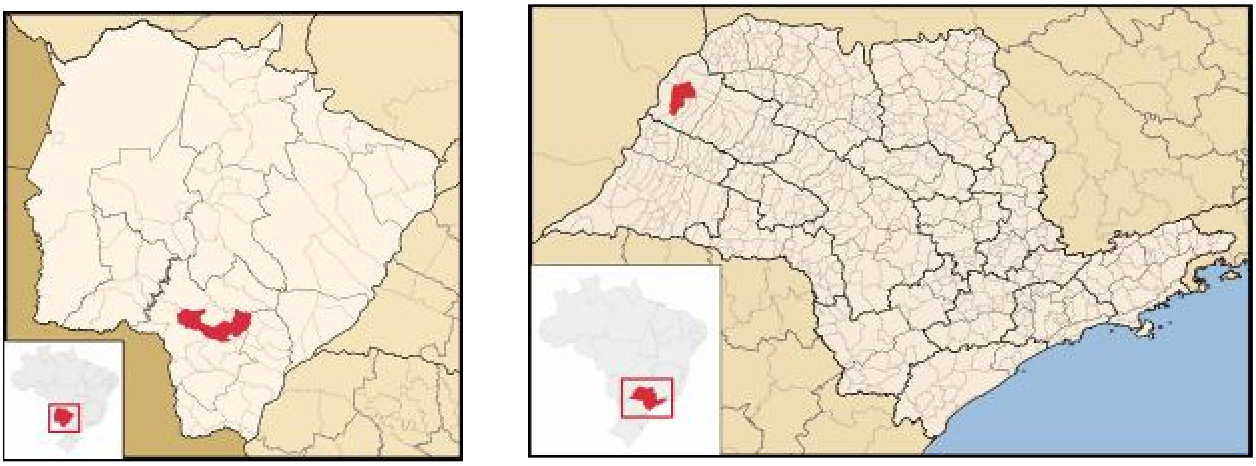

Figure: Physical location of Dourados City (red, left), in State of Mato Grosso do Sul, Mid-West Brazil[1]; and Andradina City (red, right), in State of São Paulo, Southeast Brazil[2].

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

According to Annex A of the Kyoto Protocol, this project fits in Sectoral Category 13 (Waste Handling and Disposal)[3].

This methodology comprises measures to avoid the emissions of methane to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site. In the project activity, controlled biological treatment of biomass is introduced through aerobic treatment by composting and proper soil application of the compost. As shown in section A.4.3, the project results in emission reductions of less than or equal to 60 kt CO2 equivalent annually, thus fitting in methodology AMS-III.F.

According to Monteiro (1999, *apud* Azevedo, 2000), there are two possible ways to perform a composting process: anaerobic and aerobic. The basic reaction and products of both are described below:

Anaerobic process

Organic Matter + Microorganisms → CO_2 + H_2O + CH_4 + NH_3 + Other Reduced Products + Microorganisms

Aerobic process

Organic Matter + Microorganisms + O_2 → CO_2 + H_2O + Other Oxidized Products + Microorganisms

The composting process used in this project activity is based on the aerobic decomposition of the organic matter. Besides the numerous benefits of composting, the aerobic process produces fewer unpleasant odors and does not generate methane.

[1] http://pt.wikipedia.org/wiki/Imagem:MatoGrossodoSul_Municip_Dourados.svg

[2] http://pt.wikipedia.org/wiki/Imagem:SaoPaulo_Municip_Andradina.svg

[3] http://cdm.unfccc.int/DOE/scopes.html#1

The technology applied is based on the utilization of a specific mix of microorganisms and compounds (Biotechnological Catalyst Extract HSNI) that promotes the **Humification** (decomposition of the organic matter), **Nitrification** (fixation of nitrogen), **Solubilization** (mineralization of substances) and **Sterilization** (inactivation of pathogens by means of heat) of the material.

The above mentioned Extract is patented under the Brazilian National Institute of Industrial Property (INPI), registry number PI-0504277-1 A. Its formulae is described in the patent description, and consists basically of several samples of microorganisms (more than 60 species, including fungi, bacteria and yeast) and other compounds that, together, aim to decompose aerobically organic residues and make all nutrients available to be used by plants, therefore producing a powerful natural fertilizer. The innovation of this Catalyst bioextract is the speed of biodegradation, occurring in 15 to 21 days.

The Biotechnological Catalyst Extract HSNI was developed in Japan, and patented by Sérgio Massao Watanabe, one of the partners and founders of Organoeste Franchising Ltda.. This Bioextract is in constant evolution, as the project developer has an agreement with University of São Paulo (USP) to research and study this product and its effects, in order to further develop it and adapt it to Brazilian conditions. The project activity represents an important process of technology transfer to improve the waste management practice in Brazil.

The technology proposed for the composting plant can be regarded as a new technology to Brazil, and of course, both Mato Grosso do Sul and São Paulo States, to the Mid-west and Southeast regions. However, there are already environmental licenses supplied to Organoeste Units and the soil fertilizer produced by Organoeste is registered in the Brazilian Ministry of Agriculture.

This technology uses a different composting process, shorter than the normal given a special kind of Bioextract (as described above), creating the market perception that the compost composition is very different to standard compost types. Because of this, the project developer has sites certified by Ecocert Brasil (a subsidiary of Ecocert S.A.), specialized in the certification of organic products, to produce organic compounds to Brazilian, European Union and United States standards. This fact shows the commitment of this company to the chosen technology and demonstrates that the technology can work as expected.

The basic procedure for this technology is detailed below. All new staff undergo thorough specific training to know how to operate the composting plant.

- The organic residue is piled as soon as it gets to the unit.
- With the piles formed, the microorganisms are added to the pile and the project developer's unique composting process begins;
- Type of aeration: the composting pile will be regularly turned over, the height of the pile will be limited and the turnover of the pile will be made slowly in order to maximize the oxygen content inside the composting slot where the aerobic process occurs;
- The composting pile will have key parameters monitored as stated in section B.7.1, in order to ensure the oxygen content remains higher than 10%;
- One tonne of organic waste net input will result approximately 600 kg to 800 kg of compost;

This technology is differentiated from other technologies used in Brazil because of the following points:

- The speed of the transformation of the waste. The product is transformed within 15 to 21 days, which is faster than other common composting processes;
- Other chemicals can be added to the final compost, adapting the product to specific needs;
- The final compost has beneficial complex of microorganisms that interact with the soil, promoting an increase of meso and microfauna.

Therefore, it is proven that this technology is safe and sound, with no associated negative impacts.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The project activity aims to reduce GHG emissions by avoiding the production of methane in landfills. This goal is achieved by avoiding dumping organic matter at the landfill and, instead, treating this waste aerobically.

Table - estimated emissions reductions from the project:

Years			Annual estimation of emission reductions in tonnes of CO2e
Jul 2010	-	Jun 2011	7 444
Jul 2011	-	Jun 2012	19 039
Jul 2012	-	Jun 2013	27 651
Jul 2013	-	Jun 2014	34 178
Jul 2014	-	Jun 2015	39 234
Jul 2015	-	Jun 2016	43 239
Jul 2016	-	Jun 2017	46 484
Total estimated reductions (tonnes of CO2e)			**217 269**
Total number of crediting years			**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)			**31 038**

A.4.4. Public funding of the small-scale project activity:

The project will not receive any public funding from Parties included in Annex I of the UNFCCC.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

De-bundling is the fragmentation of a large project activity into smaller parts. As the project participants are already working on developing more registered SSC project activities, the “Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities” was applied. The criteria to evaluate if the project is an example of de-bundling are the following:

Table – De-bundling criteria

Category	Yes	No
Same participants in both projects	X	
Same project category and technology/measure in both projects	X	
Registered within the previous 2 years	X	
Project boundary within 1 km of the project boundary of the other project		X

Only a project that complies with all categories above can be considered a de-bundling. The other possible project activities are all in different cities, with project boundary with more than 1 km from the project boundary of the other possible projects. Therefore, this project activity is not considered de-bundled.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

The project uses approved small scale methodology AMS-III.F. ("Avoidance of methane emissions through controlled biological treatment of biomass"), Version 8, Valid from 31 Jul 09 onwards.

For first order decay model and methane avoidance calculations, AMS-III.F. refers to the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site", Version 4, EB 41 Meeting Report

For calculations of Grid Emission Factor, AMS-III.F. refers to AMS-I.D. (Grid connected renewable electricity generation), Version 14, Valid from 31 Jul 09 onwards. For its part, AMS-I.D. refers to the "Tool to calculate the emission factor for an electricity system", Version 1.1, from EB 35 Meeting Report.

B.2 Justification of the choice of the project category:

The project qualifies as a small-scale project activity (SSC) and will remain under the limits of the cap of 60,000 tCO_2 for type III projects during every year of the crediting period. Section B.6.4 shows the estimated values for project and baseline emissions for this project activity.

The project activity consists of aerobically compost waste that, in the absence of the project activity, was going to be dumped in a landfill, thus falling under the type III SSC project category.

The project meets all the applicability criteria as set out in the methodology. AMS-III.F. is applicable where:

Criteria	Pass	Justification
This methodology comprises measures to avoid the emissions of methane to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site. In the project activity, controlled biological treatment of biomass is introduced through one, or a combination, of the following measures: (a) Aerobic treatment by composting and proper soil application of the compost; (b) Anaerobic digestion in closed reactors equipped with biogas recovery and combustion/flaring system.	Yes	The project activity avoids the emissions of methane to the atmosphere from organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site through an aerobic treatment by composting and proper soil application of the compost.
The project activity does not recover or combust landfill gas from the disposal site (unlike AMS-III.G), and does not undertake controlled combustion of the waste that is not treated biologically in a first step (unlike AMS-III.E).	Yes	The project activity does not recover or combust landfill gas and does not undertake controlled combustion of the waste that is not treated biologically.

Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	Yes	The project activity will remain below the 60kt CO_2 limit as shown in section B.6.4.
This methodology is applicable to the treatment of the organic fraction of municipal solid waste and biomass waste from agricultural or agro-industrial activities. The treatment of manure is not eligible under this methodology.	Yes	Only organic waste from municipal, agricultural and agro-industrial will be treated.
This methodology includes construction and expansion of treatment facilities as well as activities that increase capacity utilization at an existing facility. For project activities that increase capacity utilization at existing facilities, project participant(s) shall demonstrate that special efforts are made to increase the capacity utilization, that the existing facility meets all applicable laws and regulations and that the existing facility is not included in a separate CDM project activity. The special efforts should be identified and described.	Yes	The project activity comprises the construction of a new plant.
This methodology is also applicable for co-treating wastewater and solid biomass waste, where wastewater would otherwise have been treated in an anaerobic wastewater treatment system without biogas recovery. The wastewater in the project scenario is used as a source of moisture and/or nutrients to the biological treatment process e.g., composting of empty fruit bunches (EFB), a residue from palm oil production, with the addition of palm oil mill effluent (POME) which is the wastewater co-produced from palm oil production.	N/A	Not applicable, as the project scenario does not comprises co-treatment.
The location and characteristics of the disposal site of the biomass in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions. Guidance in paragraphs 4, 6 and 7 in AMS-III.E shall be followed in this regard.	Yes	The location and characteristics of the disposal site are explained in section B.6.1 .
In case residual waste from the biological treatment (slurry, compost or products from those treatments) are handled aerobically and submitted to soil application, the proper conditions and procedures (not resulting in methane emissions) must be ensured.	Yes	The only residual waste from the project is the compost. This is a product from the company that uses it as a source of revenues. The compost will be sold to be used as fertilizer, thus the aerobic conditions will be ensured.
In case residual wastes from the biological treatment (slurry, compost or products from those treatments) are treated	N/A	Residual waste will not be treated thermally/mechanically. Only composting will be used to treat the waste.

thermally/mechanically, the provisions in AMS-III.E related to thermal/mechanical treatment shall be applied.		
In case residual waste from the biological treatment (slurry, compost or products from those treatments) are stored under anaerobic conditions and/or delivered to a landfill, emissions from the residual waste shall to be taken into account and calculated as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site".	N/A	The project activity does not involve anaerobic digestion; therefore no methane is produced by this source. The residual waste (compost) will be sold to be used as fertilizer.
For project activities involving controlled anaerobic digestion and production of biogas, technical measures shall be used (e.g., flared, combusted) to ensure that all biogas produced by the digester is captured and gainfully used or combusted/flared.	N/A	The project activity does not involve anaerobic digestion; therefore no methane is produced by this source.
The recovered biogas from anaerobic digestion may also be utilised for the following applications instead of flaring or combustion: (a) Thermal or electrical energy generation directly; or (b) Thermal or electrical energy generation after bottling of upgraded biogas; or (c) Thermal or electrical energy generation after upgrading and distribution using one of the following options: (i) Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; or (ii) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or (d) Hydrogen production.	N/A	The project activity does not involve anaerobic digestion; therefore no methane is produced by this source.
If the recovered biogas is used for project activities covered under paragraph 12 (a), that component of the project activity shall use a corresponding category under Type I.	N/A	The project activity does not involve the recovery of biogas.
If the recovered biogas is used for project activities covered under paragraph 12 (b) or 12 (c) relevant provisions in AMS-III.H related to upgrading of biogas, bottling of biogas, injection of biogas into a natural gas distribution grid and transportation of biogas via a dedicated piped network shall be used.	N/A	The project activity does not involve the recovery of biogas.

The project activity meets all the conditions above and is therefore applicable to the methodology.

B.3. Description of the project boundary:

According to AMS-III.F. the project boundary is the physical, geographical site:

- where the solid waste would have been disposed and the methane emission occurs in absence of the proposed project activity;
- where the treatment of biomass through composting takes place;
- where the residual waste from biological treatments (compost), is handled, disposed, submitted to soil applications and the itineraries between them, where the transportation of compost occurs.

According to the "General guidance" from the "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories"[4], the project boundary shall be limited to the physical project activity.

Therefore, the boundary of the present project activity comprises Dourados landfill and Andradina landfill, the composting unit, the clients that buy the compost and the itineraries between these places.

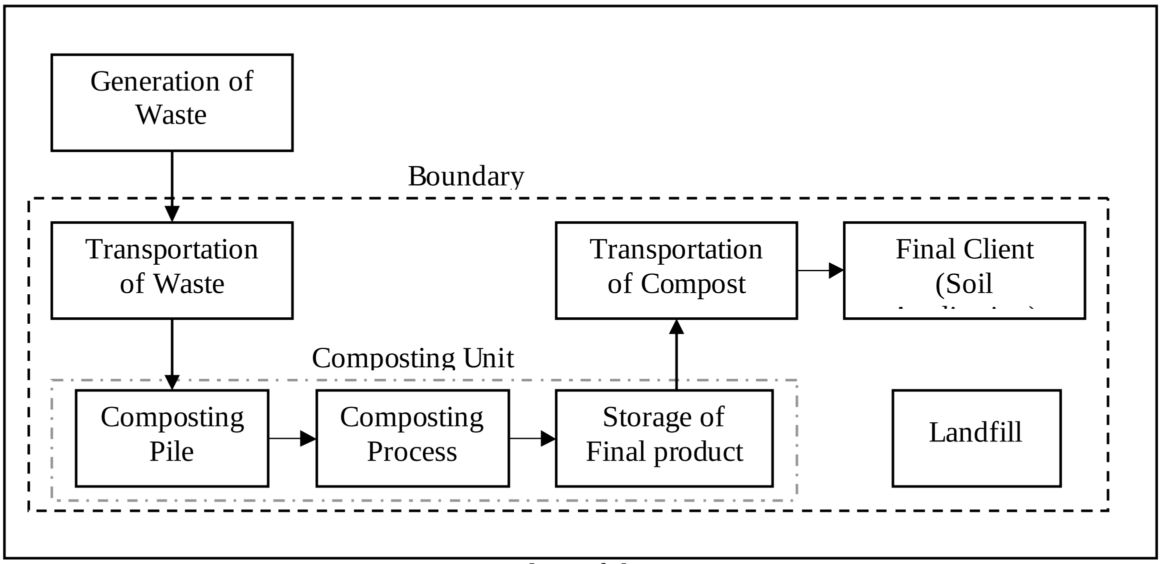

Figure: Boundary of the project activity.

Each unit will have the best suitable configuration of equipment to its needs. Basically, each composting facility will have a Loader (to manipulate the waste and the compost), a system of Conveyor Belts (according to each configuration, to transport the waste/compost between equipments), a sieve (to prevent that big pieces goes to the final compost pile; the big pieces go back to the waste pile and undergo through the composting process again) and a packing machine (to separate the compost into bags to be sold).

The table below presents in a detailed way what sources of emission are considered and what are not in the emission reduction calculation.

[4] http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_gnal_guid.pdf

Table: Sources and gases included in the project boundary

	Source	Gas	Status	Justification / Explanation
Baseline	Emissions from decomposition of waste at the landfill site	CH_4	Included	The major source of emissions in the baseline
		N_2O	Excluded	N2O emissions are small compared to CH4 emissions from landfills. Exclusion of this gas is conservative.
		CO_2	Excluded	CO2 emissions from the decomposition of organic waste are not accounted.
	Emissions from electricity consumption	CO_2	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Emissions from thermal energy generation	CO_2	Excluded	No thermal energy consumption in the baseline.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Emissions from the waste transportation to the landfill	CO_2	Included	The waste was transported to the landfill by trucks in the baseline.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
Project Activity	On-site fossil fuel consumption due to the project activity other than for electricity generation	CO_2	Included	It includes mainly vehicles used on-site.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from onsite electricity use	CO_2	Included	There is electricity consumption from the grid.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Direct emissions from the waste treatment processes.	N_2O	Excluded	N2O emissions from the decomposition or combustion of organic waste are not accounted.
		CO_2	Excluded	CO2 emissions from the decomposition or combustion of organic waste are not accounted.
		CH_4	Included	The composting process may not be complete and result in anaerobic decay.
	Emissions from waste water treatment	CO_2	Excluded	CO2 emissions from the decomposition of organic waste are not accounted.
		CH_4	Excluded	The wastewater treatment do not result in CH4 emissions.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from waste transportation to the composting site and of the compost to the final users	CO_2	Included	There will be an increase in transportation emissions due to the project.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

B.4. Description of baseline and its development:

Both heat and electricity may be considered as the same in all scenarios, as the present project activity does not comprise any changes in these components. In the Baseline and Project scenarios, the electricity is bought from the Brazilian Interconnected Grid and there is no need for heat. The only change is in the treatment of organic waste, the alternatives below are identified as realistic:

Four alternatives to the project scenario are considered:

Alternative 1: The proposed project activity without CDM. Organic waste composting identical to the proposed project, but not undertaken as a CDM project activity. Methane production would be avoided by breaking down organic matter through aerobic processes. Composting includes processes of waste separation, composting and monitoring, which requires advanced technology and, therefore, a high initial capital investment and associated operational and maintenance costs. Moreover, the sales of generated compost face marketing risks.

Alternative 2: Continuation of current practices. Disposal of the waste on a landfill (in this case, Dourados landfill and Andradina landfill) without the capture of landfill gas. As this is the regular practice in Brazil and, more specifically, in the region of the project activity, this alternative does not face problems to its continuation.

Alternative 3: Disposal of waste at a landfill where the landfill gas captured is flared. Methane production would be captured and the gas flared without generating electricity or heat. This alternative requires reliable technology and additional investment without any revenues.

Alternative 4: Disposal of waste at a landfill where the landfill gas captured is used for electricity generation. This alternative requires reliable technology and significant additional investments.

In principle, solid waste could be disposed of in other ways, e.g. incineration, conversion to Refuse-derived fuel (RDF), thermochemical gasification, and biomethanation. None of these are realistic alternatives for the project proponents. These alternatives involve advanced processes for treatment of solid waste; require very large investments and high operating costs compared to the alternatives mentioned above. Finally, there is only limited experience with these alternative processes in Annex 1 countries, and almost none in non-Annex 1 countries, except for a handful of projects being submitted through the CDM.

Assessment of Alternatives:

Alternative 1:

This alternative would face investment and other barriers outlined in section B.5 below, therefore is neither considered a plausible scenario nor baseline scenario.

Alternative 2:

Continuation of the current situation would require investments neither on the part of the project developer nor other parties, and would not face any technological or other barriers. The waste would continue to be dumped in a landfill without the capture of landfill gas, as is the common practice in the country and region where the project is located (also discussed in section B.5 below).

Alternative 3:

According to the Brazilian Institute of Geography and Statistics (IBGE – *Instituto Brasileiro de Geografia e Estatística*) (2002), from a total estimated volume of garbage collected in Brazil (161,827.1 t/day) 47.1% of the collected garbage was dumped on managed landfill, 22.3% was dumped on "controlled" landfills (managed dump sites, adapted to be landfills) and 30.5% was dumped on "Garbage dumping sites" without any control (unmanaged landfill).

Neither Brazilian national legislation, nor state or county legislation requires landfill gas to be captured, burned or used, and there are no signs that evidence a change to this current pattern as stated in the National Climate Change Plan[5] and Project Law Nº 1991/2007 that establishes the National Waste Management Policy[6].. The focus is on improving the adequacy of dumping in order to avoid environmental contamination caused by leakage from waste residues reaching water and soil. The positive impact of this focus has been huge in recent years: in 1989 only 10.7% of the collected garbage was dumped on Sanitary or Controlled landfills compared with 69% in the year 2000 (IBGE, 2002).

Within these circumstances, improvements in landfill gas collection and combustion in Brazil entail financial costs that undermine aims to reduce GHG emissions. There is no project activity implemented in Brazil with forced methane extraction and destruction, using blowers, collection system and flaring system, without the CDM incentive. However, there are CDM project activities that do so, including the Bandeirantes, Nova Gerar, Onyx, Marca, Sertãozinho, Salvador da Bahia, Paulínia, Caieiras, Lara, São João, Anaconda, Central de Resíduos do Recreio, Canabrava, Aurá, Quitaúna, Itapevi, Feira de Santana and João Pessoa Landfills, among others.

Since there are no laws to enforce those reductions, there is no reason to believe that Alternative 3 would happen and thus this alternative will be excluded from further analysis.

<u>Alternative 4:</u>

The alternative 4 represents an improvement of practice when compared to Alternative 3. Alternative 4 will face even more significant technological barriers than alternative 3. In order to use Biogas for energy generation, the landfill must have an efficient structure of biogas capture. Given that the common practice in the country and region is the non-capture of biogas, it is unlikely that energy generation is currently feasible at these landfills.

As demonstrated in the table below, from 1006 thermal plants in Brazil, just 3 use Biogas as fuel. From these three plants, two are registered CDM projects located in the two biggest landfills of the country, and the third one is another CDM project that is not registered yet. Brazil has more than 8000 municipalities, and thousands of landfills and dump sites. Three thermal biogas plants represent less than 0.1% of landfill sites.

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[5] National Climate Change Plan. Available at: http://www.mma.gov.br/estruturas/169/_arquivos/169_29092008073244.pdf (Accessed on 20/07/2009)

[6] National Waste Management Policy. Available at: http://www.camara.gov.br/sileg/integras/501911.pdf (Accessed on 20/07/2009)

Table: Thermoelectric plants Registered in the National Agency on Electrical Energy (ANEEL – *Agência Nacional de Energia Elétrica*) on date 25 of March of 2008.

Plant	Installed Capacity (Kw)	Location	Fuel	Fuel Type
Bandeirante	20 000	São Paulo - SP	Biogás	Biomass
São João Biogás	24 640	São Paulo - SP	Biogás	Biomass
Energ-Biog	30	Barueri - SP	Biogás	Biomass

Source: ANEEL website[7]

The explanation for the existence of these two big biogas thermal plants is the fact that they are located in very large scale landfills, and with a significant potential of electricity generation. Small plants of electricity generation usually face a barrier related to the disproportionate costs necessary to implement the plant. The fixed costs (registration in ANEEL – National Electricity Agency) are large, and as in Small Scale CDM projects, transaction costs cannot be diminished. The landfills nearby the project activity are small landfills, receiving less than 1000 tonnes/day of waste, and thus do not have the required scale to develop a Biogas Thermal plant.

Additional evidence that capture and destruction or capture and use of biogas from landfills are not plausible scenarios is the continuous registration of landfill CDM projects, demonstrating that the baseline for their cases are always the non capture and destruction of biogas. Recently registered CDM projects (Ex.: CTRVV Landfill emission reduction project) demonstrates that also for their case, there are several barriers for projects related to capture and destruction of biogas, corroborating the facts stated in the present project.

Finally, given the very high uncertainties of Biogas generation, and high costs of storing it, there is no way to guarantee an amount of electricity to be generated. As result, the price paid for Biogas electricity is lower given the high risk of non generation. The only exception was under the PROINFA[8] program, a public program which the call for projects was closed in 2004. PROINFA would pay higher prices for some sources of renewable energy and provide some guarantees for raising a loan for these projects. Unfortunately the landfills of the region where the project is located are not inscribed in this program, making this scenario very unlikely.

In summary, Alternative 1, using a composting unit to treat the waste aerobically, faces more barriers than Alternative 2, and therefore is unlikely to implemented in the absence of the CDM (i.e. is not the baseline scenario). Alternatives 3 and 4 also face strong barriers.

Alternative 2, continuation of the current situation, would not face any barriers, and is therefore identified as *the baseline scenario*. The baseline scenario is composed of dumping organic waste in a landfill with no capture and destruction of methane. The characteristics of baseline landfills are presented in the table below:

Landfill	City/state	Type of landfill (MCF)	% of methane captured(AF)	OBS
Dourados Landfill	Dourados / MS	Deep Unmanaged landfill	0%	The Landfill is a "controlled" landfill. For conservativeness, it is considered to fall under the "unmanaged"

[7] ANEEL (Agência Nacional de Energia Elétrica), Banco de Informações de Geração. Available at: http://www.aneel.gov.br/aplicacoes/capacidadebrasil/GeracaoTipoFase.asp?tipo=2&fase=3. (Accessed on 20/07/2009)

[8] PROINFA – Programa de Incentivo as Fontes Alternativas de Energia Elétrica (Available at: http://www.mme.gov.br/programas/proinfa (Accessed on 20/07/2009)

				category. There is no CDM project being developed in this site.
Andradina Landfill	Andradina / SP	Deep Unmanaged landfill	0%	Same as above.

Table – Key information and data used to determine the Baseline Scenario

Variable / Information	Unit / Type	Source
Forecasted and Contracted Suppliers of Waste	-	Contracts and Project Developer Information
Main practices of Waste Disposal in Brazil	National Researches	IBGE (2002) – National Research on Basic Sanitation ABRELPE (2006) – Overview of Solid Residues in Brazil
Applicable Laws and Regulations	Text	National and Regional legislation

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

The founder of Organoeste developed the technology himself, and took him a long time to make it applicable in large scale and also to be applicable to the Brazilian environment. The technology was firstly developed in Japan. Therefore, there is no major proof of money expenditures during this period, as the research and development of the technology was very amateur. Moreover, even with money being spent, the point of no return is indeed the Operational License Issuance in this project. After a couple of months of the issuance of this license, EcoSecurities could make sure that the project was indeed feasible, because operational patterns were now being put in practice and the compost was presenting good results as fertilizer.

It is important, at this point, to establish the main differences between the different types of environmental licenses that can be obtained in Brazil. Basically, according to FIRJAN (2004), Brazil has three different licenses that are issued in a sequence, as described below:

Environmental Previous License (Licença Prévia – LP) → First step of licensing process, where the environmental authority evaluates the location and the conception of the enterprise, attesting its environmental viability and establishing the basic requisites to the next phases. The previous license is like a foundation to the edification of the entire enterprise. In this step, all aspects regarding environmental control of the company are defined.
Environmental Installation License (Licença de Instalação – LI) → After the initial Project is detailed and the environmental protection measures are defined, this license must be requested. Its issuance authorizes the start of the construction of the enterprise and the installation of equipments.
Environmental Operation License (Licença de Operação – LO) → This license authorizes the enterprise to start operations. It must be requested when the site is constructed and after the verification of the effectiveness of the environmental control measures established in the other licenses.

Because of the facts stated above, the event that marks the starting date of the project activity is the issuance of the Environmental Operation License by the Environmental Authority to the Dourados unit (the oldest unit from Organoeste), on 11/04/2006. The issuance of this license is the actual point of no return of the Organoeste company. Before the Operational License, in Brazil, all new facilities must have already had an Environmental Previous License and an Environmental Installation License, which states several measures to be undertaken by the company to start the construction of the new facility. It is difficult to prove the purchase of equipments or the actual start of installation of equipments because Organoeste builds its own equipments.

Before this, Carbon Credits revenues had already been considered during meetings undertaken by the future Project Developer's directors and interested personnel, during 2004 and 2005. The time from the installation of the unit to the beginning of the validation of this project activity was spent with the consolidation of Organoeste's technology and the installation of other units to support the company's growth. Moreover, this time also comprises the contractual negotiations with the Carbon Advisory Company (i.e. EcoSecurities), as the benefits from Carbon Credits were essential to the Project Developer but, at the same time, the Project developer could not divert its attention during the very beginning of its operation to put efforts in the CDM Project Cycle. The decision to go ahead with the project in spite of the risks was made considering carbon credits revenues, and EcoSecurities provided the means to fulfill the alternative waste treatment goal.

During the time of installation of the Dourados unit, in 2004, a meeting between the parters of Organoeste Franchising Ltda. discussed the possibility of CDM revenues for the Organoeste units in order to viabilize the project and concluded that they needed to get specialized information from a professional. Later on this year, the engineer Marcos Duarte advised the partners of Organoeste Franchising Ltda. on CDM revenues for their activity. This proves that the company, as a whole, considered CDM revenues in the very first beginning of their activities for all units.

The beginning of contractual negotiations with EcoSecurities was before 14 August 2006 (the first traceable contact was in this date, but the negotiations started in the beginning of the year). The operation starting date of the project activity was 18/04/2007. Therefore, this project is in compliance with paragraph 13 of Decision 17/CP.7.

It is essential, in this project activity, to divide the timeline into two separate lines. One for the development of the technology (resulting in the entire Organoeste company and associated units) and a different one for this proposed project activity milestones. Expenditures incurred in during the R&D phase cannot be attributed to the proposed project activity and should not be considered as part of it as they are rather aimed at developing a replicable composting technology to be scaled up on a large number of sites, well beyond the proposed project activity.

Research and Development of the technology:

Event	Approximate Time	Explanation
Development of the technology	Until 2005	The founder of Organoeste came with the technology from Japan and was adapting the technology to the Brazilian environment during several years. Dourados and Andradina units were working as pilot plant, with incentives from the City Hall (because the cities had problems with waste disposition), in order to make several tests, making the technology operational in Brazil.
Environmental Installation License issued.	04/08/2005	At this date, the Dourados unit (pilot plant) received the Environmental Installation License. This means that the company was formally authorized to start the installation / construction work. However, as this was the first Organoeste unit, the equipments were extremely amateur. Hand sieves and shovels were still being used, as in the pilot phase. There were no guarantees, at this time, that the company was indeed reducing emissions. The company did not have any operation patterns to prove that the technology was feasible in large scale. EcoSecurities was still not convinced that the technology worked.
Patent Request	20/09/2005	After the technology was adjusted to the Brazilian reality, a

		Patent was required to the Brazilian Institute on Industrial Property (INPI – *Instituto Nacional de Propriedade Industrial*).
Modernization of the pilot plant	11/04/2006	The first Environmental Operational License was issued. Now, with full guarantees that the company was authorized to operate and considering CDM revenues, the plants were starting to be modernized.

Project activity:

Event	Approximate Time	Explanation
Meetings and phone calls	2004/2005	After getting in touch with the Organoeste technology, directors from EcoSecurities and Organoeste conducted several meetings in order to find out what was the best way to establish a partnership. However, as Organoeste had no operational plants, no environmental license and a very new technology, EcoSecurities waited in order to have a more concrete indication that the project was real indeed. No record was made of these meetings and phone calls, as both Organoeste and EcoSecurities were very small companies at that time and the meetings had an inherent informality.
First Operational License	11/04/2006	The first unit of Organoeste to receive an environmental operational license was the Dourados unit, in Mato Grosso do Sul state, mid-west region of Brazil. From this point on, EcoSecurities was convinced that the project was really going to happen. The operation patterns were starting to become well defined and emission reductions could now be verified. Because of carbon credits revenues, Organoeste started to modernize their plants, installing machines and making the composting process more professional.
First traceable contact between EcoSecurities and Organoeste	14/08/2006	This date can represent the beginning of contractual negotiations, but in fact it had already started a long time before this date. This is the first contact that EcoSecurities were able to retrieve. After Organoeste showed a good level of internal organization and technological development, the contractual negotiations started.
Permission to sell compost	18/04/2007	As the registration of the Organoeste product (fertilizer) was only issued on this date, they were not authorized to sell it. Therefore, the considered starting date of operations of the plant is the issuance of the registration certificate of the product by the Brazilian Agriculture Ministry.
Contract with EcoSecurities Signed	22/08/2007	After a long period of negotiations, the contract was signed.
Start of Installation / Construction	08/11/2007	At this date, the Andradina unit received the Environmental Installation License. This means that the company was authorized to start the installation / construction work.
PDD development Starts	Beginning 2008	After a thorough evaluation regarding additionality and real potential of emission reductions, EcoSecurities started developing the PDD.
PDD submitted to first validation	03/04/2008	Project submitted to validation to a new DOE that was starting operations in Brazil at that time.
Cancellation of first validation	Mid 2008	The new DOE had accreditations problems, what seriously delayed the start of the validation of the project. Therefore, EcoSecurities decided to cancel the contract.
Contact with TÜV-Nord	August 2008	TÜV-Nord was contacted to validate this project and a proposal was requested.
PDD submitted to validation	17/09/2008	The PDD was sent to TÜV-Nord to be validated.

It is demonstrated in this section that the proposed project activity is additional as per the guidance provided under attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

Four alternatives were evaluated in order to determine the baseline scenario, as shown in section B.4 above. However, Alternative 3 (Disposal of waste at a landfill where the landfill gas is captured and flared) and 4 (Disposal of waste at a landfill where the landfill gas is captured and used for electricity generation) are not a plausible alternatives, because it is not economically attractive as a business operation, as it implies higher additional investments with insufficient additional revenues, and would involve additional risks, capital expenditure and work, which makes this alternative unrealistic. A demonstration of it is the fact that these two alternatives are not implemented in Brazil without CDM revenues. In order to demonstrate that the proposed project activity is additional to the baseline scenario chosen, a Barrier Analysis is performed below.

Table: Scenarios considered in Additionality analysis.

Scenarios	Description
Alternative 1	Proposed project activity without CDM
Alternative 2	Continuation of current practice (the baseline)

Evidence for why the proposed project is additional is offered under the following categories of barriers: (a) finance barriers, (b) technological barriers and (c) prevailing practice barriers. The result is a matrix that summarizes the analysis, providing an indication of the barriers faced by each scenario; the most plausible scenario will be the one with the fewest barriers.

Finance Barrier

This barrier evaluates the economic risks associated with each scenario, considering the overall economics of the project and/or economical conditions in the country.

Alternative 1 – The proposed project faces problems obtaining financing and selling compost.

According to Alves & Vieira (1998), one of the factors that makes it difficult to implement alternative systems to manage solid waste residues in Brazil is problems associated with obtaining financing, as well as public opinion towards these projects.

As described in the technological barrier below, the technology used by the Project Developer is a new technology for the region where the Project is located. As a new technology, it requires an investment in time and money to develop, and adapt foreign technology to the Brazilian environment. However, the company was not able to request financing from any project financer in Brazil (i.e. BNDES - *Banco Nacional de Desenvolvimento Econômico e Social* **–** National Economic and Social Development Bank). The main obstacle for this was that Organoeste Franchising Ltda. is a small company and did not have any assets to provide as guarantee for the financing. BNDES, as any other financial institution, needs a financial guarantee in order to accept a request for financing and the company was unable to provide this crucial item[9].

[9] One of the conditions to BNDES provide a Loan or a Financing is that the Project Developer must present 130% of financed value in financial guarantees (may be equipments, lands, receivables, etc). Please check this site for more information: http://www.bndes.gov.br/linhas/garantias.asp

According to specialists[10]: "*Investments into companies usually require both debt and equity. (….) It is unlikely that this ratio will consist of 100% equity*". Thus, the capacity of structuring the financial scheme of plant is limited, and the project is not expected to be developed without additional incentives.

Besides this financing problem, there is the difficulty of selling the compost to a market not used to buying this kind of product. The consumers of fertilizers in Brazil tend to buy mineral fertilizers, a product backed by a massive marketing campaign and that they have been using for the last several decades, with very positive results. Bearing in mind all the economic and social problems in Brazil, convincing the consumer that a new expensive product is better than a product they are already accustomed to use is a very difficult task.

Marketing activities for new products in the market involve a significant amount of resources, including time and money. The most common activities are: advertisement, distributing product samples trials, participation of events, congress, publication of articles (specially technical articles). For example, Organoeste Franchising Ltda. needs to donate compost (while not receiving an income) to companies and consumers to try and sell it in the future and convince those consumers that the product is also standardized, reliable, and brings results as good as the traditional product. As this company is a very small one compared to the inorganic fertilizer sector (examples: ADM, Braskem, Bunge, Petrobras, Seara, Ultrafertil, etc) that has as its only source of income the sale of compost, all these difficulties culminated in lots of expenses and a lack of secured financing along all the project lifetime, specially at the start of the project's installation. According to IPT (2000), the argument for the "profitability" of composting plants (presented many times to public or private decision makers) is not sound, as frequently the sales of the compost do not cover the operational and financial expenses or investment. It happens given the lower volume of sales, when compared to the expected one. Rural people are usually not commercially sophisticated, and are not used to work with long term contracts of raw material supply, thus, it is impossible to secure the sells of compost along the time. Thus, the problem of a project cash flow analysis is the very high uncertainty on selling the compost.

An important benefit of CDM is the fact that it will bring additional financial benefits to the project, and it may be considered as a guarantee of income even if the compost is not quickly sold. Thus, the CDM is an important tool to alleviate this barrier, and decrease the risks and uncertainties of project activity.

Alternative 2 – The continuation of the practice of dumping the waste in landfills would not have any financial barriers, as this is common practice in the host country. There are no problems with technology and licensing, and it is a very cheap practice when compared to composting. Therefore, there would not be any investment or economic constraints in this alternative.

Technological Barrier

This barrier evaluates whether the technology is currently available, if there are locals skilled in its operation, if the application of the technology is a regional, national or global standard, and generally if there are technological risks associated with the particular project outcome being evaluated.

Alternative 1 – The proposed project uses new technology in the host country, resulting in difficulties associated with completely understanding of the technology and proving that the technology is viable and ready to operate.

The Project Developer's composting process uses a unique technology to produce their organic compost, as described in section A.4.3. It uses Biocatalyst Agents to increase the speed of composting, reducing the

[10] Please, visit this site for more details and information: http://www.dynamic-equity.com/vcmag03.htm

lag-time for transforming the waste into compost. This technology was developed by the company itself and is patented by INPI (Brazil). The composting technology being new to the region meant that the company owners encountered many problems that hindered the project's successful implementation.

According to IPT (2000), one of the major difficulties in operating composting plants in Brazil is the lack of management and/or operational know-how to conduct the activities. In the composting process, the raw material is waste. The waste presents two serious problems for maintaining a good, constant industrial process: usually it is not homogeneous (very different composition, ration of Carbon/Nitrogen, humidity, etc) and it may present toxic substances or pollutants. According to Silva *et. Al* (2005), it is very common the composting units produce compost with unacceptable level of Coliforms (a type of bacteria that indicates pollution), heavy metals (such as chrome, copper, Nyquil, Plumb and others). Barreira (2005), during her Doctoral thesis, analysed some composting units in Brazil. As result, she found that most of the plants had concentration of at least one heavy metal rising above the country legislation limits. Regulating the composting process and the environmental quality of the compost properly is technologically very challenging.

Table: Compost sites and the average concentration of heavy metals in the compost. National regulation limits: Copper: 200mg/kg – Zinc 500mg/kg, aluminum and siliceous: no limits.

Cities	Metal (mg/kg)			
	Cu	Zn	Al	Si
Adamantina	212,81	502,12	8848,23	2037,31
Assis	581,22	889,31	14738,81	762,44
Bocaina	202,51	750,83	9951,39	840,30
Garça	448,68	391,52	12263,10	780,84
Itatinga	157,43	292,84	12382,35	627,51
Martinópolis	81,08	217,16	7821,55	852,04
Osvaldo Cruz	58,44	222,01	11031,56	485,52
Parapuã	151,03	295,25	6991,64	744,82
Pres. Bernardes	116,31	384,54	8218,76	963,34
S. J. Campos	205,19	390,05	12038,26	1178,13
S. J. Rio Preto	405,52	536,42	8573,42	749,08
São Paulo composto A	135,12	268,06	14960,25	1304,98
São Paulo composto B	81,23	213,06	7970,38	942,21
Tarumã	193,52	482,80	31108,09	625,66
Uru	55,95	177,18	10245,50	475,70
Médias	205,73	400,87	11809,60	891,32
SEM	31,83	43,45	1123,99	117,82

Source: Barreira (2005)

Uncertainties regarding the composting procedure and the technology were always present. Moreover, finding specialized workers for this kind of activity is not an easy task and the company must provide extensive training to their employees on the operation of the composting unit in order to minimize operational risks, and produce a high quality compost, in accordance with the legislation and in order to gain wide market acceptance.

Because of the perceived risks associated with the technology, the project developer was neither able to acquire financing nor secure long term contract for selling the compost.

Therefore, there was a technological barrier due to the fact that the technology used in this project activity had not been implemented before by the project developer, and needed to be completely understood by the project developer and by the authorities in the host country, which may lead to extra works, delays and high expenses that had to be paid with their own resources.

Alternative 2 – The continuation of the practice of dumping the waste in landfills would not face any technological barriers, as this practice is commonplace in the host country. Therefore, there would not be any technological constraints preventing this alternative.

Prevailing Practice Barrier

Alternative 1 – As seen below, there are several other practices commonly done in Brazil regarding to waste disposal. The country has several problems with waste disposal practices like any other developing country and therefore investment in the sector is focused on collecting and disposing the waste in landfills.

In Brazil only about 3% of the waste from the country is treated by composting. In São Paulo and Mato Grosso do Sul together, only 4.4% of the waste is treated in composting stations (IBGE, 2002), as shown in the figure below.

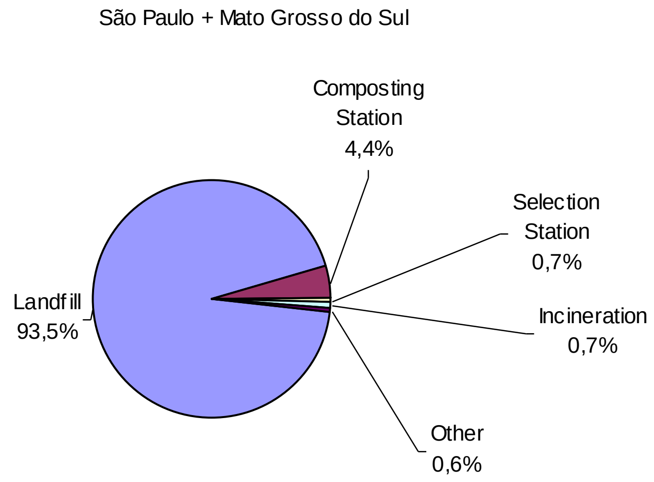

Figure – Waste disposal practices per amount of waste in São Paulo and the State of Mato Grosso do Sul, Brazil. Source: Adapted from IBGE (2002).

Only 2.2% of districts from São Paulo and the State of Mato Grosso do Sul use composting as a treatment system, as shown by the figure below. And this percentage does not change much in other districts of Brazil, with only 2.3% of districts using composting.

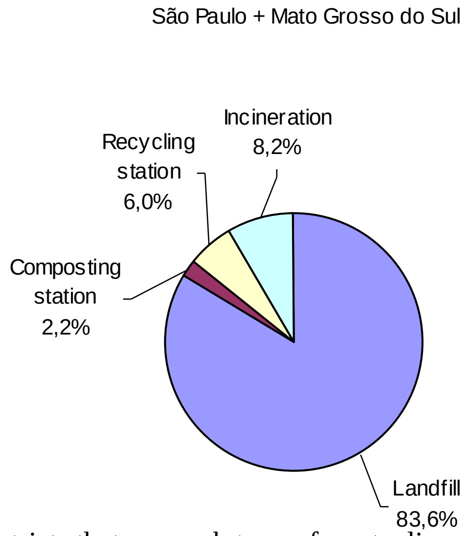

Figure – Percentage of districts that use each type of waste disposal practices in São Paulo and the State of Mato Grosso do Sul, Brazil. Source: Adapted from IBGE (2002).

There are very few other similar projects in the host country. Two other composting plants operated by Organoeste are certified by EcoCert Brasil S.A., an international company specialized in certifying organic products for the Brazilian, European and United States markets, and the other plants are working to reach this certification. There are only four other fertilizer producers certified by EcoCert in Brazil, as listed in their website[11]. The companies and the technologies used are presented below:

Table – Other Brazilian companies certified by EcoCert to produce Organic Fertilizers.

Company	Location	Product	Technology
Ferticel[12]	Santa Catarina State	Organic Fertilizer	Made from bird excrement
RockAll[13]	Mato Grosso State	Organic Fertilizer	Compound with minerals
Provaso[14]	São Paulo	Organic Fertilizer	Traditional composting (40 to 150 days)
Lixo Zero[15]	Rio de Janeiro State	Organic Fertilizer	Uses artificial aeration associated with the composting process, speeding it up to 72 hours. This company is also developing their composting process as CDM Project.

Source: EcoCert Brasil website (http://www.ecocert.com.br/26701.html).

None of the companies cited above use the same technology as Organoeste Franchising Ltda.. As the biocatalyst agent was developed by the project developer, there is no other company that uses this same product to compost their waste aerobically. The technology used by Organoeste Franchising Ltda. is unique in its region and in Brazil.

Moreover, from a survey done by Silva (2006), from 27 composting units in Brazil, 10 are not operational, and the other 17 present technologies and sizes significantly different from this project. From

[11] http://www.ecocert.com.br/26701.html (visited in 20 February 2008)

[12] http://www.ferticel.com.br

[13] www.rockall.com.br/

[14] www.provaso.com.br/

[15] www.lixozero.com.br

the 17 operational units, 8 units are smaller than 30 ton/day, representing less than 25% of the installed capacity of project activity. From the other 9 sites, 4 do not have the installed capacity disclosed. The remaining 5 units are located faraway from the project activity, demonstrating that it is not a common practice in the region surrounding the project. Furthermore, as explained above, they do not use the same biocatalyst technology implemented in this project. The 17 operational composting units in the country all use a technology significantly different from the project activity, and have as their end product, composts without acceptable standards of quality. This fact is reinforced by Barreira (2005).

As explained by IPT (2000), many composting plants had their operation interrupted or shut down. Others never began operating, mainly due to the following reasons (IPT, *op. cit.*):

- Bad planning when starting up composting plants which caused competition for resources between plant owners;
- **Absence of institutional and/or management and/or operational know-how to conduct the activities;**
- Misunderstanding of the plants' space needs and operational capacity meaning space was lacking for the installation of the landfill necessary to contain the residual compost produced;
- Employment generation: a common argument in favor of composting projects is that they generate employment. However, opposition to composting projects can arise if they displace the waste collectors (*catadores de lixo do lixão*) on the open landfill and fail to provide alternative employment to these people;
- **Absence of budget, institutional and operational integration** of the plants with the local sanitation company/service;
- **Inadequate sitting of the plants**, causing environmental problems and the rejection of its operation by the affected population;
- Local Political and Party dispute issues or prejudice, including the cessation of activities of a recently operational plant simply due to the change in local government;
- Mistakes made by municipal managers, forecasting operational "profit" from the plants;
- **Inability to obtain products with the quality characteristics necessary to agricultural use, due to poor operation of the plant;**
- **Poor conception of the project,** incomplete or poorly dimensioned installations, inadequate equipment, high maintenance costs, lack of resources and difficulties in selling the compost.

The following table provides a summary of the barriers analysis.

Table: Summary of barrier analysis.

Barriers	1 – Proposed project activity without CDM	2 – Continuation of previous activities
Finance barrier	**Yes**	No
Technological barrier	**Yes**	No
Prevailing practice barrier	**Yes**	No
Other barriers	No	No

As shown in the prevailing practice barrier, there are very few alternatives to landfilling being put into practice in Brazil. A few other composting projects do exist in Brazil, but these represent a small fraction of the total waste treatment in the country, and only occur in a tiny fraction of districts. Furthermore, the present project activity comprises a totally different technology, as discussed above.

This section clearly explains how the approval and registration of the project as a CDM activity, and the attendant benefits and incentives derived from the project activity, will alleviate the barriers illustrated above, and thus enable the project to be undertaken.

The financial benefit from the revenue obtained by selling the CO_2 emissions reductions has been one of the key issues encouraging investment in the proposed project activity. The CDM has been considered from an early stage and it is an integral part of the financial package of the proposed project activity.

Since the project activity is subject to barriers while the current waste management practice is not, the baseline is confirmed as the continuation of current disposal practices with waste (biomass and other organic matter are left to decay and methane is emitted to the atmosphere) and, therefore, the Project shall be deemed to be additional according to attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The Methodology AMS-III.F. is applicable to the proposed project activity, as it is applicable to an aerobic composting process where the baseline scenario is the disposal of waste in a landfill.

As mentioned before, the Project is based on two complementary activities, as follows:

- The aerobic composting of the waste;
- The use of the compost product in agriculture.

All the aforementioned activities have as their objective the avoidance of methane generation in the anaerobic degradation of organic waste.

The Project fulfils all applicability conditions of the methodology (as stated in section B.2), and thus AMS-III.F. was considered the most appropriate methodology for the Project.

The weather in the region where the project is located can be classified as Tropical Wet. The average historical temperature is above 20ºC and the average historical precipitation is above 1000 mm/yr, as shown by the figure below.

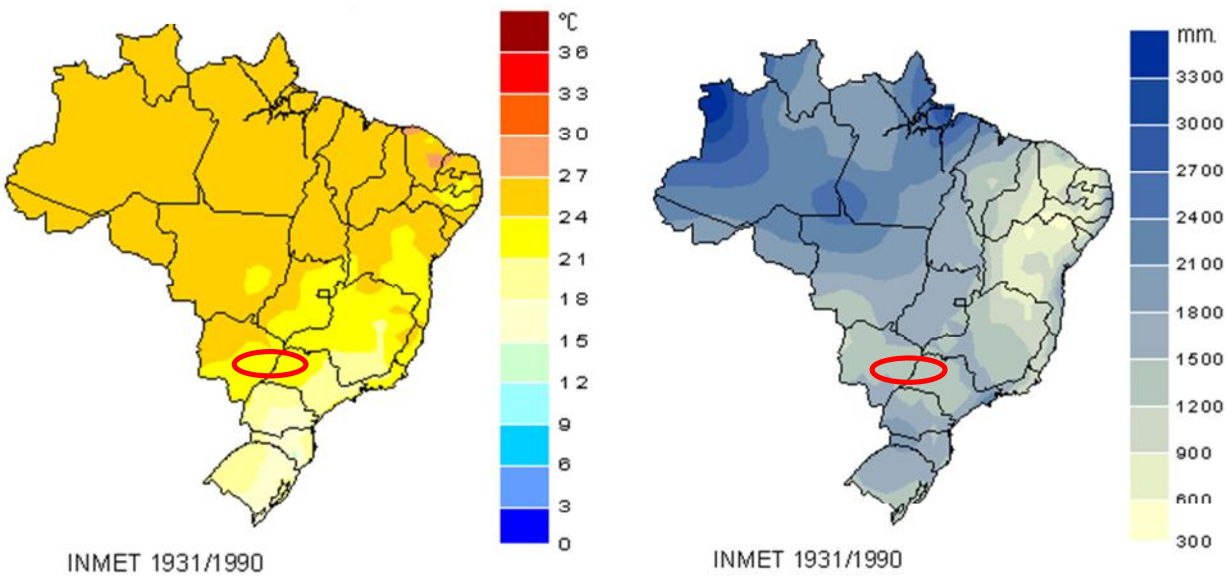

Figure – Mean annual temperature (left) and Mean annual rain (right). The project area location is highlighted. Source: National Institute of Meteorology (http://www.inmet.gov.br/html/clima.php?lnk=/html/clima/mapas/).

Project emissions:

According to the methodology, there are six sources of project emissions. Their specific relevance for this project activity is discussed below.

- CO_2 emissions from consumption of fossil fuel based energy on site – This emission source is taken into account, as there are vehicles on-site with the function of turning over the compost, among other things. Emissions are calculated from the quantity of fuel used and the specific CO2-emission factor of the fuel. Moreover, emissions due to the consumption of electricity for chopping of biomass for size reduction and any other electricity use will be accounted using AMS-I.D.;
- CO_2 emissions are taken into account from incremental distances between:
  - The collection points of biomass and the composting site as compared to the baseline solid waste disposal site;
  - Composting site and the soil application sites.
- The difference of distance between the major suppliers of waste and the landfill and from the major suppliers of waste and the composting unit is very small, as the distances from Organoeste's plants to the municipal landfills are less than 10 Km in Andradina and less than 3 Km in Dourados. The distance from the composting site to the soil application sites is around 250 Km.

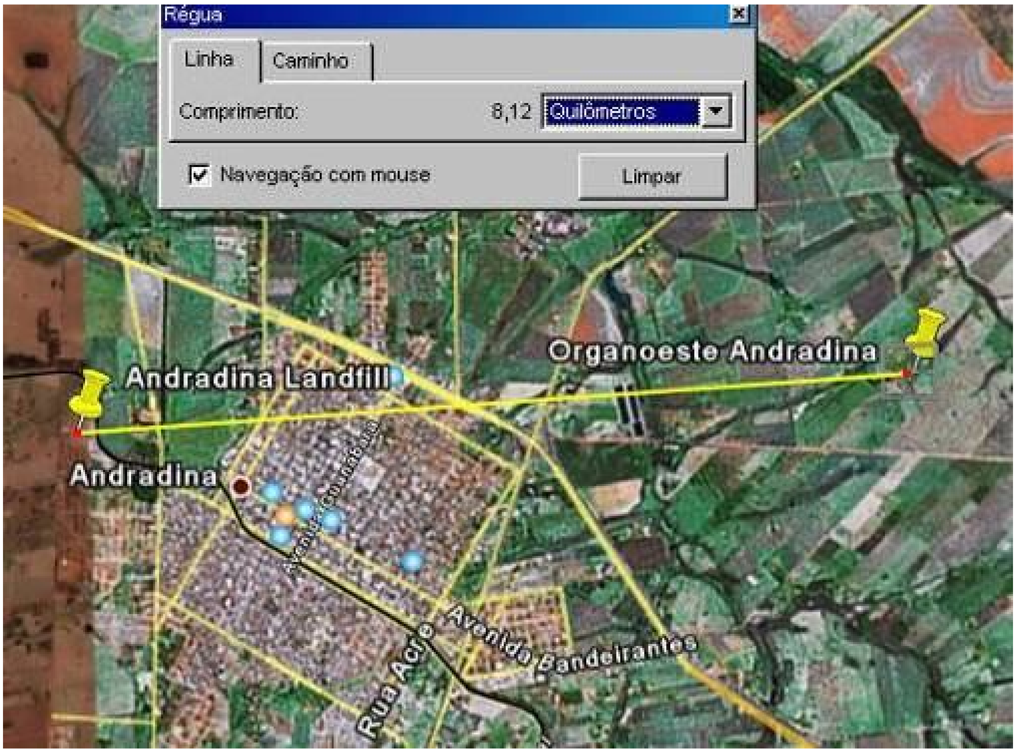

Figure – Location and distance of Organoeste Andradina unit and Andradina Landfill. Source: GoogleEarth

Figure – Location and distance of Organoeste Dourados unit and Dourados Landfill. Source: GoogleEarth

- Methane emissions during composting process – This emission source is taken into account as there is a small amount of methane emitted during the aerobic composting process, as required by the methodology;
- Methane emissions from runoff water will be taken into account when applicable. During the composting process, the produced runoff water is collected for a few days and when the biocatalyst is added to a new composting pile, this water is used to dilute the biocatalyst before spraying it on the pile. Since the runoff water does not exit the project site and is used for the aerobic composting process, the methane emission is not applicable; however, the volume of water and COD will be monitored regularly.
- The methane emissions from the disposal/storage under anaerobic conditions of the compost are not taken into account. The final product has little to no amount of decomposing matter left, is packed and sent to wholesalers/ distributors or directly to the consumer. The turnover rate is very high, meaning that what is produced is used quickly and therefore the final product is not stored for a prolonged period of time.

Baseline emissions:
According to the methodology, the baseline emissions are the amount of methane emitted from the decay of the degradable organic carbon in the biomass solid waste composted in the project activity. The yearly Methane Generation Potential for the solid waste is calculated using the first order decay model as described in the Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site.

Methane emissions that would have to be captured, fuelled or flared to comply with national or local safety requirement or legal regulations should be excluded from baseline emissions. Neither Brazilian State nor County legislation requires the gas to be captured, burned or used and there is no plan or intention to do so, as better explained in section B.4. Therefore the amount of methane that would have to be captured and combusted in the year "y" (MDy,reg) is considered zero.

In AMS-III.F. is stated that the estimation of the methane emission potential of a solid waste disposal site ($BE_{CH4,SWDS,y}$, in tCO_2e) shall be undertaken using the Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site. The tool will be used:

- With the factor "f=0.0" assuming that no methane is captured and flared.
- With the definition of year x as 'the year since the landfill started receiving wastes, x runs from the first year of landfill operation (x=1) to the year for which emissions are calculated (x=y)'.

The landfills that the waste was going to be dumped in the baseline are Dourados landfill and Andradina landfill. These landfills can be described according to their characteristics as anaerobic deep unmanaged solid waste disposal sites, with depths greater than 5 meters. At the beginning of each crediting period it will be established that the identified landfill(s) can be expected to accommodate the waste to be used for the project activity for the duration of the crediting period or it will be established that it is common practice in the region to dispose off the waste in solid waste disposal site (landfill). For this assessment, the geographical boundary of the region shall be defined as 100 Km radius around the composting units.

Leakage emissions:

According to AMS-III.F., leakage effects are to be considered if the composting technology is the equipment transferred from another activity or if the existing equipment is transferred to another activity. As no equipment is transferred from another activity or transferred to another activity, leakage will be considered as zero.

Emission reductions:

According to AMS-III.F., the emission reductions achieved by the project activity will be measured as the difference between the baseline emissions and the sum of the project emissions and leakage. As the leakage is zero, the simplified calculation is:

Where:

ER_y	Emission reductions in the year "y" (tCO2e)
BE_y	Baseline emissions in the year "y" (tCO2e)
PE_y	Project emissions in the year "y" (tCO2e)
L_y	Leakage emissions in the year "y" (tCO2e)

All equations applied to obtain the emission reduction from the project activity are listed in Section B.6.3.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	NCV_{fuel}
Data unit:	TJ/l
Description:	Net calorific value of fuel (e.g. diesel)
Source of data used:	Brazilian energetic balance (BEN), 2007, Annex E, Table E.9
Value applied:	0.00000004
Justification of the choice of data or description of measurement methods and procedures actually applied :	Country specific default value used (Brazil). Value established *ex-ante*.
Any comment:	This value is established *ex-ante* and will remain fixed for the first crediting period. In case the type of fossil fuel should change during the crediting period, respective default values can be used.

Data / Parameter:	EF_{fuel}
Data unit:	tCO_2/TJ
Description:	CO_2 emissions factor of the fuel (e.g. diesel)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, Table 1.4
Value applied:	74 100
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default IPCC value used. Value established ex-ante.
Any comment:	This value is established *ex-ante* and will remain fixed for the first crediting period. In case the type of fossil fuel should change during the crediting period, respective default values can be used.

Data / Parameter:	CEF_{elec}
Data unit:	tCO_2/MWh
Description:	Emission factor for the electricity consumed by the project activity
Source of data used:	Official data from the Brazilian Science and Technology Ministry (MCT)
Value applied:	0.2556
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated according to the "Tool to calculate the emission factor for an electricity system", as guidance provided by AMS-I.D. Defined *ex-ante*, according to data published in the MCT website (http://www.mct.gov.br/index.php/content/view/73318.html)
Any comment:	This value is determined *ex-ante* and will remain fixed for the first crediting period. More information can be found in Annex 3.

Data / Parameter:	EF_{CO2}
Data unit:	tCO2e/Km

Description:	CO2 emission factor from fuel (diesel) use due to transportation
Source of data used:	BEN 2007 value (NCVfuel) and IPCC 2006 data (EFfuel).
Value applied:	0.000526
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated using BEN 2007 value (NCVfuel) and IPCC 2006 data (EFfuel). Value established ex-ante.
Any comment:	This value is established *ex-ante* and will remain fixed for the first crediting period. In case the type of fossil fuel should change during the crediting period, respective default values can be used.

Data / Parameter:	Φ
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value as Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site.
Any comment:	Oonk et el. (1994) have validated several landfill gas models based on 17 realized landfill gas projects. The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results.

Data / Parameter:	**OX**
Data unit:	-
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Recommended by IPCC 2006 Guidelines for National Greenhouse Gas Inventories for unmanaged deep solid waste disposal site, according to the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site".
Any comment:	

Data / Parameter:	**F**
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site

Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value as Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site .
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. Recommended by IPCC 2006 Guidelines for National Greenhouse Gas Inventories according to the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site".

Data / Parameter:	**DOC_f**
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Recommended by IPCC 2006 Guidelines for National Greenhouse Gas Inventories according to the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site".
Any comment:	

Data / Parameter:	**MCF**
Data unit:	-
Description:	Methane Correction Factor
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	• 0.8 for **unmanaged solid waste disposal sites – deep**. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters and/or high water table at near ground level. Both landfills are deeper than 5m. Recommended by IPCC 2006 Guidelines for National Greenhouse Gas Inventories according to the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site".
Any comment:	The methane correction factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.

Data / Parameter:	**DOC_j**
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j*
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site

Value applied:	The following values are applied for the different waste types *j*: **DOCj (wet waste)** — % A. Pulp, paper and cardboard (other than sludge) — 40 B. Garden, yard and Park waste — 20 C. Food, food waste, beverages, tobacco and sludge — 15 D. Wood and wood products — 43 E. Textiles — 24 F. Glass, plastic, metal, other inert waste — 0
Justification of the choice of data or description of measurement methods and procedures actually applied :	DOCj values for wet weight are chosen since the plant will not dry the products (residues / compost) in the entrance and exit of the unit. Recommended by IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5) according to the “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site”.
Any comment:	If a waste type, prevented from disposal by the proposed CDM project activity, cannot clearly be attributed to one of the waste types in the table above, project participants will choose among the waste types that have similar characteristics to that waste type where the values of DOC_j and k_j result in a conservative estimate (lowest emissions), or request a revision of / deviation from this methodology.

DOCj (wet waste)	%
A. Pulp, paper and cardboard (other than sludge)	40
B. Garden, yard and Park waste	20
C. Food, food waste, beverages, tobacco and sludge	15
D. Wood and wood products	43
E. Textiles	24
F. Glass, plastic, metal, other inert waste	0

Data / Parameter:	**K_j**
Data unit:	-
Description:	Decay rate for the waste type *j*
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site
Value applied:	The following values are applied for the different waste types *j*: (see table below) MAT – mean annual temperature, MAP – Mean annual precipitation
Justification of the choice of data or description of measurement methods and procedures actually applied :	Values for wet weight are chosen since the plant will not dry the products (residues / compost) in the entrance and exit of the unit. As can be found in section B.6.1, the climate in Mato Grosso do Sul and State of São Paulo is classified as tropical wet. Recommended by IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3) according to the “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site”.
Any comment:	If a waste type, prevented from disposal by the proposed CDM project activity, cannot clearly be attributed to one of the waste types in the table above, project participants will choose among the waste types that have similar characteristics to that waste type where the values of DOC_j and k_j result in a conservative estimate

Type	Waste type j	Tropical (MAT>20°C)
		Wet (MAP>1000mm)
Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.07
	Wood, wood products and straw	0.035
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.17
Rapidly degrading	Food, food waste, beverages, tobacco and sewage sludge	0.4

MAT – mean annual temperature, MAP – Mean annual precipitation

	(lowest emissions), or request a revision of / deviation from this methodology.

Data / Parameter:	$EF_{composting}$
Data unit:	g CH4/kg wast treated - wet waste
Description:	Emission factor for composting of organic waste Emission
Source of data used:	IPCC default value (table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gas Inventories).
Value applied:	4 g CH_4/kg.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is used as suggested by AMS-III.F. for waste treated on a wet weight basis. Values for wet weight are chosen since the plant will not dry the products (residues / compost) in the entrance and exit of the unit.
Any comment:	Whenever site specific data is available, $EF_{composting}$ can be set to zero for the portions of *Qy* for which the monitored oxygen content of the composting process is above 8%. Monitoring data being acquired by means of sampling with maximum margin of error of 10% at a 95% confidence level. For this purpose a portable oxygen meter can be used with lancets of at least 1 m length.

Data / Parameter:	GWP_{CH4}
Data unit:	-
Description:	Methane global warming potential
Source of data used:	IPCC default value
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is used as suggested by AMS-III.F. for GWP.
Any comment:	This parameter will be checked at each crediting period and updated, if applicable.

Data / Parameter:	$B_{o,ww}$
Data unit:	kg CH_4/kg.COD or kg CH4/kg BOD
Description:	Methane producing capacity of the wastewater
Source of data used:	IPCC default value
Value applied:	0.21 or 0.6
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is used as suggested by AMS-III.F. The project activity will preferably use COD value. Another option is to use BOD instead of COD. The default value for BOD can be used in case the parameter $BOD_{5,20}$ is used to determine the organic content of the wastewater. In this case the monitoring shall be based in direct measurements of $BOD_{5,20}$.
Any comment:	

Data / Parameter:	$MCF_{ww,treatment}$
Data unit:	-
Description:	Methane correction factor for the wastewater treatment system where the runoff

	water is treated
Source of data used:	Table III.F.1
Value applied:	Possible values for this project activity: Aerobic treatment, poorly managed or overloaded 0.3 Anaerobic shallow lagoon (depth less than 2 metres) 0.2 Anaerobic deep lagoon (depth more than 2 metres) 0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is used as suggested by AMS-III.F.
Any comment:	

Data / Parameter:	UF_b
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	FCCC/SBSTA/2003/10/Add.2, page 25.
Value applied:	1.06
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is used as suggested by AMS-III.F.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

All calculations follow guidance provided by the approved methodology AMS-III.F.. In order to calculate the Project Emissions, the methodology AMS-III.F. recommends the following equation:

$$PE_y = PE_{y,transp} + PE_{y,power} + PE_{y,comp} + PE_{y,\mathrm{runoff}}$$

Where:

PE_y Project activity emissions in the year "y" (tCO2e)

$PE_{y,\mathrm{transp}}$ Emissions from incremental transportation in the year "y" (tCO_2e)

$PE_{y,\mathrm{power}}$ Emissions from electricity or diesel consumption in the year "y" (tCO_2e)

$PE_{y,comp}$ Methane emissions during composting process in the year *y* (tCO_2e)

$PE_{y,\mathrm{runoff}}$ Methane emissions from runoff water in the year *y* (tCO2e)

For emissions from incremental transportation, the calculations used are as follows, according to AMS-III.F.:

Where:

$PE_{y,\mathrm{transp}}$ Emissions from incremental transportation in the year "y" (tCO2e)

Q_y Quantity of raw waste treated in the year "year" (tonnes)

CT_y average truck capacity for transportation (tonnes/truck)

DAF_w	average incremental distance for raw solid waste transportation (km/truck)
EF_{CO2}	CO2 emission factor from fuel use due to transportation (kgCO2/km)
I	type of residual waste/products and or compost
$Q_{y,treatment,i}$	quantity of residual compost waste/products and/or i produced in year "y" (tonnes)
$CT_{y,treatment,i}$	average truck capacity for residual waste/products compost transportation(tonnes/truck)
$DAF_{treatment,i}$	average distance for residual waste/products compost i transportation (km/truck)

The calculation of $PE_{y,power}$ is, according to AMS-III.F.:

Where:

$PE_{y,power}$	Emissions from electricity or diesel consumption in the year "y"
$EG_{PJ,FF,y}$	amount of electricity consumed from the grid as a result of the project activity (MWh)
CEF_{elec}	carbon emissions factor for electricity generation in the project activity (tCO_2/MWh)
$F_{cons,y}$	fuel consumption on site in year y (l)
NCV_{fuel}	net caloric value of the fuel (TJ/l)
EF_{fuel}	CO_2 emissions factor of the fuel (tCO_2/TJ)

The calculation of the CEF_{elec} will follow guidance provided by AMS-I.D. and further information regarding this calculation is presented in annex 3. A default value for Brazilian fuel will be used for EF_{fuel} and NCV_{fuel}.

Methane emissions during composting ($PE_{y,comp}$) shall be calculated as follows:

Where:

$EF_{composting}$	Emission factor for composting of organic waste (g CH4/kg wast treated - wet waste).
Q_y	Quantity of raw waste treated in the year "y" (tonnes)

Project emissions from runoff water from the composting facility ($PE_{y,\ runoff}$) are calculated as follows:

$$PE_{y,runoff} = Q_{y,ww,runoff} * COD_{y,ww,runoff} * B_{o,ww} * MCF_{ww,treatment} * UF_b * GWP\_CH_4$$

Where:

$Q_{y,ww,runoff}$	Volume of runoff water in the year y (m3)
$COD_{y,ww,runoff}$	Chemical oxygen demand of the runoff water leaving the composting facility in the year y (tonnes/m3)
$B_{o,ww}$	Methane producing capacity of the wastewater
$MCF_{ww,treatment}$	Methane correction factor for the wastewater treatment system where the runoff water is treated.
UF_b	Model correction factor to account for model uncertainties.

The Baseline emissions will be calculated as follows, according to the Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site and AMS-III.F.:

Where:

$BE_{CH4,SWDS,y}$	Yearly methane generation potential of the solid waste composted by the project activity during the years “x” from the beginning of the project activity (x=1) up to the year y (tCO2e).
$MD_{y,\ reg}$	Amount of methane that would have to be captured and combusted in the year “y” to comply with the prevailing regulations (tonnes);

For the calculation of $BE_{CH4,SWDS,y}$, the Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site will be used, as per AMS-III.F. guidance, using f=0.0 and with the definition of year x as “the year since the landfill started receiving wastes, x runs from the first year of landfill operation (x=1) to the year for which emissions are calculated (x=y)”:

*

—

Where:

$BE_{CH4,SWDS,y}$	Methane emissions avoided during the year *y* from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year y (tCO2e)
φ	Model correction factor to account for model uncertainties (0.9)
f	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
GWP_{CH4}	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
F	Fraction of methane in the SWDS gas (volume fraction) (0.5)
DOC_f	Fraction of degradable organic carbon (DOC) that can decompose
MCF	Methane correction factor
$W_{j,x}$	Amount of organic waste type *j* prevented from disposal in the SWDS in the year *x* (tons)
DOC_j	Fraction of degradable organic carbon (by weight) in the waste type *j*
k_j	Decay rate for the waste type *j*
j	Waste type category (index)
x	Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are calculated (x = y)
y	Year for which methane emissions are calculated

As different waste types *j* are prevented from disposal, the amount of different waste types ($W_{j,x}$) will be determined through sampling and the mean from the samples will be calculated as follows, according to the “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site”:

Where:

Wj,x	Amount of organic waste type *j* prevented from disposal in the SWDS in the year *x* (tons)
Wx	Total amount of organic waste prevented from disposal in year *x* (tons)
pn,j,x	Weight fraction of the waste type *j* in the sample *n* collected during the year *x*
z	Number of samples collected during the year *x*

B.6.4 Summary of the ex-ante estimation of emission reductions:

Years	Estimation of project activity emissions (tonnes of CO2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO2 e)	Estimation of overall emission reductions (tonnes of CO2 e)
Jul 2010 - Jun 2011	8 453	15 898	0	7 444
Jul 2011 - Jun 2012	8 453	27 492	0	19 039
Jul 2012 - Jun 2013	8 453	36 104	0	27 651
Jul 2013 - Jun 2014	8 453	42 631	0	34 178
Jul 2014 - Jun 2015	8 453	47 687	0	39 234
Jul 2015 - Jun 2016	8 453	51 693	0	43 239
Jul 2016 - Jun 2017	8 453	54 938	0	46 484
Total estimated reductions (tonnes of CO2e)	**59 174**	**276 444**	**0**	**217 269**

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	Q_y
Data unit:	Tonnes
Description:	quantity of raw waste composted in the year “y”
Source of data to be used:	Project Developer
Value of data	85 000
Description of measurement methods and procedures to be applied:	The amount of organic waste prevented from disposal in landfills will be monitored by a weighbridge, weighing the trucks entering the project’s site. The composition of waste from each supplier is recorded and/or will be evaluated through representative sampling (please see Pn,j.x for more information). The PD will frequently take samples from the trucks delivering the raw waste to the facility.
QA/QC procedures to be applied:	Weighbridge will be subject to periodic calibration in accordance with stipulation of the weighbridge supplier and/or national regulation (whichever applicable).
Any comment:	

Data / Parameter:	$\mathbf{MD_{y,reg}}$
Data unit:	-
Description:	Quantity of methane that would have to be captured and combusted to comply with prevailing regulations
Source of data to be used:	Federal, State or Municipal regulations
Value of data	0
Description of measurement methods and procedures to be applied:	Regulatory framework will be assessed annually, however, until the present data there are no applicable regulations which impose the capture and destruction of methane.
QA/QC procedures to be applied:	n/a
Any comment:	Although assessed annually this parameter will only be updated at the renewal of the crediting period.

Data / Parameter:	CT_y
Data unit:	tonnes/truck
Description:	Average truck capacity for waste transportation
Source of data to be used:	Project Developer
Value of data	5 (ex-ante estimate)
Description of measurement methods and procedures to be applied:	Trucks entering the facility will be weighted on weight bridge. This data will be recorded electronically.
QA/QC procedures to be applied:	Electronic records can be cross-checked with waste suppliers' documentation if necessary.
Any comment:	

Data / Parameter:	DAF_w
Data unit:	km/truck
Description:	Average incremental distance for raw solid waste transportation
Source of data to be used:	Project Participants
Value of data	0
Description of measurement methods and procedures to be applied:	Calculated ex-post. The incremental average difference of the distance will be monitored and recorded annually. The distances will be calculated using the addresses from the waste suppliers and the project facility, and comparing them to the distances from the waste suppliers facility to the SWDS the waste was disposed of in the baseline scenario.
QA/QC procedures to be applied:	n/a
Any comment:	For the purpose of ex-ante emission reduction calculations, this parameter was assumed to be zero, however it will be monitored ex-post and taken into account once a monitoring period is concluded.

Data / Parameter:	$Q_{y, treatment\ i}$
Data unit:	Tones
Description:	Quantity of final compost product produced in the year "y"
Source of data to be used:	Project Developer
Value of data	68 000
Description of measurement methods and procedures to be applied:	Data will be recorded electronically. Monitored regularly and reported annually by the Project Developer. The compost will be weighed on a weight bridge, weighing the trucks leaving the project's site.
QA/QC procedures to be applied:	Electronic records can be cross checked with invoices or sales receipts for the compost. A maintenance and calibration regime will be followed as per manufacturer's or national recommendations (whichever applicable).
Any comment:	

Data / Parameter:	$CT_{y, treatment\ i}$
Data unit:	tonnes/truck
Description:	average truck capacity for final compost product transportation

Source of data to be used:	Project Developer
Value of data	30 (*ex-ante* estimate)
Description of measurement methods and procedures to be applied:	Trucks leaving the facility will be weighted on weight bridge. This data will be recorded electronically.
QA/QC procedures to be applied:	Electronic records can be cross-checked with invoices or sales receipts for the final compost if necessary.
Any comment:	

Data / Parameter:	**DAF** $_{treatment\ i}$
Data unit:	Km/truck
Description:	Average distance for final compost transportation
Source of data to be used:	Project Developer
Value of data	350 (*ex-ante* estimate)
Description of measurement methods and procedures to be applied:	Calculated *ex-post*. The average distance will be monitored and reported annually. The distance between the off taking entities and the project facility will be calculated using the addresses on the sales receipts or invoices.
QA/QC procedures to be applied:	n/a
Any comment:	

Data / Parameter:	$PE_{y,res\ waste}$
Data unit:	tCO_2e
Description:	Methane emissions from anaerobic decay of residual waste/products
Source of data to be used:	Project Developer
Value of data	0
Description of measurement methods and procedures to be applied:	Not applicable since none of the residual waste/products are subject to anaerobic decay. Quantities of the residual waste/products will be monitored and reported annually.
QA/QC procedures to be applied:	n/a
Any comment:	

Data / Parameter:	$EG_{PJ,FF,y}$
Data unit:	MWh
Description:	amount of electricity consumed from the grid as a result of the project activity
Source of data to be used:	Electricity meter from the electricity supplier company
Value of data	4 500
Description of measurement methods and procedures to be applied:	Electricity meter from the electricity supplier company will be continuously measuring the electricity consumed by the project activity. The Project Developer will use the data provided and report annually.
QA/QC procedures to	Electricity meter(s) will be maintained as per meter suppliers' and/or

be applied:	concessionaires' stipulation.
Any comment:	The present project activity will use the data from the electricity bill as a proof of the electricity consumed, and assuming that the meter is fully calibrated and maintained.

Data / Parameter:	$F_{cons,y}$
Data unit:	L
Description:	Fuel consumption on site in year y
Source of data to be used:	Project Developer
Value of data	35 000
Description of measurement methods and procedures to be applied:	Calculated from fossil fuel purchase receipts. Data will be monitored and reported annually.
QA/QC procedures to be applied:	n/a
Any comment:	Fossil fuel is used by equipment for the turning of compost piles.

Data / Parameter:	Aerobic conditions' parameters
Data unit:	-
Description:	Measures to ensure the aerobic conditions of the composting process
Source of data to be used:	Project Developer
Value of data	Not applicable
Description of measurement methods and procedures to be applied:	The Project Developer will be responsible for implementing measures and/or procedures which allow aerobic conditions during composting process. Tests will be performed in order to establish key parameters (e.g., height and length of compost pile, its composition and frequency of turns) to be monitored in order to ensure aerobic conditions.
QA/QC procedures to be applied:	These monitoring parameters will be formalised in a quality control program.
Any comment:	

Data / Parameter:	Soil application of the compost
Data unit:	-
Description:	Monitoring of the soil application of the compost in the area / region
Source of data to be used:	Project Developer
Value of data	Not applicable
Description of measurement methods and procedures to be applied:	Documentation of sales or delivery of the compost.
QA/QC procedures to be applied:	An in situ verification of the proper soil application of the compost will ensure aerobic conditions for further decay.
Any comment:	

Data / Parameter:	$\mathbf{W_x}$
Data unit:	tons
Description:	Total amount of organic waste prevented from disposal in year *x* (tonnes)
Source of data to be used:	Project Developer
Value of data	85 000
Description of measurement methods and procedures to be applied:	The amount of organic waste prevented from disposal in landfills will be monitored by a weighbridge, weighing the trucks entering the project's site. The composition of waste from each supplier is recorded and/or will be evaluated through representative sampling.
QA/QC procedures to be applied:	Weighbridge will be subject to periodic calibration in accordance with stipulation of the weighbridge supplier and/or national regulation (whichever applicable).
Any comment:	Same as parameter $\mathbf{Q_y}$

Data / Parameter:	$\mathbf{p_{n,j,x}}$
Data unit:	-
Description:	Weight fraction of the waste type *j* in the sample *n* collected during the year *x*
Source of data to be used:	Sample measurements by project participants
Value of data	see table below
Description of measurement methods and procedures to be applied:	Sampling of the waste prevented from disposal, using the waste categories *j*, as provided in the table for *DOCj* and *kj*. The size and frequency of sampling will be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling will be undertaken four times per year.
QA/QC procedures to be applied:	n/a
Any comment:	

Value of data:

	Dourados	Andradina
A. Pulp, Paper and Cardboard (other than sludge)	2.5%	10.0%
B. Garden and Park waste (non-food)	36.3%	10.0%
C. Food, Food waste, beverages, tobacco and sludge	38.8%	65.0%
D. Wood and straw waste	17.5%	10.0%
E. Textiles	0.0%	0.0%
F. Inert	5.0%	5.0%

Data / Parameter:	**z**
Data unit:	-
Description:	Number of samples collected during the year *x*
Source of data to be used:	Project participants
Value of data	≥4
Description of measurement methods and procedures to be applied:	Continuously, aggregated annually
QA/QC procedures to	n/a

be applied:	
Any comment:	This parameter only needs to be monitored if the waste prevented from disposal includes several waste categories *j*, as categorized in the tables for DOC_j and k_j.

Data / Parameter:	$Q_{y,ww,runoff}$
Data unit:	-
Description:	Volume of runoff water
Source of data to be used:	Project Developer
Value of data	-
Description of measurement methods and procedures to be applied:	Data monitored ex-post. The volume of the runoff water in the collection system will be monitored through ruler measuring the depth of the water in the lagoon. This monitoring will be performed frequently, at least once a month. From these monthly readings a yearly average will be calculated and in case the average water depth measured does not exceed 2m, no project emissions will be accounted for.
QA/QC procedures to be applied:	Two rulers will be used in each lagoon in order to crosscheck data.
Any comment:	The date will be recorded monthly by the project developer. The depth of 2m was chosen in accordance with the small scale methodology AMS-III.I. (Avoidance of methane production in wastewater treatment through replacement of anaerobic systems by aerobic systems).

Data / Parameter:	$COD_{y,ww,runoff}$
Data unit:	-
Description:	Project emissions due to excess runoff water
Source of data to be used:	Project Developer
Value of data	-
Description of measurement methods and procedures to be applied:	Data monitored ex-post. A sample of the water retained in the collection system will be mixed with oxidizing solution and heated to have its COD analyzed. This monitoring will be performed frequently, at least one each six months.
QA/QC procedures to be applied:	The analysis will be performed by an outsourced laboratory.
Any comment:	The date will be recorded by the project developer.

B.7.2 Description of the monitoring plan:

The monitoring plan details the actions necessary to record all the variables and factors required by the methodology AMS-III.F. as detailed in section B.7.1 above. All data will be archived on paper basis and/or electronically, and backed up regularly. Moreover, it will be kept for the full crediting period, plus two years after the end of the crediting period or the last issuance of CERs for this project activity (whichever occurs later).

The monitoring equipment will be chosen carefully to be able to perform good measurements with high quality and a low level of uncertainty. It will be calibrated and maintained according to the manufacturer's recommendations.

Project staff will be trained regularly in order to satisfactorily fulfill their monitoring obligations. The authority and responsibility for project management, monitoring, measurement and reporting will be agreed between the project participants and formalized. Detailed procedures for calibration of monitoring equipment, maintenance of monitoring equipment and installations, and for records handling will be established.

All data to be monitored will be collected and quality checked by Organoeste Franchising Ltda. EcoSecurities will assure the quality of monitoring by adequately training the personnel involved and controlling monthly the data acquired, using its highly specialized monitoring staff.

The operation of the composting facilities will be documented, monitoring the conditions and procedures that ensure the aerobic condition of the waste during the composting process.

The amount of runoff water will be monitored and if applicable, considered as mentioned in the methodology, however, it is not expected that this runoff water will generate project emissions due to the short storage period in the collection system and also due to the fact that the runoff water will be returned to the composting pile and, therefore, will be treated aerobically.

Soil application of the compost in agriculture or related activities will be monitored. This includes documenting the sales or delivery of the compost final product. *In situ* verification of the proper soil application of the compost will also be done to ensure aerobic conditions for further decay. This verification will be done at representative sample of user sites.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

The baseline study and the monitoring methodology were concluded on 25/02/2008 (DD/MM/YYYY). The entity determining the baseline study and the monitoring methodology and participating in the project as the Carbon Advisor is EcoSecurities, listed in Annex 1 of this document.

Personnel responsible for the baseline and monitoring of this project:

Mr. Thiago Viana	EcoSecurities Brasil Ltda.	Project Manager	Thiago.viana@ecosecurities.com

Contact: EcoSecurities Brasil Ltda., Rua Lauro Müller 116, 4304, Botafogo, Rio de Janeiro, Brazil. CEP: 22290-160. Phone: +55 (21) 2546-4150

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

11/04/2006 (DD/MM/YYYY) – Issuance of the Environmental Operation License of the older composting unit comprised by this project activity (i.e. Dourados unit).

C.1.2. Expected operational lifetime of the project activity:

21 years 0 months (it is not expected that any equipment involved in this project activity will have its lifetime smaller than the entire renewable crediting period)

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

01/07/2010 (DD/MM/YYYY) or the registration date, whichever is later.

C.2.1.2. Length of the first crediting period:

7 years 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Organoeste Franchising Ltda. is in compliance with all laws and regulations applicable. All applicable licenses were obtained and all conditions were obeyed. The State Environmental Authority, i.e. Instituto Ambiental do Mato Grosso do Sul (IMASUL) and Companhia de Tecnologia de Saneamento Ambiental (CETESB/SP), requests Environmental Impact Assessment (EIA) for all activities with a high potential to harm the environment. However, as this project does not have a high potential to harm the environment, an EIA was not requested for this project activity.

Therefore, given that the project activity will not induce significant impacts, no impact assessment was undertaken.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

Not applicable.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

According to Resolution #7 dated March 5th, 2008 from the Brazilian Interministerial Commission on Global Climate Change (Comissão Interministerial de Mudança Global do Clima - CIMGC), the project proponents must send an invitation for comments to the stakeholders involved, interested or affected by project activities under the Clean Development Mechanism. This invitation must be in the form of a letter sent by mail. The letters sent:

a) contain the name and type of project activity under the Clean Development Mechanism, as shown in the project design document – PDD;

b) inform the specific electronic address for the web site where copies can be obtained, in Portuguese, of the last available version of the project design document in question, as well as the description of the project activity's contribution under the Clean Development Mechanism towards sustainable development; and

c) provide an address so stakeholders who do not have access to the Internet can request a written and timely copy of the documentation mentioned above from the project proponent.

In this case, letters were sent to the following local stakeholders:

- City Hall of Andradina and Dourados;
- Chamber of Deputy of Andradina and Dourados;
- Government and legislative assembly of each state involved
- Federal and State Attorney General (known in Portuguese as Ministério Público Estadual e Federal, i.e. the permanent institution essential for legal functions responsible for defending the legal order, democracy and social/individual interests);
- Environment agencies from the Federal, State and Local Authority;
- Brazilian Forum of NGOs;
- Local community association(s).

Local stakeholders were invited to raise their concerns and provide comments on the project activity for a period of 30 days after receiving the letter of invitation.

E.2. Summary of the comments received:

To date no formal comments have been received from stakeholders.

E.3. Report on how due account was taken of any comments received:

Not applicable, given that no comments were received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Project Annex 1 participant:

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not receive any public funding from annex 1 parties.

Annex 3

BASELINE INFORMATION

TYPE AND AMOUNT OF WASTE PER UNIT:

DOURADOS			
		Equivalent Waste	
		%	ton
A. Pulp, Paper and Cardboard	%	2.5%	875
B. Garden and Park waste (non-food)	%	36.3%	12688
C. Food, Food waste, beverages and tobacco	%	38.8%	13563
D. Wood and straw waste	%	17.5%	6125
E. Textiles	%	0.0%	0
F. Inert	%	5.0%	1750
Others			
		100.0%	35000

DOURADOS			
Year of beggining of the CDM project	Year	---	2009
Quantity of waste composted and/or wastewater co-composted in the year "y"	ton/year	Q_y	35000
Quantity of final compost product produced in the year "y"	ton/year	$Q_{y,treatment}$	28000
Average distance from the composting plant to the collection points of biomass/waste (2-way distance)	Km	---	80
Average distance from the landfill where the waste would have been disposed in the absence of the project to the collection points of biomass/waste	Km	---	80
Average incremental distance for raw solid waste transportation	km/truck	DAF_w	5
Average truck capacity for waste transportation	ton/truck	CT_y	5
Average truck capacity for final waste compost product transportation	ton/truck	$CT_{y,treatment}$	30
Average distance for final compost product transportation	km/truck	$DAF_{treatment}$	300
Composting factor (how many tonnes of compost are produced per ton of waste)	ton_{comp}/ ton_{waste}	---	0.8
Electricity consumed per year	MWh	$EG_{PJ,FF,y}$	3500
Fuel consumed at the site per year	Liters	$F_{cons,y}$	25000

ANDRADINA			
		Equivalent Waste	
		%	ton
A. Pulp, Paper and Cardboard	%	10.0%	5000
B. Garden and Park waste (non-food)	%	10.0%	5000
C. Food, Food waste, beverages and tobacco	%	65.0%	32500
D. Wood and straw waste	%	10.0%	5000
E. Textiles	%	0.0%	0
F. Inert	%	5.0%	2500
Others			0
		100.0%	50000

ANDRADINA			
Year of beggining of the CDM project	Year	---	2009
Quantity of waste composted and/or wastewater co-composted in the year "y"	ton/year	Q_y	50000
Quantity of final compost product produced in the year "y"	ton/year	$Q_{ytreatment}$	40000
Average distance from the composting plant to the collection points of biomass/waste (2-way distance)	Km	---	80
Average distance from the landfill where the waste would have been disposed in the absence of the project to the collection points of biomass/waste	Km	---	80
Average incremental distance for raw solid waste transportation	km/truck	DAF_w	0
Average truck capacity for waste transportation	ton/truck	CT_y	8
Average truck capacity for final waste compost product transportation	ton/truck	$CT_{y,treatment}$	30
Average distance for final compost product transportation	km/truck	$DAF_{treatment}$	400
Composting factor (how many tonnes of compost are produced per ton of waste)	ton_{comp}/ ton_{waste}	---	0.8
Electricity consumed per year	MWh	$EG_{PJ,FF,y}$	1000
Fuel consumed at the site per year	Liters	$F_{cons,y}$	10000

INFORMATION REGARDING EMISSION FACTOR CALCULATION

The Project Activity is connected to the Brazilian Interconnected Grid. The grid emission factor is calculated by the Brazilian DNA, according to AMS-I.D

By means of the Resolution number 8, issued on May 26th, 2008, the "Interministerial Commission on Global Climate Change" (*Comissão Interministerial de Mudança Global do Clima* – CIMGC), the Brazilian Designated National Authority (DNA), delineated the electricity system as the National Interconnected Grid (Sistema Interligado Nacional – SIN), for CDM purposes.

As the purpose of the project developer is composting, the monitoring of the Grid Emission Factor ex-post was considered cumbersome and unnecessary. Therefore, the ex-ante option was chosen. Please find below the values used for this calculation, as published in the Brazilian DNA website (http://www.mct.gov.br/index.php/content/view/73318.html):

Table – Values used to calculate CEFelec.

	$EF_{OM,y}$
2006	0.3246
2007	0.2936
2008	0.4780
Average (EF_{OM})	0.3654

EF_{BM}	0.1458
ω_{OM}	0.5
ω_{BM}	0.5
EF_{Grid} (tCO2e/MWh)	**0.2556**

Annex 4

MONITORING INFORMATION

Please refer to section B.7 above.

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Barreira, L.P. (2005). *Avaliação das usinas de compostagem do estado de São Paulo em função da qualidade dos compostos e processos de produção*. Thesis presented to receive the title of Doctor of Science, in the São Paulo University (USP), São Paulo, SP, Brazil. Available online at http://www.teses.usp.br/teses/disponiveis/6/6134/tde-08032006-111308/ (accessed in January 2008).

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