CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-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 the small-scale project activity

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

CERVEPAR- Biomass based project.- Paraguay

Version 01

Date: 30/01/07

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

The project is presented by *Cerveceria Paraguaya S.A.*-CERVEPAR, a leading brewery company in Paraguay (Quinsa's beer subsidiary). The CERVEPAR factory, located in *Ypane* Municipality, 26 kilometers south of Asunción, boasts 150 employees and an annual production of 1 million hectoliters. CERVEPAR is a company that is related to the Bemberg Group of Argentina and Quilmes, therefore being associated with InBev the world's largest producer of beer by volume. InBev was formed in 2004 when Interbrew and *Companhia de Bebidas das Américas* (AmBev) combined to create what is now the world's largest brewer.

In the beer manufacturing process, the wort is boiled along with any remaining ingredients (excluding yeast) to remove excess water, kill any microorganisms and improve the protein coagulation. The major use of the generated steam is to provide heat to the boilers.

The project activity aims to use extracted coconut biomass from *acrocomia totai, Mart.*, known as the Paraguayan palm tree, and other biomass types as rice husk and saw dust, to supply steam to the CERVEPAR boilers, instead of heavy oil, which is the fuel currently used. The project developer plans to start the operation of the biomass based boiler on 01st of September, 2007.

The project activity takes into account GHG emission mitigation due to the replacement of heavy oil to generate heat with carbon-neutral biomass residues. The amount of oil utilized is around 5 500 tonnes/year, which will be entirely replaced by renewable biomass.

The emission reductions, by the project activity, will occur via two different ways: First, by displacing heavy oil fuel, which is used to generate around 17 to 18 t/h of steam, and second, by reducing methane emissions from the decay process of the biomass, which would occur in open-air conditions in the absence of the project (biomass would be piled and decay would happen naturally in the absence of the project).

Biodiesel Misiones (biodiesel production plant) will provide the coconut kernel and husk to CERVEPAR, which is not utilized for the biodiesel production. The coconut kernel is almost pure lignin; hence it is very consistent and contains a considerable net heat value.

The project expects the contribution from Biodiesel Misiones to provide the amount of 1 500 tonnes/year of coconut biomass. The expected production of Biodiesel Misiones is about 2 200 liters/day of biodiesel through the processing of coconut pulp and almond, using a discontinuous process with 4 to 5 reservoirs, which results in a better quality biodiesel and offers more flexibility and efficiency to the production.

CERVEPAR will be responsible of finding other sources of renewable biomass, as rice husk and saw dust, considering that these types of biomass are abundantly available in the region.

CERVEPAR´s current practice has a direct negative impact, since a large amount of pollution agents, such as carbon dioxide, carbon monoxide, sulphur oxides among others are emitted through the combustion of fossil fuels. Besides its local effects, these negatives impacts are directly related to major global issues, such as the greenhouse effect and the acid rain phenomenon. On the other hand, biomass is a low-sulphur fuel, which is therefore much less contributive than fossil fuels to the acid rain phenomenon. Biomass use also helps to mitigate the greenhouse effect, since biomass grows at the same rate as it is being harvested, so the net flux of CO2 to the atmosphere is zero.

The project contributes to Paraguay sustainable development by providing sound environmental and social-economic practices through the use of biomass residues, which is a renewable fuel source, instead of fossil fuel. This activity specially contributes to the local community sustainable development. The Project has positive environmental impacts by providing better air quality and sustainable use of the local resources. Moreover, there are no significant negative environmental impacts related to the implementation of the project. The social conditions are also favored, due to job opportunities and local income increase. All these aspects lead to the fact that this project contributes to sustainable development as a project consequence of its implementation.

A.3. Project participants:

Name of the Party involved	Private entity(ies) project participants	Party involved whishes to be considered as project participant
Paraguay (Host Country)	*Biodiesel Misiones*	NO
Paraguay (Host Country)	*CERVEPAR*	NO

Table 01 .Project Participants

All contact details are provided in Annex 1.

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

The Project will replace an oil fired boiler with three units of a biomass waste boiler and a biomass processing unit. This equipment will supply steam to the beer manufacturing process.

The following table summarizes the technical description of the baseline and CDM project scenario:

Characteristics	Baseline Scenario	Project Scenario
Technology	One unit of a oil fired boiler Standard - Kessel (10 kg / cm2) With one fuel burner – Saacke – SKV 100	Three units of biomass waste boiler (10 kgf/cm2, 170°) and a biomass processing unit.
Fuel input	Fuel Oil	Biomass Waste

Table 02. Baseline and CDM Project Scenarios

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

CERVEPAR is located in the Municipality of *Ypane*, Central Department, Paraguay.

A.4.1.1. Host Party(ies):

Paraguay.

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

Central Department.

A.4.1.3. City/Town/Community etc:

Municipality of *Ypane.*

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

The project activity is located on the municipality of *Ypane*, 27 km from *Asunción*, capital of Paraguay. The project site has the following physical address:

Villeta St. Km 30 Ypane- Paraguay.

Figure 01. Physical location of the project activity.

According to the methodologies I.C and III.E of appendix B of the simplified M&P for small scale CDM project activities applied to the project activity, the project boundary encompasses the physical and geographical site, therefore:

A. The places where the biomass would have been disposed of and where the methane emissions would have occurred in the absence of the proposed project activity;

B. The CERVEPAR facility where controlled combustion of the biomass will take place, providing thermal energy and displacing the use of non-renewable fuels;

C. The CERVEPAR facility where the final residues of the combustion process will be deposited;

D. The itinerary between A and B described above where the transportation of wastes and combustion residues will occur.

E. The area of the renewable generation source.

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

The Project is in accordance with the Appendix B of the simplified modalities and procedures for small scale CDM project activities:

-Type I.C “Thermal energy for the user with or without electricity.” – Due to the utilization of the heat value of the biomass on the beer manufacture boilers.

-Type III.E “Avoidance of methane production from biomass decay through controlled combustion” – since it avoids the production of methane from biomass that would have otherwise been left to decay as a result of anthropogenic activity.

The estimated average of annual emission reductions for the project activity, including leakages, is in the order of 17 315 tonnes CO2eq/year, which represents a total of 121 208 tonnes CO2eq over the first crediting period of 7 years. Under such circumstances, this project is eligible as a small-scale project activity, as it is in line with the criteria specified under Type I and Type III small-scale project activities.

Project Technology

There are numerous decisions to be made when producing steam for industrial applications at different steam loads and fully operation 24 hours/day, annually. There are four primary classes of biomass power systems: direct-fired, co-fired, gasification, and modular systems. Most of today's biomass power plants are direct-fired systems that are similar to most fossil-fuel fired power/steam plants.

The technology of the project activity foresees a direct combustion technology. The direct combustion technology is based on the direct oxidation of biomass with excess air, producing hot flow gases which in turn produce steam in the heat exchanger. The biomass boiler design includes reheat and regenerative steam cycles. The boiler configuration used for steam generation is based on traveling-grate combustors (stokers). The process foresees to modify current stoves, biomass furnaces, boilers and the installation of a biomass processing unit.

- Biomass processing unit

The project activity will use several biomass storage facilities (two to three large store tanks) for incoming biomass in order to have enough energy provision. The dumpsters where the biomass will be stocked are placed nearby the boilers and the biomass shredder, from where the biomass will be delivered into a hopper. The hopper drops the biomass into a conveyor that will deliver it into a shredder. The project activity will use a shredder to chip down the biomass into a more efficient size, in order to be used as a compatible fuel.

- Steam generation plant

For the project activity, steam from the boilers is required year-round for process heating applications. For such systems, the biomass fuel will be burned in a boiler to produce high-pressure steam (10 kgf/cm2, water vapor). All biomass combustion systems require feedstock storage and handling systems. The project activity will have two major handling sections: the tipping floor, where the biomass feedstock will be delivered, and the processing line, where the biomass will be treated, in order to be burned.

The steam generation plant is expected to economically utilize annual plant growth materials (such as rice hulls, cotton gin trash, nut shells, and various husks, chip wood) from Industrial activities within the project boundary area. The steam generation facilities will use moving-grate spreader stoker boilers to produce steam. The three new boilers will deliver a total steam capacity of 17 000 to 18 000 kg/hour at 170 °C.

The combustion of biomass waste is considered carbon neutral and the project activity has no GHG emission compared to the emissions from the heavy oil[1]-fired boilers, which are part of the GHG emissions in the baseline. The efficiency of carbon absorption through the vegetation growth is very significant, and can be equalized to the biomass (as rice straw and saw dust) combustion emissions.

In the absence of the project activity there will be no use for the rice straw and saw dust, which will be left to open air decay; therefore, emitting methane during its rotting process. There is no policy or

[1] Heavy oil is a type of crude oil which is very viscous and does not flow easily. The common characteristic properties are high specific gravity, low hydrogen to carbon ratios, high carbon residues, and high contents of asphaltenes, heavy metal, sulphur and nitrogen, therefore being a very pollutant fuel.

legislation regulating biomass residues destination; as a result, most of it is displaced on an open dump. The project activity, by providing an alternative destination to biomass residues, will contribute to methane emissions reduction and will also contribute to increase landfills lifetime.

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

Year	Estimation of annual emission reductions in tonnes of CO_2eq
Year 1 (Starting September 01)	3 843
Year 2	14 227
Year 3	15 820
Year 4	17 027
Year 5	17 970
Year 6	18 649
Year 7	19 370
Year 8 (Ending August 31)	14 302
Total estimated reductions (tonnes of CO_2equ)	121 208
Total number of crediting years	*7*
Annual average of the estimated reductions over the crediting period (tCO_2eq)	17 315

Table 03. Estimation of emission reductions.

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

The project will not receive any public funding that will result in a diversion of official development assistance.

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

A proposed project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or a request for registration by another small-scale project activity:

- By the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point

The project activity is the only CDM project proposed by the project developer; therefore, it is not part of a larger project activity, according to the definitions established in Appendix C of the ***"Simplified Modalities and Procedures for Small-Scale CDM Project activities"*[2].**

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:

Project	Types of the project	Project Category
CERVEPAR- Biomass based project.- Paraguay	Type I – Renewable energy projects.	Version 12 of AMS-I.C. "Thermal energy for the user with or without electricity."
	Type III – Other project activities	Version 13 of AMS-III.E. "Avoidance of methane production from biomass decay through controlled combustion."

Table 04 .Title and references.

B.2 Justification of the choice of the project category

The two methodologies employed are:

- AMS I.C – Thermal energy for the user with or without electricity. The project activity will use sawdust and rice husk, both renewable biomasses, to generate thermal energy for the boilers of CERVEPAR. In the baseline scenario the fuel employed is the bunker C oil, a high-pollutant fossil fuel.

- AMS III.E – Avoidance of methane production from biomass decay through controlled combustion. The sawdust and rice husk employed would be disposed of in an open dump without any control and would decay anaerobically.

The proposed project activity is eligible to apply the following monitoring methodologies:

- AMS – I.C since the project involves the supply of thermal energy by means of a renewable source of biomass that displaces fossil fuels and the aggregate installed capacity of the units will not exceed 45 $MW_{thermal}$.
- AMS – III.E since the project involves the avoidance of methane emission from biomass that would otherwise have been left to decay under clearly anaerobic conditions throughout the crediting period in a solid waste disposal site without methane recovery, or is already deposited in a waste disposal site without methane recovery. With a project emission threshold of 60,000 tCO2e annually.

[2] http://cdm.unfccc.int/Reference/Documents/AnnexII/English/annexII.pdf

B.3. Description of the project boundary

The project boundary encompasses the physical and geographical site (described in section A.4.1.4) of the renewable generation source.

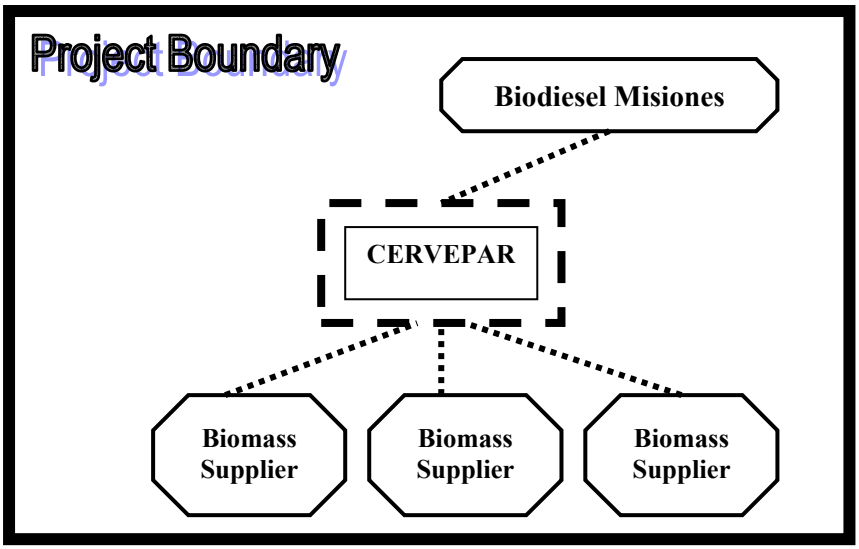

Figure 02. Project Boundary.

According to the methodologies I.C and III.E of appendix B of the simplified M&P for small scale CDM project activities applied to the project activity, the project boundary encompasses the physical and geographical site are:

A. The places where the biomass would have been disposed of and where the methane emissions would have occurred in the absence of the proposed project activity;

B. The CERVEPAR facility where controlled combustion of the biomass will take place, providing thermal energy and displacing the use of non-renewable fuels;

C. The CERVEPAR facility where the final residues of the combustion process will be deposited;

D. The itinerary between A and B described above where the transportation of wastes and combustion residues will occur.

E. The area of the renewable generation source.

The greenhouses gases included in or excluded from the project boundary are shown in table 5.

	Source	Gas		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	N_2O emissions are small compared to CH_4 emissions from landfills.

		CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted.
	Emissions from thermal energy generation	CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
		CO_2	Included	Emissions generated by the thermal energy produced.
Project Activity	On-site fossil fuel consumption due to the project activity	CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
		CO_2	Included	An important emission source in the project activity. The transportation of the biomass residues.

Table 05 .Overview of emissions sources included in or excluded from the project boundary and baseline.

B.4. Description of the baseline and its development:

The project activity utilizes two baselines under the category I.C "Thermal energy for the user with or without electricity" and category III.E "Avoidance of methane production from biomass decay through controlled combustion." Both are in Appendix B of the simplified Modalities and Procedures for Small-Scale CDM project activities.

For the renewable thermal energy generation, which displaces heavy oil use, the baseline will be the amount of oil used (TJ) to produce 17-18 tonnes of steam per hour at 10kgf/cm² (170°C) with two oil-fired boilers. The annual consumption of the brewery is about 5 500 tonnes of heavy oil with a net calorific value of 10 579 kcal/kg, totalizing 244 TJ/year.

The baseline for the methane avoidance component as defined in Type III. E projects is the situation where, in the absence of the project activity, the biomass is left to decay and the methane is emitted into the atmosphere. The baseline emission is the amount of methane from the decay of biomass that is treated in the project activity, calculated using the IPCC default emission factors.

The calculation formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities is provided in section B.6.3.

	Carbon Emission Factor (CEF)	**CO2 Carbon Ratio**	**Default carbon oxidation factor**	**CO_2 emissions**
Units	Tonnes of C/TJ	-	-	Tonnes of CO2/TJ

Value	21.1	(44/12)	0.99	76.593

Table 06. Baseline calculation data[3].

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 project activity is a biomass-fuelled steam generation project, that provides steam to the brewery plant and at the same time, avoids methane emissions from biomass waste piles.

The GHG emission reductions from the project activity are additional and would not have occurred in the absence of the proposed project activity. According to the attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities the project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions,

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to the implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

Barriers:

The barriers associated with this project are described below:

- **Biomass market barrier**

Several industrial processes generate biomass as a sub-product that has seasonal variation depending on the industrial activity and localization. Nevertheless, biomass stock, biomass availability and biomass prices are not subject to market forces, since there is not an established market for residual biomass in Paraguay. This aspect strongly decreases the project developer analysis ability over the medium-term. Specifically, the price for rice husk and other biomass residues is not known and the project developer has problems to define a current biomass price and trends for the value in the near future. Credit incentives could help CERVEPAR to look for the biomass, helping to build a reliable market that could provide the biomass.

As a result, the main barrier is that the project developer in not in a reliable market with an established price to decrease project risk. Moreover, the project developer can not warrant the biomass availability for the steam generation throughout the year.

[3] IPCC Manual, 1996, Chapter 1- Energy, Table 1-1, pg. 1-13

A reasonable and more natural alternative would be the combustion of wood chips and wood pellets, for which there is a large scale market established, although its origins are usually native forest. The cost of one ton of wood is approximately 35 USD (including cost of transportation and wood availability nearby the Industrial facility) and the price for one ton of rice straw is approximately 64 USD (excluding transportation cost).

- **Qualify Operation Barrier**

The lack of experience on dealing with biomass suppliers is seen by the project developer as a major risk for the industrial plant operation. The project developer does not have previous experience in dealing with biomass suppliers and fuel transport logistics.

- **Financial and project viability barriers**

Many technical studies have been carried out worldwide to improve and to find better ways for using and/or disposing of biomass residues in the course of generating steam/electricity. Still, the volume of useable power being produced from biomass is extremely small relative to the biomass resources available for this use. Moreover in Paraguay, this is not a current practice at all.

Several barriers are found in relation to this technology; for example the biomass-based steam plant has to compete with other power supply options. In the case of Paraguay, considering Paraguayan industrial practices, the first option would be steam generation based on fossil fuels (diesel or residual fuel oil). The advantage of this type of steam generation plant is that it can be very economical, it is reliable, it can be installed relatively quickly, it can be built on both small and large scales, and it is well known by the finance community.

Fossil fuels are currently abundant and possess a reliable supply through a well structured market, delivering fairly competitive prices. On the other hand, biomass power plants rely on less efficient steam boiler technology and draw on fuel supplies that are bulkier, less homogeneous, and more difficult to fire and handle than fossil fuels (especially relative to the project baseline scenario that is based on fuel oil)

- **Reliability Barrier**

While steam generation technology is very reliable, its efficiency is limited. For biomass direct combustion facilities, the electrical equivalent power of the boilers is in the 20-50 MW range, compared to coal-fired plants, which are in the 100-1500 MW range. The small capacity plants tend to be lower in efficiency because of economic trade-offs; efficiency-enhancing equipment cannot pay for itself in small plants. Although, modern techniques exist to push biomass steam generation efficiency over 40%; actual plant efficiencies available in the market are in the low 20% range.

Common practice analysis

Analyze other activities similar to the proposed project activity.

There is not a similar project activity implemented previously or currently underway in Paraguay.

Discuss any similar options that are occurring.

No similar activities to this project activity are being carried out in Paraguay.

Impact of the CDM registration

Paraguay has an economy market that is marked by a large informal sector. The informal sector features both re-export of imported consumer goods to neighboring countries as well as the activities of thousands of small businesses and urban street vendors. Because of the importance of the informal

sector, accurate economic measures are difficult to obtain. A large percentage of the population makes its living from agricultural activity, often on a subsistence basis.

The country has vast hydroelectric resources, including the world's largest hydroelectric generation facility built and operated jointly with Brazil (*Itaipú Dam*), but it lacks significant mineral or petroleum resources.

The government welcomes foreign investment and provides national treatment to foreign investors. The economy is dependent on exports of soybean, cotton, cattle and timber, and also on electricity generation, and to a decreasing degree on re-exporting to Brazil and Argentina products made elsewhere.

According to Paraguayan Government statistics, Paraguay's GDP of USD 7.67 billion in 2005 represented a real increase of 2.9% in relation to the previous year, and its accumulated increase from 1995 to 2005, was about 12.49%. However, given the importance of the informal sector, accurate economic measures are difficult to obtain. Paraguay generally maintains a small balance-of-payments surplus. In December 2005, official foreign exchange reserves were USD 1.297 billion, and foreign official debt remained about USD 2.271 billion. On a per capita basis, GDP declined by about 5.7% from 1995 to 2005, but from 2004 to 2005 it rose 1.01%, and inflation, at the first period, rose to 8.6%. Furthermore, the balance of trades in 2005 was about USD -1.450 billions.

Until today no Paraguayan projects have been registered as CDM project activities. This project could be the pioneer, opening a new awareness in the market and creating an alternative income stream to the Paraguayan society through the negotiation of Certified Emission Reductions (CERs). The registration and implementation of the proposed project activity will have a strong impact on the development of biomass-based activities by encouraging other project developers to implement similar projects based on the prospect of generating CERs as a financial incentive for the implementation of this type of project. This will contribute to sustainable development and environmental conditions improvement, through both the switch from fossil fuel to biomass, a renewable energy source, and the avoidance of methane that results from biomass decay. In addition, one of the financial benefits from the revenue obtained by selling the CERs is that new players who can bring the capacity to implement new technologies will be attracted.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

Two methodologies are used in this project activity:

AMS – I.C Thermal energy for the user with or without electricity

AMS – III.E. Avoidance of methane production from biomass decay through controlled combustion

The proposed project activity is eligible to apply the following monitoring methodologies:

- AMS – I.C since the project involves the supply of thermal energy by means of a renewable source of biomass that displaces fossil fuels and the aggregate installed capacity of the units will not exceed 45 $MW_{thermal}$.

- AMS – III.E since the project involves the avoidance of methane emission from biomass that would otherwise have been left to decay been left to decay under clearly anaerobic conditions throughout the crediting period in a solid waste disposal site without methane recovery, or is

already deposited in a waste disposal site without methane recovery. With a project emission threshold of 60,000 tCO2e annually.

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

Data / Parameter:	**CEF**
Data unit:	TC/TJ
Description:	Carbon Emission Factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value applied:	21.1 TC/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied:	Mandatory under Methodology I.C.
Any comment:	-

Data / Parameter:	**COF**
Data unit:	-
Description:	Default Carbon Oxidation Factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value applied:	0.99
Justification of the choice of data or description of measurement methods and procedures actually applied:	Mandatory under Methodology III.E.
Any comment:	-

Data / Parameter:	**GWP CH4**
Data unit:	-
Description:	Global Warming Potential for Methane
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied:	Mandatory under Methodology III.E.
Any comment:	Value valid for the first commitment period.

Data / Parameter:	NCV
Data unit:	kcal/kg of oil
Description:	Net Calorific Value of the Heavy Oil
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value applied:	10 579 kcal/kg of oil
Justification of the choice of data or description of measurement methods	This value will provide the energy generated by the amount of oil that would be used in the absence of the project.
Any comment:	-

B.6.3. Ex-ante calculation of emission reductions

The selected formulae to estimate emission reductions from heavy oil and methane avoidance are given below:

Methodology I.C.

$BE_{oil}y$ (tCO_2eq) = Fuel Consumption (TJ) x Emission Coefficient of the Fuel (tCO_2eq/TJ) (1)

Where:

$BE_{oil}y$: Baseline emission reductions from switching heavy oil with a renewable biomass in year y;

Emission Coefficient: last recent value from IPCC.

Methodology III.E.

$BE_{CH4}y(tCO_2eq) = MB,y * GWP\_CH4 – MDy,reg * GWP\_CH4$ (2)

Where:

$BE_{CH4}y$: Baseline emission reductions from methane avoidance in year y;

MB,y : methane generation potential in the year "y" (tonnes of CH4), estimated as in AMS III-G

MDy,reg: methane that would be destroyed or removed in the year "y" (tones of CH4) for safety or legal regulation

CH4_GWP: IPCC default value of 21 is used for the first commitment period

In order to calculate MB,y the following formula was employed from AMS III-G:

$$MB_y = \frac{44}{12} * F * DOC_f * MCF * \sum_{x=1}^{y} \text{Error! Objects cannot be created from editing field codes.Error! Objects cannot be created from editing field codes.} * DOC_j * \left(1 - e^{-k_j}\right) * e^{-k_j(y-x)} \quad \textbf{(3)}$$

where:

F: fraction of methane in the landfill gas (default 0.5)

DOC:j per cent of degradable organic carbon (by weight) in the waste type j (%).

DOCf: fraction of DOC dissimilated to landfill gas (IPCC default 0.77)

MCF: Methane Correction Factor (fraction, IPCC - 0.4 for Unmanaged Disposal sites- shallow (<5m waste))

***Aj,x*:** amount of organic waste type j landfilled in the year x (tonnes/year)

***Kj**:* decay rate for the rice straw and wood (k=0.027)

***j**:* waste type distinguished into the waste categories

x: 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)

y: year for which LFG emissions are calculated

The mean annual precipitation in Paraguay is approximately 1 270 mm[4] and, therefore, following the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" (Annex 14 –EB26), the kj applicable for rice straw is 0.4 and for saw dust is 0.035. The rice straw and saw dust will be kept dry by disposing of it in a shed. The DOCj used was, respectively, 38% and 50%, following the same methodological tool.

$$BEytotal((tCO_2/y) = BE_{OIL}y(tCO_2/y) + BE_{CH4}y(tCO_2/y) \quad (4)$$

According to methodology III.E the project activity emissions can consist of:

"a. CO2 emissions related to the combustion of the non-biomass carbon content of the waste (plastics, rubber and fossil derived carbon) and auxiliary fuels used in the combustion facility;

b. Incremental CO2 emissions due to incremental distances between the collection points to the controlled combustion site and to the baseline disposal site as well as transportation of combustion residues and final waste from controlled burning site to disposal site;

c.CO2 emissions related to the power used by the project activity facilities, including the equipments for air pollution control required by regulations. In case the project activity consumes grid –based electricity, the grid emission factor (kgCO2eq/kWh) is used, or it is assumed that diesel generators would have provided a similar amount of electric power, calculated as described in category I.D."

The project activity emissions may occur only due to the transport of the biomass (husk-rice, saw-dust, straw-coconut and kernel-coconut). Since the wood employed is a renewable biomass, deriving from a reforestation activity, there is no incremental consumption on electricity or fuel and no combustion of non-biomass occurs.

Formulae to estimate project activity emissions due to transport:

$$PEy,transp = (Qy/CTy) * DAFw * EFCO2 + (Qy,ash/CTy,ash) * DAFash * EFCO2 \quad (5)$$

[4] *Source: http://www.rlc.fao.org/paises/h2o/paraguay.htm*

where:

Qy : quantity of waste combusted in the year "y" (tonnes)

CTy: average truck capacity for waste transportation (tonnes/truck)

DAF: average incremental distance for waste transportation (km/truck)

EFCO2: CO2 emission factor from fuel use due to transportation (kgCO2/km, IPCC default values were used)[5].

Qy,ash: Quantity of combustion residues produced in the year "y" (tonnes)

CTy,ash: average truck capacity for combustion residues transportation (tonnes/truck)

DAFash: average distance for combustion residues transportation (km/truck)

The "General guidance on leakage in biomass project activities" of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories identified different emission sources based on the type of biomass being considered (described in the table 07).

Biomass Type	Activity/ Source	Shift of pre project activities	Emissions from biomass generation/ cultivation	Competing use of biomass
Biomass from forests	Existing forests	-	-	X
	New forests	X	X	-
Biomass from croplands or grasslands (woody or non-woody)	In the absence of the project	X	X	-
	In the absence of the project the land will be abandoned	-	X	-
Biomass residues or waste	Biomass residues or wastes are collected and use.	-	-	X

Table 07. Sources of leakage according to the type of the biomass.

Therefore, the only source of leakage of the project activity is the competing use of biomass. However the biomass availability is 25% larger than the amount demanded by the project and, according to the guidance, it can be neglected. In Paraguay, there is high availability of biomass to be used in the project activity (rice straw, saw-dust, straw-coconut and kernel-coconut) despite the fact that the biomass market is not well established and reliable (since biomass is not employed for other purposes). The table below shows some possible biomass providers.

Provider	Biomass	Distance (Km)
Blas Zapag	Briquettes from wood residue	50
Alejandro Guggiari	Briquettes from wood residue	300
Industrias Trociuk	Rice Straw	200
Biodiesel Missiones	Coconut	200

Table 08. Possible biomass providers of the project activity.

[5] Source: http://www.ipcc-nggip.iges.or.jp/EFDB/find_ef.php

The leakage predicted in methodology I.C and III.E is not applicable for this project activity as there is no transference of equipment.

The selected formula to estimate emission reductions from heavy oil and methane avoidance are given below:

Methodology I.C.

$BE_{oil}y$ (tCO_2eq) = Fuel Consumption (TJ) x Emission Coefficient of the Fuel (tCO_2eq/TJ) (6)

Where:

$BE_{oil}y$: Baseline emission reductions from switching heavy oil for a renewable biomass in year y;

Emission Coefficient: last recent value from IPCC.

Methodology III.E.

$BE_{CH4}y(tCO_2eq) = MB,y * GWP\_CH4(factor) – MDy,reg* GWP\_CH4(factor)$ (7)

Where:

$BE_{CH4}y$: Baseline emission reductions from methane avoidance in year y;

MB,y : methane generation potential in the year "y" (tonnes of CH_4), estimated as in AMS III-G

$MD_{y,reg}$: methane that would be destroyed or removed in the year "y" (tonnes of CH4) for safety or legal regulation

CH_4_GWP: value of 21 is used for the first commitment period

In order to calculate MB,y the following formulae was employed from AMS III-G:

$$MB_y = \frac{44}{12} * F * DOC_f * MCF * \sum_{x=1}^{y} \text{Error! Objects cannot be created from editing field codes.Error! Objects cannot be created from editing field codes.} * DOC_j * \left(1 - e^{-k_j}\right) * e^{-k_j*(y-x)} \quad \textbf{(8)}$$

Where:

F: fraction of methane in the landfill gas (default 0.5)

DOC:j per cent of degradable organic carbon (by weight) in the waste type j

DOCf: fraction of DOC dissimilated to landfill gas (IPCC default 0.77)

MCF: Methane Correction Factor (fraction, IPCC - 0.4 for Unmanaged Disposal sites- shallow (<5m waste)

***Aj,x*:** amount of organic waste type j landfilled in the year x (tonnes/year)

***Kj*:** decay rate for the straw rice and wood (k=0.027)

***j*:** waste type distinguished into the waste categories

x: 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)

y: year for which LFG emissions are calculated

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

During the first year of the renewable crediting period, it was predicted that the project developer will find the biomass barrier described in B.5 and not all biomass required will be available (except renewable wood), therefore the emissions reductions due to the avoidance of methane from biomass decay are estimated to be lower.

Year	BECH4y (tCO2e)	BEOILy (tCO2e)	Pey (tCO2e)	ER (tCO2e)
Year 1 (starting Sept 01)	215	3 650	22	3 843
Year 2	2,451	12 060	283	14 227
Year 3	4,043	12 060	283	15 820
Year 4	5,250	12 060	283	17 027
Year 5	6,194	12 060	283	17 970
Year 6	6,872	12 060	283	18 649
Year 7	7,593	12 060	283	19 370
Year 8 (Ending August 31)	5,470	9 045	212	14 302

Table 09. Emissions reductions table

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

Two methodologies are used in this project activity:

AMS – I.C Thermal energy for the user with or without electricity.

AMS – III.E. Avoidance of methane production from biomass decay through controlled combustion.

The description of the monitoring plan is in B.7.2.

B.7.1. Data and parameters monitored

Data / Parameter:	Steam
Data unit:	t/h
Description:	Steam Supplied to the refinery
Source of data to be used:	Measured and calculated by the project developer.
Value of data	Estimated in 17 tonnes per hour.
Description of measurement methods and procedures to be applied:	The measurement will be taken monthly with a minimum of 2 years after last CER issuance.
QA/QC procedures to be applied:	The thermal energy will be calculated by the amount of biomass and its respective energy content
Any comment:	Mandatory under methodology I.C

Data / Parameter:	Biomass
Data unit:	Tonnes
Description:	Biomass consumed by the steam boiler
Source of data to be used:	Measured by the project developer.
Value of data	Estimated in 3 780 tonnes per year.
Description of measurement methods and procedures to be applied:	The measurement will be taken monthly with a Minimum of 2 years after last CER issuance.
QA/QC procedures to be applied:	The biomass weighing will be done with a government approved scale for truck weighing to commercial standards. Amount of biomass will be double checked with receipt of purchase
Any comment:	Mandatory under methodology III.E

Data / Parameter:	Diesel oil
Data unit:	L
Description:	Amount of diesel oil consumed for transportation
Source of data to be used:	Estimated by the project developer.
Value of data	Estimated in 88 000 litters per year.
Description of measurement methods and procedures to be applied:	The measurement will be taken monthly with a Minimum of 2 years after last CER issuance.
QA/QC procedures to be applied:	The amount of fuel consumption in the transport of the biomass will be monitored by fuel meters and sales record.
Any comment:	Necessary to calculate the project emissions

Data / Parameter:	Energy of Biomass
Data unit:	TJ/t
Description:	Energy Content of Biomass
Source of data to be used:	Measured by the project developer.
Value of data	Estimated in 0,0188 TJ/t.
Description of measurement methods and procedures to be applied:	The measurement will be taken annually with a minimum of 2 years after last CER issuance.
QA/QC procedures to be applied:	The energy content of each biomass will be determined by a qualified laboratory with international approved

	standards and procedures (3rd party)
Any comment:	Measured by Third Party Laboratory

B.7.2. Description of the monitoring plan:

The party responsible for implementing the monitoring plan shall be the owner company *CERVEPAR S.A*. The project developer will also be responsible for developing the forms and registration formats for data collection and further classification. For this purpose the authority for the registration, monitoring, measurement and reporting will be an Engineer appointed by *CERVEPAR*.

The management structure will rely on the local technicians with a periodical operation schedule during the project. The project operator will be responsible for the training of monitoring and operation personnel with the help of equipment manufactures. The technical team will manage the monitoring, the quality control and quality assessment procedures and the different audits carried out at the project premises.

The maintenance structure will be based on the internal O&M (Operation and Maintenance) staff to guarantee the perfect working conditions of the meters. The maintenance structure will also ensure that the monitoring equipment is perfectly calibrated based on the INTN standards (*Instituto Nacional de Tecnología y Normalización*)[6].

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

The baseline and monitoring methodology for the project was made by *Ecológica Assessoria* and concluded in 04/08/2006. The name of the responsible person/entity determining the baseline is given below:

Name of person/Organization	Project Participant
Paulo Zanardi *Ecológica Assessoria Ltda*. *São Paulo*, Brazil. Tel: +55 11 5083 3252 Fax: +55 11 5083 8442 e-mail: zanardi@ecologica.ws WWW: www.ecologica.ws	NO

Table 10 Baseline contact.

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:

The start date for this activity is 01/09/07.

[6] http://www.intn.gov.py/

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

21 years.

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

The CDM project activity will use a renewable crediting period.

C.2.1. Renewable crediting period:

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

01/09/2007.

C.2.1.2. Length of the first crediting period:

7 years.

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:

The National Environmental Politics (NEP) of Paraguay establishes guidelines for preserving and managing natural resources and cultural patrimony, enabling sustainable development and its benefits; consequently, improving present and future population's livelihood. NEP introduces the principle of sustainability in the industry and services sector.

In compliance with NEP's principals, the project contributes to sustainable development and environmental conditions improvement through the switch from fossil fuel to biomass, a renewable energy source. Therefore, the project applies the principle of sustainability in its industrial process, and furthermore, promotes the reduction of GHG emissions into the atmosphere.

The project directly contributes to the improvement of local environmental conditions, by promoting sustainable agriculture activities and agriculture waste management and treatment; as lumber activity and biodiesel production, through the oil extracted from the coconut's pulp and almond. Therefore, the project does not cause any additional impacts, as all generated energy is a result of the best and unique management of the available natural resources; coconut, rice husk and saw dust.

The Project does not have any significant negative environmental impacts, since the biomass production does not lead to or depends on the expansion of the agricultural area. Moreover, the exploitation of these agricultural wastes has a positive impact, since in the absence of the project, the rice husk and the saw wood would putrefy outdoors, releasing methane gas into the atmosphere, contributing to intensifying the greenhouse effect.

The project will also contribute to job and income generation in the region, through both the collection and commercialization of the biomass, as well as the reduction of transport costs.

The licensing process contemplates the analysis of the Environmental Impacts Evaluation by the Administrative Authority. The company is in compliance with the environmental legislation of Paraguay. The company's environmental license was granted by SEAM - *Secretaría del Ambiente*, (Environment Secretariat) through note SEAM nº142/02 in 09/07/02. This license was renewed, together with the Monitoring Report of the Environmental Control Plan regarding mitigation goals, for a 2-year period, on January 19th, 2005 by the General Direction of Environmental Control and the Natural Resources Department of the Environment Secretariat.

SECTION E. Stakeholders' comments:

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

In line with CERVEPAR's commitment to transparency, the company will send informative letters to the parties involved, describing the main aspects of the proposed project implementation and operation, and requesting comments and suggestions on the project activity and impacts.

The Project Proponent will be available and willing to clarify further doubts, comments and suggestions received within 30 days, counting from the date that the invitation letter will be sent to the parties involved. During this period, a copy of the PDD will be available for public comments in English and Spanish versions.

The main identified stakeholders are Non-Governmental Organizations, City halls, Governmental Institutions, Centers of Studies in Sustainable Development and Local Associations. For further information, please refer to table 11 below.

Name of the Institution	Type of Entity	Address	Phone / Fax	Contact Point	E-mail
Interior of the Department of Missions	Public	San Juan Bautista, Misiones	(595) 81-212260 / 81-212536	Sonia Pinto, Secretaria de Medio Ambiente	gmisiones@contratacionesparaguay.gov.py
San Patricio City Hall	City Hall	San Patricio, Misiones - Paraguay	(595) 744-280278	Mario Hugo Maidana,	-
Santa María de Fe City Hall	City Hall	Santa María de Fe, Misiones - Paraguay	(595) 781-283214	Daniel García	-
San Miguel City Hall	City Hall	San Miguel, Misiones – Paraguay	(595) 783-248205	José Efrén González	-
Santa Rosa City Hall	City Hall	Santa Rosa, Misiones – Paraguay	(595) 858-285379	Rubén Jaquet	-
Yabebyury City Hall	City Hall	Yabebyry, Misiones – Paraguay	(595) 72-222565 / 72-222850	Numan Arrechea	-
San Ignácio City Hall	City hall	San Ignacio, Misiones – Paraguay	(595) 82-232218 / 232581 / 232466	Ricardo Omar Yednacz Britez	-
Yabebyury City Hall	Public	Calle Cero Corá c/San Marcial de Lorenzana. San Ignacio, Misiones – Paraguay	(595) 82-232206	Ramón Noguera	pastorsi@highway.com.py
Fleitas, President of the Administration Council	Private	Mcal Estigarribia esq. Gral. Caballero. San Ignacio, Misiones - Paraguay	(595) 82-232340	-	pastorsi@highway.com.py
Centro de Educación Agroecológico San Isidro Labrador (CEASIL)	Non Governmental	Compañía Potrero San Antonio Distrito San Ignacio, Misiones - Paraguay	-	Oscar Chamorro	-
Centro de Estudios Paraguayos Antonio Guasch (CEPAG)	Non Governmental	Calle Marcial de Lorenzana. San Ignacio, Misiones - Paraguay	(595) 82-232095	Gladys Montenegro	cepagmisiones@hotmail.com
Environment Secretariat of Paraguay (SEAM)	Public Secretariat	Avenida Madame Lynch 3.500 Asunción - Paraguay	(595) 21 615-806/7	Don Silvio Alfredo Molinas Maldonado	gabinete@seam.gov.py
Ministry of Industry and Commerce (Technical Environment Direction)	Ministry	Av. Mcal. López 3333 c/ Dr. Wiss, Villa Morra. Asunción - Paraguay C.P. 2151	(595) 21 616-3000	Don Raúl José Vera Bogado	-
Public Ministry of Paraguay	Ministry	Ntra. Señora de la Asunción entre E.V. Haedo y Humaitá Asunción - Paraguay	(595) 21 415-5000	-	-
Public Ministry of San Ignácio	Ministry	Mcal. Estigarribia N° 771 e/ Yegros – San Ignacio - Paraguay	(595) 82 232171	Alder Ramon Ferreira Altamirano	-
Public Ministry of Santa Rosa	Ministry	Pdte. Franco 790 c/ Juan del Rosario Acosta.Santa Rosa - Paraguay	(0858) 285604	Egidio Ramon Jara	-
Nacional Institute of Technology and	Governmental	Avda. Gral. Artígas 3973 c/ Gral. Roa.	(595) 21 29 01 60	-	intn@intn.gov.py

Normalization	Organization	Asunción - Paraguay Casilla de correos 967	(595) 21 29 02 66		
Industrial Union of Paraguay (UIP)	NGO	Cerro Corá 1038 entre EE.UU. y Brasil. Asunción - Paraguay	(595) 606-988	Gustavo Volpe	uip@uip.org.py
The Coconut Industry City council	NGO	Av. Mcal. López 3313 c/ Ingavi. Asunción - Paraguay	0531-32188 / 670-338	Manuel Fiore	-
City council of Beer Manufactures of Paraguay. (CAPAFACE)	NGO	Gral. Perón c/ Calle Porá Km. 10 – Ita Enramada	(595) 602-030/ 906-152 498-766 -495-461	-	cca@telesurf.com.py
Association of Vegetal Oil Producers	NGO	Pte. Franco 773 c/ Ayolas 1º. Piso – Asunción - Paraguay	(595) 559572/4 (595)559-572/4 (595) 492-825	Sante Matteucci	Juridico_est_@telesurf.com.py
Gestion Local	NGO	De la Conquista Nº 1331 Bº Carlos Antonio López Asunción - Paraguay	(595) 21 42 34 48 (595) 21 42 03 64	Raúl Monte Domecq	gestionlocalrm@cmm.com.py
Centro de Estudios Ambientales y Sociales (CEAMSO)	NGO	Dr. Morra 470 e/ Del Maestro y Bertoni. Asunción – Paraguay	(595) 21 608-626	Carlos Alberto Galarza Jara	ceamsopy@rieder.net.py
Asociacion de ONGs del Paraguay, POJOAJU	NGO	Gral. Díaz 429 c/ Alberdi. Asunción - Paraguay	(595) 448-559 / 448-559	Hermes García	cipade@sce.cnc.una.py
AlterVida – Centro de Estudios e Formación para el Ecodesarrollo	NGO	Itapúa 1372 c/ Primer Presidente y Rio Monday. Asunción, Paraguay	(595) 21 298842/3 - Fax: 298 845	Jorge Abbate	info@altervida.org.py
Centro de Desarrollo, Hábitat y Medio Ambiente (CEDES/HABITAD)	NGO	Caballero 458 c/ 25 de Mayo. Asunción - Paraguay	(595) 446-338	Silvio Ríos Cabrera	habitat@highway.com.py
Centro de Estudios del Medio Ambiente (CEMAPAR)	NGO	Austria 1886 e/ Viena y Bélgica Asunción - Paraguay	(595) 600-246	Hernán Enrique Kallsen Rottondo	-
Centro de Estudios y Desarrollo Económico y Social (CEPADES)	NGO	Mcal. Estigarribia 1050 e/ EE.UU. y Brasil. Asunción - Paraguay	(595) 211-779 / 210-858	Rolando Dítese	cepades@quanta.com.py
Mingara, Asociación para el Desarrollo Sustentable	NGO	Dr. Candia 373 c/ Tte. Rodi. Asunción - Paraguay	(595) 420-165	Mabel Barreto	ming-ra@pol.com.py minga@pol.com.py

Table 11. Participants entities

E.2. Summary of the comments received:

So far no comments have been received, as the stakeholder's commenting process has not yet taken place.

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

Not applicable.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	CERVEPAR
Street/P.O.Box:	*Villeta* Route, km 30
City:	*Ypane*
State/Region:	Central Department
Country:	Paraguay
Telephone:	+595 21 588 6578
FAX:	+595 21 5886544
E-Mail:	lcolussi@cervepar.com.py
Title:	Sub-manager
Salutation:	Mr.
Last Name:	Colussi
First Name:	Luis
Department:	Engineering
Direct tel:	+595 21 588 6578
Personal E-Mail:	lcolussi@cervepar.com.py

Organization:	Biodiesel Misiones S.A.
Street/P.O.Box:	*Artigas avenue* nº 3.473
City:	Asunción
State/Region:	Central Department
Country:	Paraguay
Telephone:	+595 21 291842
FAX:	+595 21 294221
E-Mail:	caconsul@adsl.net.py
Title:	Sub-manager
Salutation:	Mr.
Last Name:	Salomoni
First Name:	Tomás
Department:	Engineering
Direct tel:	+595 21 291842

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Not applicable.

Annex 3

BASELINE INFORMATION

The current practice of CERVEPAR has an immediate negative impact, due to the large amount of pollution agents, such as carbon dioxide, carbon monoxide, sulphur oxides among others are emitted through the combustion of fossil fuels; and in this case, through combustion of the bunker C oil.

The table below presents some information about the baseline scenario, such as consume of fuel and kind of technology employed.

Information	Value	Unit
Beer Production	100 000 000	*Liters/year*
Type of Fuel	Bunker C Oil	-
Amount of Fuel	5 500	*ton/year*
Steam Generation	17	*ton/hora*
Technology	Oil Fire Boiler	-
Model	Kessel (10Kg/cm2)	-
Fuel Burner	Saacke – SKV100	-
Fuel input	Fuel Oil	-

Table 12. Baseline information.

Annex 4

MONITORING INFORMATION

The Engineer appointed by *CERVEPAR* will be responsible for developing the forms and registration formats for data collection and further classification. The technical team will manage the monitoring, the quality control and quality assessment procedures and the different audits carried out at the project premises.

The data that will be monitored during the project activity are: steam supplied to the refinery (data collected monthly), biomass consumed by the steam boiler (data collected monthly and verified with the purchase receipt), the amount of diesel oil consumed for transportation (data collected monthly and will be monitored by fuel meters and sales record) and the energy content of biomass (data collected annually determined by a qualified laboratory with international approved standards and procedures).

The maintenance structure will be based on the internal O&M (Operation and Maintenance) staff to guarantee the perfect working conditions of the meters. The maintenance structure will also ensure that the monitoring equipment is perfectly calibrated based on the INTN standards (*Instituto Nacional de Tecnología y Normalización*)[7].

The data to be monitored in the project activity are named in the table 13 below. Further information about monitoring plan can be found in the part B.7 of the present PDD.

Data/Parameter	Description
CEF	Carbon Emission Factor
COF	Default Carbon Oxidation Factor
GWP CH4	Global Warming Potential for Methane
NCV	Net Calorific Value of the Heavy Oil

Table 13.Data to be monitored.

[7] http://www.intn.gov.py/

Annex 5

DETAIL OF PHYSICAL LOCATION, INCLUDING INFORMATION ALLOWING THE UNIQUE IDENTIFICATION OF THE PROJECT ACTIVITY

Figure 03. Physical location of the project activity.

Figure 04. Satellite image of CERVEPAR

Annex 6

TECHONOLOGY SUBSTITUTION INVESTMENT TABLE

Feasibility Study- Technology substitution investment CERVEPAR									
	Data								
1	Investment	1 500 000	US$						
		Cost		Density		Demand			
2	Fuel oil	0.39	US$/liter	0.85	ton/m3	5 000	ton/year		
		0.4588235							
		Expectation		Maximum		Substitution		Cost	
3	Substitution	2 500	ton/year	5 000	ton/year	2.5	ton biomass/ton fuel oil	50	US$/tn
		Labour		Inputs		Others		Total	
4	Other costs	36 000	US$/year	15 000	US$/year	4 000	US$/year	55 000	US$/year

	Scenario	Pessimist	Expected	Maximum	
	Fuel oil substitution (ton/year)	1 000	2 500	5 000	
1	Account	US$	US$	US$	
1.1	Additional current income	0	0	0	No variation in the level of production or income
1.2	Additional current debit	-333 824	-834 559	-1 669 118	Savings due to the reduction of fuel oil utilized
1.2.1	Fuel oil reduction	-458 824	-1 147 059	-2 294 118	
	Additional current debit				
1.2.2	By using the biomass	125 000	312 500	625 000	
1.4	Other additional costs	55 000	55 000	55 000	
1.5	Account balance	333 824	834 559	1 669 118	Additional income due to fuel savings
2	Capital account				
2.1	Investment	1 500 000	1 500 000	1 500 000	
	IRR (7 years)	9%	51%	110%	

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
	Pessimist scenario	-1 500 000	333 824	333 824	333 824	333 824	333 824	333 824
	Expected scenario	-1 500 000	834 559	834 559	834 559	834 559	834 559	834 559
	Maximum scenario	-1 500 000	1 669 118	1 669 118	1.669 118	1 669 118	1 669 118	1 669 118

Table 12. Cervepar's Feasibility Study