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:

Project title: Casa Armando Guillermo Prieto - Wastewater treatment facility for a Mezcal distillery

Version: PDD Version 2.1

Date: 18/01/07

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

Purpose of the project activity

The project activity, hereafter referred to as Project, consists in constructing a wastewater treatment facility including an anaerobic reactor for biogas production at a Mezcal distillery in Oaxaca, Mexico, which is currently under construction. The biogas shall be used as fuel for thermal energy generation, displacing diesel for steam generation.

Mezcal is a Mexican distilled spirit made from maguey plants and refers to all agave-based distilled liquors that are not Tequila. The Mezcal is obtained by alcoholic fermentation and distillation of juices extracted from mature agave hearts (piñas). The distillery under construction aims at a maximum production capacity of 14.000 liters of Mezcal per day, which will result in 250 m3 of wastewater per day when the distillery reaches its maximum production capacity in 2012.

The effluent to be produced by the Mezcal distillery is characterized by a high organic load of 85,000 mg/l COD[1] and a high concentration of suspended solids, which requires an elaborate treatment process prior to discharge. The most common and efficient process for treating this type of effluent is a combined anaerobic/aerobic biological process. The anaerobic component can be implemented in the form of an open anaerobic lagoon, which requires little investment and has low operational costs, or in the form of an anaerobic reactor with higher investment and operational costs. The project owners have opted for the more expensive and efficient anaerobic reactor system, which will reduce greenhouse gas (GHG) emissions as compared to the baseline scenario of an anaerobic lagoon by avoiding methane emissions from anaerobic decay of the organic matter in the lagoon and displacing fossil fuel for thermal energy generation. The decision to construct the anaerobic reactor was based on the expectation that the incremental investment and operational costs will be recovered through CER revenues and energy savings from diesel displacement through biogas utilization.

Contribution of the project to sustainable development in the host country

- The project activity contributes to technology transfer within a highly informal and rudimentary sector, in which wastewater treatment is often inexistent and wastewater discharge thresholds are rarely respected
- As compared to common practice scenarios within the Mezcal industry such as direct discharge into water streams or open anaerobic lagoons, the project activity will minimize environmental

[1] COD: Chemical Oxygen Demand

impacts by cleaning the wastewater more efficiently and re-injecting the treated and clean wastewater back to the groundwater, contributing to water conservation Further, the Project will avoid odour emissions and pathogenic conditions as compared to an anaerobic lagoon, which contributes significantly to an improved life quality around the project site.

- The Project will generate direct jobs during the operation of the plant and temporary jobs during the construction of the plant
- The Project is located in one of the poorest and less developed States in Mexico[2] and contributes to the regional economic development. Apart from direct jobs during the construction and operation of the treatment plant, local firms will benefit from contracts during the construction, operation and maintenance of the plant, which supports regional economic development and creates indirect jobs.

A.3. Project participants:

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as a project participant (Yes/No)
Mexico (Host)	Casa Armando Guillermo Prieto S.A de C.V. (private entity)	No
Switzerland	South Pole Carbon Asset Management (private entity)	No

Contact details of project participants are provided in Annex 1.

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):

Mexico

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

Oaxaca

A.4.1.3. City/Town/Community etc:

Tlacolula de Matamoros

[2] The State of Oaxaca ranks 31st (out of 32 states) in the list of Mexican States by Human Development Index (http://en.wikipedia.org/wiki/List_of_Mexican_states_by_HDI)

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

	The project site is located at Km. 28.2 on the Cristóbal Colón road, Paraje Lannaci. The GPS coordinates of the project location are : - 16° 59’ 06.00’’ N - 96° 30’ 39.90’’ W The project site is at 1608 m above sea level.

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

Type and category:

According to Appendix B to the *Simplified Modalities and Procedures for Small-Scale CDM Project Activities*, the Project type and categories are defined as follows:

Methane avoidance component:

Type III: Other project activities
Category III.H: Methane Recovery in Wastewater Treatment
Sectoral Scope 13: Waste handling and disposal

Thermal energy generation component:

Type I:	Renewable energy projects
Category I.C:	Thermal energy for the user with or without electricity
Sectoral Scope 1:	Energy industries (renewable /non-renewable sources)

Technology:

The average COD concentration of the wastewater is expected to be 85,000 mg/l. The plant will start treating a wastewater volume of around 150 m3/day. The volume will grow successively over the first five years of operation to maximum 250 m3/day, according to the growing needs of the distillery.

Pre-treatment
From the pump sump, the effluent flows through a coarse particle separation grid before it is pumped through a wide gap heat exchanger (to cool down to about 35 °C) to the methane reactor. The pH can be adjusted prior to the reactor by in line dosing of NaOH.

Anaerobic treatment
The anaerobic reactor, supplied by Global Water Engineering (GWE), is a mesophilic mixed reactor system, equipped with a large central mixer. Good mixing ensures that the influent is in constant contact with the biomass, and is also beneficial for degasification of the liquid. The volume of this "once through" reactor is 5280 m3 (cylinder of 15 m height and 21.5 m of diameter) aiming at a retention time of 20 days a COD reduction by 90%. The production of biogas is estimated to be 10,250 Nm3/day (65% CH4).

After digestion, a large part of the suspended solids in the effluent are removed in a decanter centrifuge with polymer dosing facility. The water fraction is further treated in the aerobic treatment plant. The sludge fraction is partially diverted back to the anaerobic reactor.

Aerobic treatment
The aerobic treatment stage consists of an activated sludge system designed as a compact "plug flow type" reactor with integrated settling tank. The remaining organic pollutants after the anaerobic reactor (COD, BOD[3]) are effectively removed within this stage. The aeration is done by surface aerators in combination with submersible mixers for dissolved oxygen (DO) regulation. The aeration basin is split in three consecutive compartments, which delivers a consistently better (low BOD) effluent quality, and a better sludge settleability (low TSS[4]). The effluent is separated into water and sludge in the fourth compartment that acts as settling tank. Excess aerobic sludge is pumped to the centrifuge for dewatering together with the anaerobic effluent

Discharge of treated wastewater and final sludge treatment
After the aerobic treatment stage, the wastewater shall have a COD concentration below 150 mg/l and will be re-injected into the groundwater for water conservation. The sludge treatment or disposal solution is still under discussion. However, it is clear that the sludge resulting from both the anaerobic and the aerobic treatment stages will be either composted and distributed as fertilizer to local farmers or disposed in a landfill close to the distillery.

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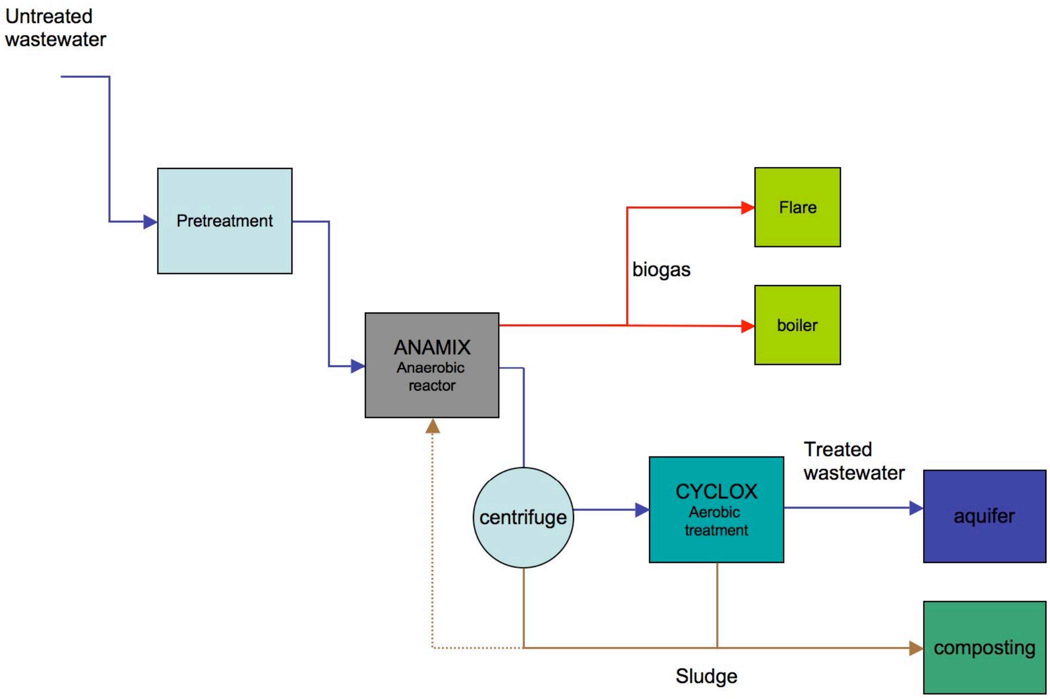
[3] BOD: Biological Oxygen Demand

[4] TSS: Total Suspended Solids

Biogas handling
The biogas is partially combusted in steam boilers (also capable of firing diesel when biogas is not available). The remaining biogas is flared off in an enclosed and monitored flaring system.

The schema below gives an overview of the WWT to be implemented:



Technology transfer:

Within the Mezcal sector in Mexico, which is known to be informal and technologically immature, common practice consists of discharging the untreated effluents directly into water streams. Therefore, this project is the first Mezcal distillery in Mexico to implement a complete treatment station with state of the art technology. Hence, the project contributes to technology transfer and innovation within the Mezcal sector. The technology is specially designed for distillery wastewater, with a high organic load and a high concentration of total suspended solids. Out of 300 treatment plants supplied by the contracted technology provider Global Water Engineering (GWE) worldwide, this is the first plant in Mexico to use this technology and the fifth worldwide. Hence technology transfer in the context of the project is considerable.

According to GWE, this will be the first ANAMIX reactor with biosolids separation by decanter centrifuge and biomass recycle to the anaerobic reactor to increase biomass concentration, methanization capacity and biogas production in the reactor. An intelligent auto-neutralisation process by mixed liquor recycle to the pre-acidification reactor will strongly reduce the consumption of neutralizing agents like NaOH.

Safe and environmentally sound operation:

The project is being constructed according to national safety standards, taking the highest seismic safety factor of the country into account. The project also complies with all environmental regulations and standards of the country.

The wastewater treatment system relies on a safe and robust design of the installation and the different treatment steps and providing enough redundancy and spare capacity to safely handle fluctuations in waste water quantities and qualities, leveling out shock loadings. Continuous and accurate process control with redundant instrumentation and safety devices (pH control, oxygen control, level and flow controls) contribute further to a safe operation. The biogas collected in safely closed concrete reactors with adequate coating, multiple control of gas pressure, gas flow, CH4 content and extended safety devices such as flare, breathervalve, flame arrestors, pressure controls and switches. Critical equipment is foreseen with spare unit.

Operation of the treatment facility will be subject to intensive training and strict quality control subject to ISO 9000 certification.

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

The estimated amount of emission reductions from the small-scale project activity over first seven year crediting period is shown in the following table below.

Years	Estimation of annual emission reductions in tonnes of CO_2 e
2008 (from April onwards)	4,767
2009	6,356
2010	7,945
2011	15,891
2012	23,836
2013	23,836
2014	23,836
2015 (until end of March)	5,959
Total estimated reductions (tonnes of CO_2 e)	**112,425**
Total number of crediting years	**7 (to be renewed twice)**
Annual average of the estimated reductions over the crediting period (tonnes of CO_2 e)	**16,061**

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

The project activity did not receive any public funding.

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

The project participants confirm that there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity with the same project participants and whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

According to Appendix C to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*, the Project is not a debundled component of a large-scale project activity.

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:

Methane avoidance component:

The approved CDM small-scale baseline and monitoring methodology AMS III.H "Methane Recovery in Wastewater Treatment" (Version 08) is applied to the methane avoidance component of the project activity.

Thermal energy generation component:

The approved CDM small-scale baseline and monitoring methodology AMS-I.C "Thermal energy for the user with or without electricity" (Version 12) is applied to the thermal energy generation component of the project activity.

For more information on both methodologies, please refer to the link:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

Baseline selection and additionality:

According to the *Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories* (Version 11, approved in EB meeting 35), Type III greenfield projects (new facilities) can use a type III small-scale methodology provided that they can demonstrate that the most plausible baseline scenario for this project activity is the baseline provided in the respective type III small-scale methodology. The demonstration should include the assessment of the alternatives of the project activity. For the purpose of the demonstration, project participants may apply the steps 1 to 3 of the latest version of *Combined tool to identify the baseline scenario and demonstrate additionality*.

Therefore, Steps 1 to 3 of the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 02.1) are applied to the project activity in Section B.4.

Above-mentioned tool is available at:
http://cdm.unfccc.int/methodologies/Tools/EB28_repan14_Combined_tool_rev_2.1.pdf

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

Methane avoidance component:

Being a greenfield wastewater treatment facility, which is build in parallel to a completely new distillery with no existing wastewater treatment system to be replaced, the approved small-scale methodology AMS-III.H is applicable to the project activity due to following reasons:

- the project activity recovers methane from biogenic organic matter in wastewaters
- the estimated emission reductions of the project activity will not exceed 60 kt CO_2e in any year of the crediting period

- the *Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories* (Version 11, approved in EB meeting 35), allow greenfield projects (new facilities) to use a type III small-scale methodology provided that they can demonstrate that the most plausible baseline scenario for this project activity is the baseline provided in the respective type III small-scale methodology.

As demonstrated in Section B.4, the wastewater would have been treated in an open anaerobic lagoon in the absence of the Project. The project activity refers thus to case (iv) described in AMS.III.H and fulfils the applicability conditions of the respective project category.

(vi) Introduction of a sequential stage of wastewater treatment with methane recovery and combustion, with or without sludge treatment, to an existing wastewater treatment system without methane recovery (e.g. introduction of treatment in an anaerobic reactor with methane recovery as a sequential treatment step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).

Thermal energy generation component:

The project activity also conforms to small-scale CDM project category I.C since:

- The Project comprises the use of energy derived from renewable biomass (biogas) to supply thermal energy that displaces fossil fuel (diesel).
- The thermal generation capacity of the Project is less than 45 MW_{th}

The project participants do confirm that the project activity will remain also in the future below the prescribed limits for small-scale project activities (60 kt CO_2e annual emission reductions under category III and 45 MW_{th} thermal generation capacity under category I.C).

B.3. Description of the project boundary:

The project boundary is defined as the physical, geographical site where the wastewater and sludge treatment takes place AND the site where the renewable energy generation is located.

Following emission sources and gases are considered in the emission reduction calculations.

Baseline	Lagoon	CH4	Emission from decay of organic matter
	Boiler	CO2	CO2 emissions from diesel consumption in the boiler in the absence of the Project
Project activity	Anaerobic reactor and sludge disposal	CH4	Emission from decay of organic matter

B.4. Description of baseline and its development:

Steps 1 to 3 of the "Combined tool to identify the baseline scenario and demonstrate additionality"[5] are applied to the project activity as follows:

STEP 1. Identification of alternative scenarios

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

The selection of alternative scenarios to the proposed project is based on common practices in the distillery sector in Mexico. However, given the lack of official statistics on industrial wastewater treatment facilities in Mexico, it is very difficult to gather accurate and representative data on wastewater treatment in the distillery sector. Data on the Mezcal distillery sector is particularly difficult to gather since the sector is, to a very large extent, informal and comprised of micro to small-scale distilleries.

Given the lack of public information, the project developer has carried out a market survey based on some site visits and telephone interviews with 207 Mezcal, Tequila and other spirit distilleries in Mexico in an effort to carry out a representative common practice analysis in order to identify realistic alternatives to the project activity. However, out of 207 contacted distilleries, 48 were not reachable (27 thereof were on strike) and 57 did not want to provide any information. Since non-compliance with environmental regulations is widespread in the sector, some of these companies were probably afraid of disclosing information, which might lead to inspections or sanctions by the environmental authorities. Out of the 102 distilleries that provided some sort of information, 75 mainly micro-scale (effluent volume < 1 m3/d) to small scale (1 m3 < effluent volume < 30 m3/d) and mostly informal businesses did not have any treatment systems. Out of the small-scale distilleries that had some sort of treatment system, 13 diverted their effluents to the municipal wastewater treatment plant, 2 had fully aerobic treatment systems, 2 had physical-chemical treatment systems and 3 had open anaerobic lagoons. 4 medium sized distilleries (30 m3 < effluent volume < 400 m3) had open anaerobic lagoons and 3 large-scale distilleries (with an effluent volume in the range of 2,000 m3/d) used anaerobic/aerobic systems. The results of the survey are summarized in the table below.

	micro-scale $Q_{ww} < 1\ m^3$	**small-scale** $1\ m^3 < Q_{ww} < 30\ m^3$	**medium-scale** $30\ m^3 < Q_{ww} < 400\ m^3$	**large-scale** $Q_{ww} > 400\ m^3$
Not reachable	48 distilleries			
Refused to answer	57 distilleries			
No treatment system	75 distilleries		-	-
Municipal treatment plants	-	13 distilleries	-	-
Aerobic plants	-	2 distilleries	-	-
Physico-chemical plants	-	2 distilleries	-	-
Anaerobic lagoons	-	3 distilleries	4 distilleries	-
Anaerobic/aerobic plants	-	-	-	3 distilleries

Based on the market survey, following alternative scenarios to the proposed CDM project activity are

[5] http://cdm.unfccc.int/Reference/Guidclarif/EB28_repan14_Combined_tool_ver02.pdf

perceived as plausible options:

Scenario 1: The proposed project activity without being registered under CDM

This scenario will be subject to an investment analysis under Step 3 below.

Scenario 2: The wastewater is discharged without any (or limited) treatment to local water streams

This scenario represents the most common scenario within the Mezcal sector, where mostly informal and micro to small-scale distilleries do not have the capital and the awareness to install wastewater treatment systems.

Scenario 3: The wastewater is treated in an open anaerobic lagoon followed by an aerobic treatment

It should be noted that several technical options and combinations thereof are imaginable to deal with the effluent of the project activity. However, due to practical reasons only one technical alternative to the project is analysed in detail under Step 3, limiting a whole range of possibilities to the most plausible alternative, which is also commonly seen in the sector. This scenario is based on a technical and commercial proposal to implement an anaerobic lagoon-based system followed by an aerobic system with forced aeration, which was submitted to the project owner prior to the decision to go for the solution with an anaerobic reactor.

Among other theoretical alternatives to the project, three are briefly discussed below:

a) *Anaerobic lagoons followed by facultative and shallow aerobic lagoons without forced aeration*
Even assuming a very high BOD removal ratio of 90% in the anaerobic lagoon, the BOD concentration of the effluent after the anaerobic lagoon would still be around 5,000 mg/l (equivalent to 8,500 mg/l of COD), well above the discharge limit of 150 mg/l BOD. In order to bring the BOD concentration down to 150 mg/l in the facultative and passive aerobic lagoons, the residence time and therefore the area requirement of the lagoons, would be much higher than in Scenario 3. This would lead to very high investment costs, comparable or even higher than the investment for an anaerobic reactor system, hence this scenario is not perceived as a plausible alternative.
In case such a lagoon system would be constructed based on non-ideal area requirements (which is often the case), leading to COD concentrations above legal discharge limits leaving the lagoon system, the scenario would not comply with applicable environmental laws and regulations, being excluded under Sub-Step 1.b. Such a case is represented under Scenario 2.

b) Fully aerobic system based on forced aeration tanks
Fully aerobic systems are sometimes built at small distilleries with a low effluent volume. However, in the case of this project activity with up to 250 m3 of effluent per day and COD concentration around 85,000 mg/l, the fully aerobic system would consume around nine times more electricity for forced aeration and would produce more than 7 to 10 times more sludge as compared to a combined anaerobic/aerobic system. The resulting operational costs for electricity purchase and sludge disposal kill the financial viability of the project. Hence, this scenario is not perceived as a plausible alternative to the Project and was not further investigated under Steps 2 and 3.

c) Physical-chemical treatment
Physical-chemical treatment stations (without any biological treatment stage) have been identified in small-scale distilleries. Given the very high BOD concentration of the wastewater in the project activity a physical-chemical would not be able to reduce the BOD concentration of the wastewater (especially of the dissolved organic content) to acceptable discharge levels. A

combination of a biological treatment stage with a physical-chemical treatment elements (such as coarse solid separation, sedimentation tanks, pH neutralisation), which is the most plausible setting for this type of effluent, is represented by the project activity and Scenarios 1, 3 and 4.

Scenario 4: The proposed project activity without methane recovery and combustion

There are no environmental laws and regulations in Mexico, which forbid methane emissions from wastewater treatment plants to the atmosphere; therefore this scenario could be a baseline scenario.

It should be noted that diverting the effluent of the distillery to a municipal wastewater treatment plant, which was a common scenario among interviewed small-scale distilleries, is not a viable alternative to the proposed Project because of the lack of a canalisation system that could be used for this purpose[6] and because the neighbouring municipality expected the distillery to use its own resources to treat the effluent, which was a pre-condition to grant the construction permit for the project.

Sub-step 1b. Consistency with mandatory applicable laws and regulations

Out of above described Scenarios 1 to 4, only Scenario 2 does not comply with mandatory environmental laws and regulations (NOM-001-SEMARNAT-1996), which prescribes the implementation of wastewater treatment systems to reach COD discharge values of 150 mg/l for this type of effluent. Although the government cannot always enforce this law and non-compliance is widespread in the informal Mezcal sector, this scenario cannot be assumed as baseline scenario. Given the size of this Mezcal production facility, the visibility of the distillery aiming to export its entire production to a demanding market in Europe, and the fact that the project needed to present a solution to the wastewater problem in order to receive the construction permit from the local government (approval of Environmental Impact Assessment), it cannot be assumed that existing regulations would not be enforced on the Project. Thus, Scenario 2 is excluded as plausible alternative to the project activity.

STEP 2. Barrier analysis

Sub-step 2a. Identify barriers that would prevent the implementation of alternative scenarios

<u>Investment barriers</u>

Scenarios 1 and 4 face prohibitive investment barriers. However, if savings due to displacement of fossil fuels are accounted for, Scenario 4 is even financially less attractive than Scenario 1 since both scenarios have the same investment costs, but Scenario 4 leads to higher fuel costs since it does not use the biogas to substitute diesel. Hence, if Scenario 1 is proven to be financially not feasible under Step 3, Scenario 4 would face the same conclusion. Therefore, Scenario 4 is excluded from further investigations under Step 3.

Sub-step 2b. Eliminate alternative scenarios, which are prevented by the identified barriers

Scenario 2 has been excluded under Sub-Step 1b and Scenario 4 under Sub-Step 2a. Scenarios 1 and 3 could not be excluded so far and will be submitted to an investment analysis under Step 3.

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[6] The neighbouring municipality treats its effluents in an open oxidation lagoon around 4 km away from the project site.

STEP 3. Investment analysis

The NPV is selected as financial indicator to conduct the investment analysis comparison between Scenarios 1 and 3. The NPV is better suited for a comparison than the IRR given the nature of the Project, being a required investment to mainly comply with environmental legislation rather than a profitable investment. The NPV calculation takes energy savings related to the use of biogas instead of diesel in the boilers of the distillery into account, which is a clear advantage of Scenario 1 over Scenario 3.

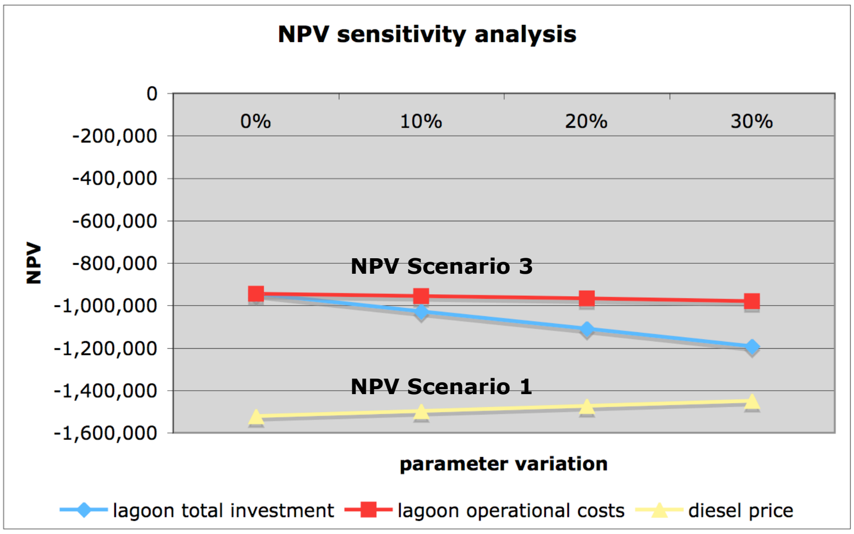
NPV analysis

The main calculation parameters and the NPV results based on a 10 year cash flow analysis for both scenarios are provided in table below. Further details are provided in Annex 3.

		Scenario 1	**Scenario 3**	**CDM Project**
Investment costs				
land purchase	EUR	16,015	392,041	16,015
turn key investment cost for entire system	EUR	1,370,110	545,404	1,370,110
conversion of boilers to biogas	EUR	119,850	-	119,850
total investment	EUR	1,505,975	937,445	1,505,975
taxes (IVA)	EUR	223,494	81,811	223,494
Investment + taxes	EUR	1,729,469	1,019,255	1,729,469
Operational costs				
O&M costs as per quotation	EUR/m3 WW	1.43	0.56	1.43
Revenues				
energy savings (biogas)	EUR/m3 WW	1.17	-	1.17
CER revenues (@ 11 EUR/CER)	EUR/m3 WW	-	-	2.91
Other				
number of operational days per year	d/yr	360	360	360
discount rate	%	18%	18%	18%
NPV	**EUR**	**-1,520,112**	**-944,246**	**-917,563**

Even considering fuel savings from biogas use, the proposed project without CDM revenues (Scenario 1) is financially less attractive than an anaerobic lagoon system combined with an aerobic post-treatment (Scenario 3). The table above demonstrates that assuming a conservative CER price of 11 EUR/CER, CER revenues help the project activity to improve the NPV substantially, surpassing the NPV of Scenario 3.

In order to test the robustness of the NPV analysis, a sensitivity analysis is carried out, varying the main parameters of the calculation as presented in the figure below.



From the figure above it can be concluded that an increase of up to 30 % of the lagoon total investment or of its operational costs would not bring the NPV of Scenario 3 down to the level of Scenario 1. Assuming an increase of diesel prices of up to 30%, which would result in higher energy savings, would not improve the NPV of Scenario 1 to the level of Scenario 3 either. Even when assuming a cumulative increase of 30% in all parameters, Scenario 3 is still the financially more attractive option. Therefore, the sensitivity analysis confirms the robustness of NPV calculations.

Conclusion: Without CDM revenues, the project activity (Scenario 1) is financially less attractive than the anaerobic lagoon based system (Scenario 3), which would have led to higher emissions. Therefore, Scenario 1 fulfils the additionality criteria of small-scale CDM projects (as defined in Attachment A to Appendix B of the *Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories*). The project activity faces prohibitive investment barriers and is additional, whereas Scenario 3 is considered to be the baseline scenario.

The energy baseline component of the project results from Scenario 3 as the baseline scenario, where in the absence of the project activity there would be no methane recovery and utilisation in the boilers. In the baseline scenario, the boilers would therefore consume diesel, which is the pre-scribed fuel for the installed boilers.

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:

As stated under Section B.4, applying the “Combined tool to identify the baseline scenario and demonstrate additionality”, the CDM project activity reduces CH_4 emissions that would have been emitted by an anaerobic lagoon and CO_2 emissions that would have been emitted due to diesel combustion in the absence of the Project.

Since the CDM validation process began after construction start of the project activity, the table below shall provide more information on the time schedule of the CDM relevant events of the Project’s history in order to demonstrate that CDM was considered right from the start of the project and played a key role in the decision making process:

Date	Event	Comment
05/12/2005	Decision by CIMSA[7] group to invest in a Mezcal distillery venture, founding the company Casa Armando Guillermo Prieto (CAGP)	After this date the technical specifications of the project, including the WWT plant, began.
13/12/2006	Offer to construct an anaerobic/aerobic effluent treatment system based on anaerobic lagoons without methane capture, followed by a facultative lagoon and an aerobic system with forced aeration.	In December 2006 CAGP started a bidding process for the effluent treatment system with different technology providers. The anaerobic lagoon system offer was the most economic offer in terms of required investment and operational costs, but it did neither consider CDM nor the possibility to capture and use the biogas.
15/12/2006	Offer from GWE/ICR Ambiental to construct a combined anaerobic/ aerobic effluent treatment plant using an anaerobic reactor to capture and use biogas as fuel.	Initial offer presented by GWE/ICR Ambiental was among the most expensive of all offers received.
10/02/2007	Revised GWE/ICR Ambiental offer including the service to recover the investment through carbon credits and energy savings from biogas use.	As part of a strategic partnership between South Pole and GWE (represented by ICR Ambiental in Mexico) to improve the financial feasibility of anaerobic reactors by jointly offering technology and CDM services, the offer to CAGP was revised and the option to recover the investment through carbon credits and energy savings was incorporated.
26/03/2007	Letter from CAGP to Mexican DNA informing the DNA about its intention to register a CDM project in order to recover incremental investment costs linked to the technology choice.	At that time, small and large-scale CDM methodologies (AMS.III.H, AM0013, AM0022) did not apply to Greenfield projects. Aware of the fact, that a methodology revision could take very long and that CDM validation would begin only after start of construction, the letter and its confirmation receipt by the Mexican DNA were meant as an evidence of early CDM consideration through a credible third party.
23/04/2007	Contract with ICR Ambiental and South Pole to construct the wastewater treatment plant. The contract included the obligation by ICR Ambiental and South Pole to enable CAGP to recover the investment through energy savings and carbon credit revenues.	Motivated by the possibility to invest in a better and cleaner technology and recover the additional investment through energy savings and carbon credit revenues, CAGP decided to invest in the more expensive technological option offered by the consortium GWE/ICR/South Pole. Due to the lack of an existing approved CDM methodology that would apply to the project, South Pole would need to either revise one of the methodologies or look for alternatives on the voluntary carbon market, which has been incorporated in the agreement between CAGP and ICR/South Pole.
02/07/2007	Start of construction of wastewater treatment plant	-
28/08/2007	Initial CDM Gold Standard stakeholder consultation.	The consultation was carried out with the purpose to go for either Gold Standard CERs or VERs.
19/10/2007	Decision by the CDM Executive Board in its 35th Meeting, to allow Greenfield	After the EB decision, which enabled the project activity to apply for CDM, the project participants started to write the

[7] CIMSA: Consorcio Industrial Mexicano

	small-scale CDM projects to apply category III baseline methodologies[8].	PDD and contracted a DOE to validate the Project.
14/01/2008	CDM validation site visit by DOE	-
15/02/2008	Start-up of the plant.	Regular biogas production starts only two months after commissioning.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The amount of methane that would be emitted to the atmosphere in the absence of the project activity is estimated according to AMS III.H, Version 8.

The baseline for this project activity corresponds to Paragraph 1, option (vi), of the methodology, defining the baseline scenario as an anaerobic wastewater treatment system without methane recovery and combustion.

The amount of CO2 that would have been emitted to the atmosphere by using fossil fuels for thermal energy generation in the absence of the project activity is estimated according to methodology AMS I.C, Version 12.

Project emissions

The project activity emissions are calculated as follows:

(1) $$PE_{y_{ww}} = PE_{y,power} + PE_{y,ww,treated} + PE_{y,s,final} + PE_{y,fugitive} + PE_{y,dissolved} + PE_{y,bottling}$$

Where:

PE_y	Project activity emissions in the year "y" (tCO_2e)
$PE_{y,power}$	Emissions from electricity or diesel consumption in the year "y"
$PE_{y,ww,treated}$	Emissions from degradable organic carbon in treated wastewater in year "y"
$PE_{y,s,final}$	Emissions from anaerobic decay of the final sludge produced in the year "y".
$PE_{y,fugitive}$	Emissions from methane release in capture and utilization/combustion/flare systems in year "y"
$PE_{y,dissolved}$	Emissions from dissolved methane in treated wastewater in year "y".
$PE_{y,bottling}$	Emissions related to the production, upgrading and use of the bottled biogas in year "y".

Project activity emissions from electricity or diesel consumption (*$PE_{y,power}$*)
There is no need for thermal energy within the effluent treatment process of the project activity. Hence, emissions of diesel consumption are considered to be zero.

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[8] *Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories* (Version 11)

Emissions from electricity consumption in the year "y" ($PE_{y,power}$) are calculated as per the procedures describe in AMS.I.D. Version 08, by multiplying the grid emission factor with the amount of electricity consumed by wastewater treatment facility:

(2) $$PE_{y,power} = EC_{y,project} \cdot EF_y$$

Where:

$EC_{y,project}$	The amount of electricity consumed by the installed wastewater treatment facility (in MWh)
EF_y	The electricity grid emission factor in the year "y"

Project activity emissions from degradable organic carbon in the treated wastewater ($PE_{y,ww,treated}$)

(3) $$PE_{y,ww,treated} = Q_{y,ww} \cdot COD_{y,ww,treated} \cdot B_{o,ww} \cdot MCF_{ww,final} \cdot GWP_{CH4}$$

Where:

$Q_{y,ww}$	Volume of wastewater treated in the year "y" (m3/yr)
$COD_{y,ww,treated}$	Chemical oxygen demand of the treated wastewater in the year "y" (tonnes/m3)
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC default value of 0.21 kg CH4/kg COD)[9]
$MCF_{ww,final}$	Methane correction factor based on type of treatment and discharge pathway of the wastewater (as per AMS.III.H a value of 0.2 shall be used for wastewater discharge to sea, river or lake)
GWP_{CH4}	Global Warming Potential for methane (value of 21 is used)

Project activity emissions from anaerobic decay of the final sludge ($PE_{y,s,final}$)

As per AMS.III.H, Version 8, Paragraph 9, emissions from anaerobic decay of the final sludge produced in the year "y" ($PE_{y,s,final}$) can be neglected if the sludge is combusted in a controlled manner, disposed in a landfill with methane recovery or used for soil application. After implementation of the project activity, the sludge produced by the wastewater treatment shall be used for soil application.

Hence:

(4) $$PE_{y,s,final} = 0$$

Sludge disposal shall be monitored throughout the crediting period of the Project.

Fugitive emissions from methane release in capture and flare systems ($PE_{y,fugitive}$)

(5) $$PE_{y,fugitive} = PE_{y,fugitive,ww} + PE_{y,fugitive,s}$$

Where:

$PE_{y,fugitive,ww}$	Fugitive emissions through capture and utilization/combustion/flare inefficiencies in the anaerobic wastewater treatment in year "y" (tCO2e);

[9] As per AMS.III.H, the IPCC default value of 0.25 kg CH4/kg COD was corrected to take into account the uncertainties.

$PE_{y,fugitive,s}$ Fugitive emissions through capture and ulitization/combustion/flare inefficiencies in the anaerobic sludge treatment in the year “y” (tCO2e)

The second term of the equation above is not applicable because the project activity does not comprise an anaerobic treatment system for sludge; it consists of an anaerobic treatment system for wastewater only. Hence, the term $PE_{y,fugitive,s}$ is neglected.

The first term of the equation above is calculated as follows:

(6) $$PE_{y,fugitive,ww} = (1 - CFE_{ww}) \cdot MEP_{y,ww,treatment} \cdot GWP_{CH4}$$

Where:

CFE_{ww} Capture and flare efficiency of the methane recovery and combustion equipment in the wastewater treatment

GWP_{CH4} Global Warming Potential for methane (value of 21 is used)

$MEP_{y,ww,treatment}$ Methane emission potential of the wastewater treatment plant in the year “y” (tonnes), which is calculated according to the equation below:

The biogas is partially sent to a steam boiler (with an assumed capture and flare efficiency of 1). The excess biogas is sent to an enclosed flare system (with an assumed capture and flare efficiency of 0.9 or higher, in case periodic flare efficiency measurements are conducted).

(7) $$MEP_{y,ww,treatment} = Q_{y,ww} \cdot COD_{y,ww,untreated} \cdot B_{o,ww} \cdot MCF_{ww,treatment}$$

Where:

$Q_{y,ww}$ Volume of wastewater treated in the year “y” (m3/yr)

$COD_{y,ww,untreated}$ Chemical oxygen demand of the wastewater entering the anaerobic treatment reactor/system with methane capture in the year “y” (tonnes/m3)

$B_{o,ww}$ Methane producing capacity of the wastewater (IPCC default value for domestic wastewater of 0.21 kg CH4/kg COD)[10]

$MCF_{ww,treatment}$ Methane correction factor for the wastewater treatment system that will be equipped with methane recovery and combustion (as per AMS.III.H a value of 1.0 shall be used for anaerobic reactors)

Emissions from dissolved methane in treated wastewater (*$PE_{y,dissolved}$*)

(8) $$PE_{y,dissolved} = Q_{y,ww} \cdot [CH_4]_{y,ww,treated} \cdot GWP_{CH4}$$

Where:

$Q_{y,ww}$ Volume of wastewater treated in the year “y” (m3/yr)

$[CH4]_{y,ww,treated}$ Dissolved methane content in the treated wastewater (tonnes/m3). In aerobic wastewater treatment default value is zero, in anaerobic treatment it can be measured, or a default value of 10e-4 tonnes/m3 can be used

[10] As per AMS.III.H, the IPCC default value of 0.25 kg CH4/kg COD was corrected to take into account the uncertainties.

GWP_{CH4} Global Warming Potential for methane (value of 21 is used)

Here a default the default value for the dissolved methane in anaerobic treatment has been applied: $[CH4]_{y,ww,treated}$ = 10e-4 tonnes/m3

Emission from upgrading and use of bottled biogas $PE_{y,bottling}$
No production, upgrading and use of bottled biogas is planned in this project, thus $PE_{y,bottling} = 0$.

Baseline emissions

Baseline emissions are the sum of emissions from the degradable organic matter in the treated wastewater (calculated according to AMS.III.H) and the emission due to the displacement of fossil fuel in the boiler (calculated according to AMS.I.C).

(9) $BE_y = BE_{y,h} + BE_{y,ww}$

Where :

BE_y Baseline emissions in the year "y" (tCO_2e).
$BE_{h,y}$ the baseline emissions from steam/heat displaced by the project activity during the year y in tCO2e.
$BE_{y,ww}$ Emissions from degradable organic carbon in treated wastewater in year "y".

(10) $BE_{h,y} = HG_y * EF_{CO2} / \eta th$

Where :

$BE_{h,y}$ the baseline emissions from steam/heat displaced by the project activity during the year y in tCO2e.
HG_y the net quantity of steam/heat supplied by the project activity during the year y in TJ.
EF_{CO2} the CO2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO2 / TJ), obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used.
η_{th} the efficiency of the plant using fossil fuel that would have been used in the absence of the project activity.

For the case of introduction of a sequential anaerobic wastewater treatment system with methane recovery (option (vi) according to AMS.III.H), Paragraph 20 of AMS III.H. Version 08, applies to baseline emissions as follows:

(11) $$BE_y = Q_{y,ww} * COD_{y,ww,untreated} * B_{o,ww} * MCF_{ww,treatment} * GWP\_CH_4$$

Where:
$Q_{y,ww}$ Volume of wastewater treated in the year "y" (m3/yr)

$COD_{y,ww,untreated}$	Chemical oxygen demand of the wastewater entering the anaerobic treatment reactor/system with methane capture in the year "y" (tonnes/m3)
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC default value for domestic wastewater of 0.21 kg CH4/kg COD)[11]
$MCF_{ww,treatment}$	Methane correction factor for the wastewater treatment system that will be equipped with methane recovery and combustion (as per AMS.III.H a value of 0.8 shall be used for anaerobic reactors in the baseline calculations)
GWP_{CH4}	Global Warming Potential for methane (value of 21 is used)

Leakage

In the absence of the project activity, the source of renewable fuel used (the wastewater) would have been left unused. Moreover the technology used in the Project is new. Therefore no leakage was considered here in this calculation.

Emission reductions

In the absence of any leakage, emission reductions are the difference between the baseline emissions and the project emissions:

(13) ERy = BEy – PEy

Where :

ER_y	Emission reductions in the year "y" (tCO_2e).
BE_y	Baseline emissions in the year "y" (tCO_2e).
PE_y	Project activity emissions in the year "y" (tCO_2e).

Ex-post ER calculations

For the case of introduction of a sequential anaerobic wastewater treatment system with methane recovery (option (vi) as per AMS.III.H), Paragraph 26 of AMS III.H. V8 prescribes that the calculation of emission reductions shall be based on the amount of methane recovered and fuelled or flared, that is monitored ex-post. In this case, the project emissions will be deducted from the emission reductions calculated from the methane recovered and combusted, except where it can be demonstrated that the technology implemented does not increase the amount of methane produced per unit of COD removed (COD removed is the difference between the inflow COD (CODy,ww,untreated) and outflow COD (CODy,ww,treated)), compared with the technology used in the baseline. The ex-post calculation of emission reductions are therefore estimated on the basis of the amount of methane recovered and destroyed, that is monitored.

Therefore ex-post baseline emissions determination will be done by replacing equation **(11)** by as follows:

(13) $BE_{y,ww,treated} = Biogas_{prod,y} * D_{CH4} * GWP\_CH4 * \%CH4$

[11] As per AMS.III.H, the IPCC default value of 0.25 kg CH4/kg COD was corrected to take into account the uncertainties.

Where,

$Biogas_{prod,y}$	the amount of biogas produced by the digester (Nm3/yr)
D_{CH4}	density of methane (tonnes/Nm3)
GWP_CH4	global warming potential of methane
%CH4	methane content in the biogas

Ex-post, project emissions determination will be done by replacing $PE_{y,fugitive}$ as follows :

$PE_{y,fugitive}$ = [$Biogas_{flare,y}$ * (1 – CFE_{ww}) + $Biogas_{boiler,y}$ * (1 – CFE_{boiler}) + ($Biogas_{prod,y}$ - $Biogas_{flare,y}$ - $Biogas_{boiler,y}$)] * D_{CH4} * GWP_CH4 * %CH4

Where :

$Biogas_{flare,y}$	the amount of biogas flared (Nm3/yr)
$Biogas_{boiler,y}$	the amount of biogas fuelled into the boiler (Nm3/yr)
$Biogas_{prod,y}$	the amount of biogas produced by the digester (Nm3/yr)
GWP_CH4	global warming potential of methane
%CH4	methane content in the biogas
D_{CH4}	density of methane (tonnes/Nm3)
CFE_{ww}	destruction efficiency of the flare (0.9 default value for enclosed flare in case that no flare efficiency measurements are cnducted)
CFE_{boiler}	destruction efficiency of the boiler (1.0 default value assumed)

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

All data and parameters used for the emission reductions calculations but not monitored during the crediting period are provided in the following tables.

Data / Parameter :	GWP CH4
Data unit	
Description	Global warning potential
Source of data used	Intergovernmental Panel on Climate Change, Climate Change 1995: The Science of Climate Change (Cambridge, UK: Cambridge University Press, 1996)
Value applied	21
Justification of the choice of data or description of measurements methods and procedures actually applied	IPCC default value
Any comments :	

Data / Parameter :	Bo.ww
Data unit	Kg CH4 / kg COD

Description	Methane producing capacity of the treated wastewater
Source of data used	IPCC default value as defined AMS.III.H, v8 methodology
Value applied	0.21
Justification of the choice of data or description of measurements methods and procedures actually applied	Conservative default value based on IPCC as proposed by AMS.III.H, v8.
Any comments :	As per AMS.III.H, the IPCC default value of 0.25 kg CH4/kg COD was corrected to take into account uncertainties.

Data / Parameter :	MCF
Data unit	Fraction
Description	Methane correction factor
Source of data used	Table III.H.1 from AMS-III.H, V.8 methodology
Value applied	$MCF_{ww,treatment}$ = 0.8 (baseline) and 1 (project). $MCF_{ww,final}$ = 0.2 (project) for discharge of wastewater to sea/river/lake.
Justification of the choice of data or description of measurements methods and procedures actually applied	All MCF values have been chosen in a conservative manner (highest values for project and lower for baseline) according to table III.H.1 from AMS-III.H, V.8 methodology.
Any comments :	

Data / Parameter :	CFE
Data unit	
Description	Capture and flare efficiency of the methane recovery and combustion efficiency
Source of data used	Default value specified in AMS-III.H, V.8 methodology
Value applied	CFE_{ww} = 0.9 and CFE_{boiler} = 1
Justification of the choice of data or description of measurements methods and procedures actually applied	The 0.9 default value for enclosed flare systems will be adopted in case no periodic flare efficiency measurements are conducted. The biogas flow rate and flare combustion temperature will be monitored to ensure the flare is operating in accordance with the manufacturer's specifications. A destruction efficiency of 1 is chosen for the boiler. The biogas flow rate and the boiler steam production (flow, pressure, temperature) will be monitored.

Any comments:	

Data / Parameter :	CH4,y,ww,treated
Data unit	tonnes/m3
Description	Dissolved methane content in the Project activity treated wastewater
Source of data used	AMS.III.H, v8 Anaerobic wastewater default value = 0.0001 (10e-4 tonnes/m^3)
Value applied	10e-4 tonnes/m^3
Justification of the choice of data or description of measurements methods and procedures actually applied	Default value as proposed in AMS.III.H, v8
Any comments:	

Data / Parameter :	$EF_{grid,y}$
Data unit	tCO_2e / MWh
Description	Emission factor of the grid
Source of data used	PDD from registered CDM project "Hasars Landfill Gas Project" (Ref. 1240).
Value applied	0.5133
Justification of the choice of data or description of measurements methods and procedures actually applied	The value has been calculated and validated in 2007 according to ACM0002 and the Mexican electricity statistics available in 2006.
Any comments:	

Data / Parameter :	ηth
Data unit	-
Description	Efficiency of the diesel boiler that would have been used in the absence of the project activity.
Source of data used	Manufacturer specifications
Value applied	0.88

Justification of the choice of data or description of measurements methods and procedures actually applied	
Any comments:	

Data / Parameter :	EF_{CO2}
Data unit	tCO2 / TJ
Description	CO2 emission factor per unit of energy of the fuel that would have been used in the absence of the project activity
Source of data used	IPCC 2006 default emission factor for diesel.
Value applied	74.1
Justification of the choice of data or description of measurements methods and procedures actually applied	
Any comments:	

B.6.3 Ex-ante calculation of emission reductions:

The excel datasheet where the ER calculations were estimated has been provided to the DOE. The main calculation parameters and results are provided below:

Project emissions:

CFEww : Flare efficiency of the anaerobic WWT	-	0.9
CFEs : Flare efficiency of the anaerobic sludge treatment	-	0

	parameter	unit	year1	year 2	year 3	year 4	year 5	year 6	year 7
plant capacity	diffusor production rate (t/d)	t/d	60	80	100	200	300	300	300
	production capacity (%)	%	20%	27%	33%	67%	100%	100%	100%
input sludge and WW	CODy,ww,untreated	tonnes/m3	0.085	0.085	0.085	0.085	0.085	0.085	0.085
	Qy,ww	m3/y	18,000	24,000	30,000	60,000	90,000	90,000	90,000
	MCFww,treatment	-	1	1	1	1	1	1	1
	CODy,ww,treated	tonnes/m3	0.00085	0.00085	0.00085	0.00085	0.00085	0.00085	0.00085
	CH4 y,ww,treated	m3/y	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	MCFww,final	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	DOC,y,s,untreated	%	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Sy,untreated	tonnes/y	0	0	0	0	0	0	0
	MCFs,treatment	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	DOC,y,s,final	%	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Sy,final	tonnes/y	92	92	92	153	153	153	153
	MCFs,final	-	0	0	0	0	0	0	0
energy input	Electricity imported from the grid	MWh	243	323	404	809	1,213	1,213	1,213
	Electric Emission Factor	TCO2e/MWh	0.5133	0.5133	0.5133	0.5133	0.5133	0.5133	0.5133
	Gas Consumption	Nm3/y	0	0	0	0	0	0	0
	Diesel Consumption	m3/y	0	0	0	0	0	0	0

			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Results	Project activity emissions	PEy	851	1,134	1,418	2,835	4,253	4,253	4,253
	Emissions from electricity or diesel consumption	PEy,power	125	166	208	415	623	623	623
	Emission from degradable organic in treated WW	PEy,ww,treate	13	18	22	45	67	67	67
	Emissions from anaerobic decay of the final sludge	PEy,s,final	0	0	0	0	0	0	0
	Fugitive emissions through capture and utilization of the anaerobic WW	PEy,fugitive,w	675	900	1,125	2,249	3,374	3,374	3,374
	Fugitive emissions through capture and utilization of the anaerobic sludge treatment	PEy,fugitive,s	0	0	0	0	0	0	0
	Emissions from dissolved methane	PEy,dissolved	38	50	63	126	189	189	189

Baseline emissions:

plant capac	diffusor production rate (t/d)	t/d	60	80	100	200	300	300	300
	production capacity (%)	%	20%	27%	33%	67%	100%	100%	100%

	parameter	unit	year1	year 2	year 3	year 4	year 5	year 6	year 7
input sludge and WW	CODy,ww,untreated	tonnes/m3	0.085	0.085	0.085	0.085	0.085	0.085	0.085
	Qy,ww	m3/y	18,000	24,000	30,000	60,000	90,000	90,000	90,000
	MCFww,treatment	-	0.8	0.8	0.8	0.8	0.8	0.8	0.8
	CODy,ww,treated	tonnes/m3	0	0	0	0	0	0	0
	CH4 y,ww,treated	m3/y	0	0	0	0	0	0	0
	MCFww,final	-	0	0	0	0	0	0	0
	DOC,y,s,untreated	%	0	0	0	0	0	0	0
	Sy,untreated	tonnes/y	0	0	0	0	0	0	0
	MCFs,treatment	-	0	0	0	0	0	0	0
	DOC,y,s,final	%	0	0	0	0	0	0	0
	Sy,final	tonnes/y	0	0	0	0	0	0	0
	MCFs,final	-	0	0	0	0	0	0	0
energy consumed in baseline	Electricity **imported** from the grid	MWh	140	187	234	467	701	701	701
	Electric Emission Factor	TCO2e/MWh	0.5133	0.5133	0.5133	0.5133	0.5133	0.5133	0.5133
	Gas Consumption	Nm3/y	0	0	0	0	0	0	0
	Diesel Consumption	m3/y		0	0	0	0	0	0

Baseline emissions related to energy production at project activity site

energy produced in the PA	Electricity **exported** to the grid	MWh/yr	0	0	0	0	0	0	0
	Electric Emission Factor	TCO2e/MWh	0	0	0	0	0	0	0
	Heat demand	MWh/yr	467	622	778	1,555	2,333	2,333	2,333
	Energy substitued	other							
	EF of the fossil fuel substitued	0.279	tCO2/MWh						
	Efficiency of boiler	88%	%						

			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Results	Baseline emissions	BEy	5,618	7,490	9,363	18,726	28,089	28,089	28,089
	Emissions from electricity or diesel consumption	BEy,power	220	293	366	733	1,099	1,099	1,099
	Emission from degradable organic in treated WW	BEy,ww,treated	0	0	0	0	0	0	0
	Emissions from anaerobic decay of the final sludge	BEy,s,final	0	0	0	0	0	0	0
	Fugitive emissions through capture and utilization of the anaerobic WW	BEy,fugitive,ww	5,398	7,197	8,996	17,993	26,989	26,989	26,989
	Fugitive emissions through capture and utilization of the anaerobic sludge	BEy,fugitive,s	0	0	0	0	0	0	0
	Emissions from dissolved methane	BEy,dissolved	0	0	0	0	0	0	0

Emission reductions:

	year 1	year 2	year 3	year 4	year 5	year 6	year 7
BE ex-ante	5,618	7,490	9,363	18,726	28,089	28,089	28,089
PE ex-ante	851	1,134	1,418	2,835	4,253	4,253	4,253
ER ex-ante	4,767	6,356	7,945	15,891	23,836	23,836	23,836

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

year	Emission of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of overall emission reductions (tCO2e)
2008 (from April on)	851	5,618	0	4,767
2009	1,134	7,490	0	6,356
2010	1,418	9,363	0	7,945
2011	2,835	18,726	0	15,891
2012	4,253	28,089	0	23,836
2013	4,253	28,089	0	23,836
2014	4,253	28,089	0	23,836
2015 (up to March)	1,063	7,022	0	5,959
Total (tonnes CO2e)	20,059	132,484	0	112,425

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

B.7.1 Data and parameters monitored:

Following data and parameters will be monitored after the implementation of the project activity. The values provided in his section are the ones used for the ER estimations provided in this PDD.

Parameter:	Qy,ww
Unit:	m3
Description:	Volume of wastewater treated in the year y
Source of data:	Supervisory Control And Data Acquisition system (SCADA)
Value of data:	Up to 250 m3/d
Brief description of measurement methods and procedures to be applied:	Volumetric flow meter at the digester inlet. Data will be recorded and stored electronically on a continuous basis.
QA/QC procedures to be applied (if any):	Periodic calibration according to the equipment’s specifications and applicable industrial standards.
Any comment:	

Parameter:	CODy,ww,untreated
Unit:	Tonnes/m3
Description:	Chemical oxygen demand of the wastewater entering the wastewater treatment
Source of data:	On site laboratory analysis
Value of data:	ca. 85,000 mg/l
Brief description of measurement methods and	Wastewater samples will be collected three times per day at the inlet of the anaerobic reactor. The COD content will be analysed using a colorimetric method in the on-site laboratory of the treatment plant. The samples results will

procedures to be applied:	be logged manually in the plant operation report on a daily basis Sampling will be performed at 95% confidence level.
QA/QC procedures to be applied (if any):	The laboratory COD testing device shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	

Parameter:	CODy,ww,aerobic
Unit:	Tonnes/m3
Description:	Chemical oxygen demand of the wastewater entering the aerobic reactor
Source of data:	On site laboratory analysis
Value of data:	8,500 mg/l expected
Brief description of measurement methods and procedures to be applied:	Wastewater samples will be collected three times per day at the inlet of the aerobic reactor. The COD content will be analysed using a colorimetric method in the on-site laboratory of the treatment plant. The samples results will be logged manually in the plant operation report on a daily basis. Sampling shall be performed at 95% confidence level.
QA/QC procedures to be applied (if any):	The laboratory COD testing device shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	This parameter is not used to estimate the ER but will be used to assess that the WWTP works properly.

Parameter:	CODy,ww,treated
Unit:	Tonnes/m3
Description:	Chemical oxygen demand of the wastewater prior to discharge
Source of data:	On site laboratory analysis
Value of data:	850 mg/l expected
Brief description of measurement methods and procedures to be applied:	Wastewater samples will be collected three times per day at the point of discharge. The COD content will be analysed using a colorimetric method in the on-site laboratory of the treatment plant. The samples results will be logged manually in the plant operation report on a daily basis Sampling shall be performed at 95% confidence level.
QA/QC procedures to be applied (if any):	The laboratory COD testing device shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	BOD discharge values shall be kept below 150 mg/l

Parameter:	S y,untreated
Unit:	Tonnes
Description:	Amount of untreated sludge generated in the year y

Source of data:	Plant operation report
Value of data:	Up to 153 t/yr expected.
Brief description of measurement methods and procedures to be applied:	Sludge coming out the digester or the aerobic treatment and directed to the composting facility will be weighted upon removal from the anaerobic and the aerobic reactors. The measurements will be logged manually in the plant operation report whenever sludge is removed from the reactors.
QA/QC procedures to be applied (if any):	The scale used to weigh the sludge shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	

Parameter:	S y,final
Unit:	Tonnes
Description:	Amount of treated sludge (compost) generated in the year y
Source of data:	Plant operation report
Value of data:	Up to 153 tonnes/yr expected
Brief description of measurement methods and procedures to be applied:	The amount of compost produced will be weighted whenever compost leaves the composting site.
QA/QC procedures to be applied (if any):	The scale used to weigh the compost shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	

Parameter:	$Biogas_{prod,y}$
Unit:	Nm3
Description:	Amount of biogas produced by the digester
Source of data:	Supervisory Control And Data Acquisition system (SCADA), calculated as the sum of biogas flows at the inlet of the boiler and of the flare system.
Value of data:	Up to 10,025 Nm3/d expected
Brief description of measurement methods and procedures to be applied:	The amount of biogas produced by the digester will be calculated as the sum of the biogas flows at the inlet of the boiler and of the flare system.
QA/QC procedures to be applied (if any):	Periodic pressure loss tests shall ensure that there is no biogas leakage between the reactor outlet and both points of biogas flow measurements.
Any comment:	

Parameter:	$\%CH_4$
Unit:	%
Description:	Methane content in biogas
Source of data:	Supervisory Control And Data Acquisition system (SCADA)
Value of data:	65% expected
Brief description of measurement methods and procedures to be applied:	On-line CH_4 content measurement. Data will be recorded and stored electronically on a continuous basis.
QA/QC procedures to be applied (if any):	Periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	

Parameter:	$Biogas_{flare,y}$
Unit:	Nm3
Description:	Amount of biogas that is sent to the flare.

Source of data:	Supervisory Control And Data Acquisition system (SCADA)
Value of data:	N.A
Brief description of measurement methods and procedures to be applied:	The amount of biogas sent to the flare will be continuously measured by means of a cumulative flow meter installed after the blowers and before the flare. Data will be recorded and stored electronically on a continuous basis.
QA/QC procedures to be applied (if any):	The flow meter shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	Measurement will allow for a conversion of Nm3, so that standard biogas density can be used to calculated the quantity (in t) of CH_4 combusted.

Parameter:	$Biogas_{boiler,y}$
Unit:	Nm3 /year
Description:	Amount of biogas that is sent to the distillery's boiler.
Source of data:	Supervisory Control And Data Acquisition system (SCADA)
Value of data:	N.A
Brief description of measurement methods and procedures to be applied:	The amount of biogas sent to the boiler will be continuously measured by means of a cumulative flow meter installed at the inlet of the boiler. Data will be recorded and stored electronically on a continuous basis.
QA/QC procedures to be applied (if any):	The flow meter shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	Measurement will allow for a conversion of Nm3, so that standard biogas density can be used to calculated the quantity (in t) of CH_4 combusted.

Parameter:	T_{flame}
Unit:	°C
Description:	Flame temperature of the flare
Source of data:	Supervisory Control And Data Acquisition system (SCADA)
Value of data:	>500°C
Brief description of measurement methods and procedures to be applied:	The flame temperature will be continuously measured. Data will be recorded and stored electronically on a continuous basis.
QA/QC procedures to be applied (if any):	The temperature meter shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	If there is no record of the temperature of the exhaust gas of the flare or if the recorded temperature is less than 500 °C for any particular hour, it shall be assumed that during that hour the flare efficiency is zero.

Parameter:	HGy
Unit:	MWh/yr
Description:	Heat output of distillery boiler
Source of data:	Heat metering device at outlet of boiler (steam)
Value of data:	N.A.
Brief description of measurement methods and procedures to be applied:	Measured electronically on a continuous basis. Data will be recorded manually on a daily basis in the plant operation report.
QA/QC procedures to be applied (if any):	The energy meter shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.

Any comment:	

Parameter:	Eelec,y
Unit:	MWh/y
Description:	Electricity used by the WWTP during year y.
Source of data:	Electricity meter at electricity transmission point to entire wastewater treatment plant.
Value of data:	N.A.
Brief description of measurement methods and procedures to be applied:	Measured electronically on a continuous basis. Data will be recorded manually on a daily basis in the plant operation report.
QA/QC procedures to be applied (if any):	The electricity meter shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	

Parameter:	mDO
Unit:	t-diesel/yr
Description:	Amount of diesel oil co-fired in the boiler
Source of data:	Volumetric flow meter at outlet of diesel storage tank.
Value of data:	0 t/y expected
Brief description of measurement methods and procedures to be applied:	Volumetric flow meter at outlet of diesel storage tanks. Measured electronically on a continuous basis. Data will be recorded manually on a daily basis in the plant operation report.
QA/QC procedures to be applied (if any):	The flow meter shall be subject to periodic calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	To be crosschecked with diesel purchase receipts. Diesel purchase receipts shall be stored for at least three years for verification purposes.

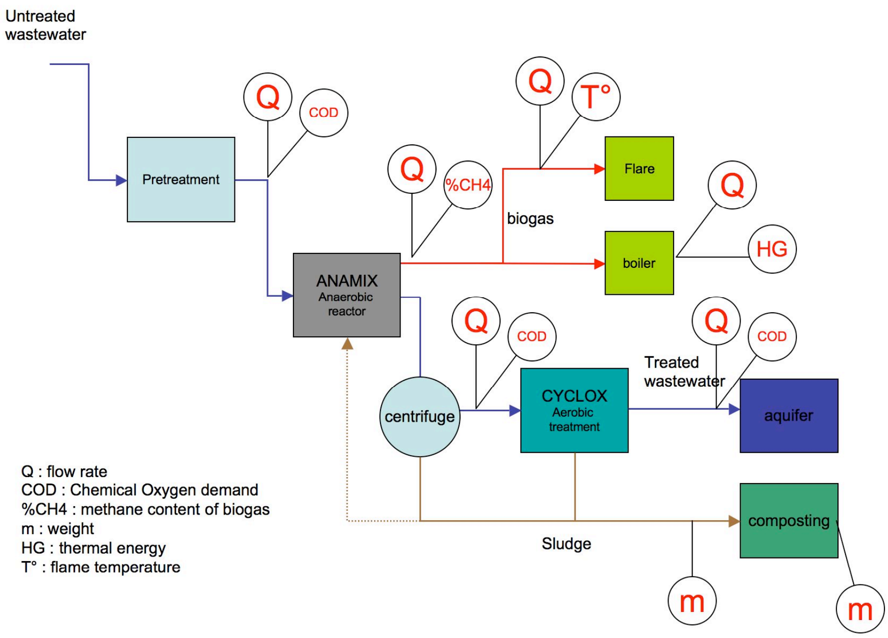
B.7.2 Description of the monitoring plan:

1. Required monitoring equipment and sampling for laboratory analysis
As specified under section B.7.1, following equipment and samples for laboratory analysis are required to meet monitoring specifications of AMS.III.H, Version 8 methodology:

- 1 effluent flow meter at inlet of anaerobic digester
- Daily COD sample at inlet of anaerobic digester
- Daily COD sample at inlet of aerobic treatment system
- Daily COD sample at discharge point
- 1 biogas flow meter at inlet of flare system
- 1 biogas flow meter at inlet of boiler
- Continuous biogas CH_4 content measurement
- 1 flame temperature meter to measure flare efficiency
- 1 scale (weighing machine) for measuring quantity of produced sludge (from anaerobic and aerobic reactor) and quantity of produced compost
- 1 thermal energy meter at boiler outlet

- 1 electricity meter for monitoring the entire electricity consumption of the effluent treatment plant
- 1 diesel flow meter at boiler inlet

Above listed equipment and samples shall be installed/collected at following points of the wastewater treatment system:



2. Monitoring Management

The required monitoring equipment is installed, maintained and regularly calibrated by the project operator. Sampling is carried out by the plant manager according to appropriate industrial standards.

The plant is operated by trained operators who also collect data under the supervision of the Assistant Plant Manager who is in charge of collecting and storing the monitoring data. South Pole Carbon Asset Management will be responsible for processing the monitoring data and compiling the CDM monitoring reports and emission reduction calculations for the purpose of CDM verification.

3. Data collection and storage

All monitoring data is collected and stored according to procedures described under Section B.7.1.

The Supervisory Control And Data Acquisition system (SCADA) records and stores most of the data required for CDM monitoring electronically in the PC's hard disk and creates daily logs of plant performance which are printed out on a daily basis (daily plant operation report). Some parameters, as specified under Section B.7.1, are recorded manually into the daily plant operation report. Lab analysis data for exmple, is fed into the operations software through a manual data entry user interface.

In addition to readings of monitoring equipment and collection of laboratory analysis results as specified under Section B.7.1, diesel purchase receipts shall be kept at the project site for at least three years for CDM verification purposes.

4. Quality Assurance and Quality Control

The Plant Manager monitors overall performance of the plant, ensures proper and timely calibration, data acquisition and storage for each monitoring parameter as specified under Section B.7.1.

The entire monitoring plan, as specified under Section B.7.1, will be subject to a combined management system of the wastewater treatment plant, which covers safety, environmental and quality aspects.

5. Calibration of Equipment

The plant operator carries out calibration according to relevant national standards and technical specifications of the monitoring equipment. Unless not specified by the manufacturer of the monitoring equipment, calibration shall be carried out on an annual basis.

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

Name of persons determining the baseline and monitoring methodology:

Mr. Patrick Bürgi, South Pole Carbon Asset Management Ltd.
Please refer to Annex 1 for detailed contact information.

Date of completion of baseline study and monitoring plan: 20 December 2007

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:

Construction start (DD/MM/YYYY): 02/07/2007

Commissioning of the project activity (DD/MM/YYYY): 15/02/2008

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

The operational lifespan of the WWTP is estimated to be between 20 and 25 years.

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:

(DD/MM/YYYY): 01/04/2008

C.2.1.2. Length of the first crediting period:

Seven (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:

An Environmental Impact Assessment (EIA) of the project activity, which is a legal requirement for this type of project in Mexico in order to receive a construction permit, has been carried out and officially approved by the Environment Ministry of Mexico (SEMARNAT) on 20/09/2007. The original EIA report has been submitted to the DOE for validation.

The major environmental impacts of the project activity and the proposed measures to avoid or limit the same are summarized under Section D.2.

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:

The major outcomes of the EIA, in terms of potential environmental impacts and the proposed measures to avoid or limit the same, are as follows:

1. The project owner shall accomplish all improvement measures identified in the EIA, such as:

   Soil quality protection measures:
   a. During the preparation and construction stages it must include solid waste and portable sanitary collection services.
   b. The sludge generated in the plant must be analyzed and discharged according to the present norms (NOM-004-SEMARNAT-2002, Environmental protection, sludge and biosolids)

   Air quality protection measures:
   c. The biogas flare must be included in a maintenance program to guarantee continuous operation.

   Water quality protection measures:
   d. During the wastewater treatment plant operation, operators shall comply with the proposed analysis program, and with the norm NOM-001-SEMARNAT-1996, that describe the allowed contamination limits for wastewater discharge in national waters and areas.

In addition, the project owner shall:

2. Reforest the land perimeter with native species and form a windbreaker curtain.
3. Establish an environmental supervision program and have a person responsible for it, informing the authorities continuously and notifying them about the operations start up 15 days prior to commissioning of the plant.
4. Protect the sites against erosion within the project area.

5. During the Project:
    a. Avoid spill outs of dangerous waste.
    b. Have an infrastructure to handle, store and dispose dangerous and sanitary waste.
6. Any kind of disturbance to wild flora and fauna within the project area shall be forbidden.

SECTION E. Stakeholders' comments

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

PART 1: Public meeting

Invitation procedure

The Gold Standard Initial Stakeholder Consultation has been conducted by the project owner Casa Armando Guillermo Prieto S.A with assistance from South Pole Carbon Asset Management Limited (Switzerland based company responsible for CDM project development) and ICR Ambiental (Mexican engineering company responsible for implementation of the wastewater treatment plant).

Stakeholder groups as defined in the Gold Standard procedures have been identified and informed through oral and written means about the meetings.

Place and date of the meeting

The initial stakeholder consultation was held at a restaurant ("El Patio"), which is located 500m away from the distillery, on 28 august 2007. Thus, all participants were able to examine the location where the proposed project will take place.

Meeting Participants

The mentioned meeting was attended by local residents and representatives from the following stakeholder categories:

1. Local residents
2. Local government representatives
3. Delegates from political parties
4. Local entrepreneurs
5. Employees

26 participants have followed the invitation and attended the meeting (participant list is provided in Annex 5).

Language

Documentation and meeting was held in Spanish (local language)

Meeting procedure

- Opening (15 min)
- Purpose of the consultation (5 min)
- Description of the project and environmental impacts (20 min)
- Questions and Answers session (10 min)

- Completing checklists (Appendix E to the Gold Standard Project Deloper's Manual) (20 min)
- General feedback (15 min)

Meeting documents and protocols

On completion of the various meetings, the following documentation was collected and attested by the signatures of the stakeholders that were present:

1. Presence list with name, address and occupation.
2. Non-technical description of the project
3. Documentation on environmental impacts of the project
4. Filled out Appendix E of Gold Standard (checklist)
5. Notes for additional comments on the project activity

These documents are available as hardcopies and will be handed over to the designated operational entity (DOE) conducting the Gold Standard validation process.

PART 2: Email consultation

Invitation procedure

An invitation was sent to representatives of Gold Standard supporting organizations in Mexico on August 9th 2007. At the time of the meeting, the only Gold Standard supporting NGO in Mexico was the local branch of Greenpeace. The invitation included a short introduction of the project and the date and location of the scheduled initial stakeholder consultation. No reply was received.

Period of email consultation

9 August 2007 to 28 August 2007.

E.2. Summary of the comments received:

PART 1: Public meeting for local stakeholders:

The overall response to the Project, from 26 participating local stakeholders, was encouraging and positive. The greatest asset achieved by the project appears to be the positive effect on the environment. Stakeholders acknowledge the very low discharge levels of the water leaving the treatment station to be important for local water resources and their lifestyle quality. The project is considered to be an example for the distillery sector, especially Mezcal distillery, where currently the wastewater is not treated at all or where treatment plants are not as advanced as in the proposed project due to high investment costs.

To sum up the sustainability aspects of the project, the various benefits (as reported by local stakeholders) are listed below.

1. The installed technology contributes to clean soil and water.
2. Use of biogas represents a sustainable way for generating energy.
3. While the system operates within strict environmental standards there will be no negative impacts to the environment due to the plant.
4. The project is well designed, returning clean water to the environment and not producing additional pollution.

5. The plant will create new jobs at the plant and indirect employment in the neighboring areas.

16 persons did not express any comments or reactions. One person refused to answer the questionnaire. No negative comments or reactions to the project have been received during the oral hearing.

3 participants left comments related to the project:

1. An engineer was asking for more detailed information about the physical operation of the plant in order to recommend the plants' techniques to relating industries.

2. An architect proposed to revise the equipment periodically as preventive measure and to keep up the contact to municipal authorities.

   Comment by project owner: "In order to operate the plant in the most effective way, revisions of the equipment are part of the common quality control procedure to assure compliance with environmental and safety standards."

3. The mitigation measures proposed in the Environmental Impact Assessment of the Project have to be implemented.

For more information on comments received as part of additional Gold Standard consultation requirements, please refer to Annex 5.

PART 2: Email consultation for Gold Standard supporting organizations in Mexico:

No comments were received.

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

As no major environmental concerns were raised during the entire initial stakeholder consultation process, which were not already addressed by the EIA submitted to the Mexican Ministry of Environment, it was not necessary to make any changes to the Project design nor incorporate any additional measures to limit or avoid negative environmental impacts. The same applies to socio-economic concerns, which have not been raised at all.

It is evident from the stakeholder consultation process, that the project is perceived as a positive example for the Mezcal sector in Mexico and that it contributes to sustainable development of the region.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Host country project participant:

Organization:	Casa Armando Guillermo Prieto S.A. de C.V.
Street/P.O.Box:	
Building:	
City:	
State/Region:	
Postfix/ZIP:	
Country:	
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by	
Title:	
Salutation:	Ms.
Last Name:	Diaz Tapia
Middle Name:	Elba
First Name:	Maria
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex I country project participants:

Organization:	South Pole Carbon Asset Management Ltd.
Street/P.O.Box:	Technoparkstr. 1
City:	Zürich
Postcode/ZIP:	8005
Country:	SWITZERLAND
Telephone:	+41 44 633 78 70
FAX:	+41 44 633 14 23
E-Mail:	info@southpolecarbon.com
URL:	www.southpolecarbon.com
Represented by	
Salutation:	Mr.
Last Name:	Bürgi
First Name:	Patrick
Department:	-
Direct tel:	+41 44 633 78 76
Personal E-Mail:	p.buergi@southpolecarbon.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Biodigestor economic analysis

currency conversion

EUR/MXN	15.611
EUR/USD	1.4393

Wasterwater treatment plant investment costs

land cost	pesos/m2	250	real purchase price for land directly at the highway
total area required	m2	1,000	
land purchase	EUR	16,015	
turn key investment cost for entire plant	EUR	1,370,110	
conversion of boilers to biogas	EUR	119,850	
total investment	EUR	1,505,975	
taxes (IVA)	EUR	223,494	
Investment + taxes	**EUR**	**1,729,469**	

Operational costs

O&M costs as per quotation	EUR/m3	1.43										
number of operational days per year	d/yr	360										
		year 0	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
distillery production capacity	%	-	20%	27%	33%	67%	100%	100%	100%	100%	100%	100%
Estimated wastewater flow	m3/yr	-	18,000	24,000	30,000	60,000	90,000	90,000	90,000	90,000	90,000	90,000
Operational and maintenance costs	**EUR/y**	**-**	**25,748**	**34,330**	**42,913**	**85,826**	**128,739**	**128,739**	**128,739**	**128,739**	**128,739**	**128,739**

Revenues due to energy savings & CERs

diesel boiler efficiency	%	88%										
diesel density	t/m3	0.830							1.17	2.91326058		
net calorific value diesel	MWh/m3	9.910										
diesel price	EUR/m3	393										
		year 0	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
thermal energy requirement	MWh/yr	-	467	622	778	1,555	2,333	2,333	2,333	2,333	2,333	2,333
displaced diesel consumption	m3/yr		53	71	89	178	267	267	267	267	267	267
savings due to diesel displacement	**EUR/yr**		**21,008**	**28,011**	**35,014**	**70,028**	**105,042**	**105,042**	**105,042**	**105,042**	**105,042**	**105,042**
assumed CER price	EUR/CER	11.00										
expected CERs as per PDD	CERs/yr		4,767	6,356	7,945	15,891	23,836	23,836	23,836	23,836	23,836	23,836
CER revenues	**EUR/yr**		**52,439**	**69,918**	**87,398**	**174,796**	**262,193**	**262,193**	**262,193**	**262,193**	**262,193**	**262,193**

NPV analysis

Cash flow	year	year 0	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Investment	EUR	(1,729,469)		-								
Operaional costs	EUR		(25,748)	(34,330)	(42,913)	(85,826)	(128,739)	(128,739)	(128,739)	(128,739)	(128,739)	(128,739)
Total costs	EUR	(1,729,469)	(25,748)	(34,330)	(42,913)	(85,826)	(128,739)	(128,739)	(128,739)	(128,739)	(128,739)	(128,739)
savings due to diesel displacement	EUR		21,008	28,011	35,014	70,028	105,042	105,042	105,042	105,042	105,042	105,042
CER revenues	EUR		52,439	69,918	87,398	174,796	262,193	262,193	262,193	262,193	262,193	262,193
Cash flow (without CERs)	EUR	(1,729,469)	(4,740)	(6,319)	(7,899)	(15,798)	(23,698)	(23,698)	(23,698)	(23,698)	(23,698)	(23,698)
Cash flow (with CERs)	EUR	(1,729,469)	47,699	63,599	79,499	158,997	238,496	238,496	238,496	238,496	238,496	238,496
Discount rate	%	18%										
NPV (without CERs)	**EUR**	**($1,520,112)**										
NPV (with CERs)	**EUR**	**($917,562.56)**										

Lagoon system economic analysis

currency conversion

EUR/MXN	15.611
EUR/USD	1.4393

Wasterwater treatment plant investment costs

land cost	pesos/m2	180 as per quotations from land owners approx. 300 m away from the street		
total area required	m2	34,000		
		Phase 1	Phase 2	**Total**
land purchase	EUR	392,041		392,041
turn key investment cost for entire system	EUR	413,395	132,009	545,404
total investment	EUR	805,436	132,009	937,445
taxes (IVA)	EUR	62,009	19,801	81,811
Investment + taxes	**EUR**	**867,445**	**151,810**	**1,019,255**

Operational costs

O&M costs as per quotation	EUR/m3	0.56
number of operational days per year	d/y	360

		year 0	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
distillery production capacity		-	20%	27%	33%	67%	100%	100%	100%	100%	100%	100%
Estimated wastewater flow	m3/yr	-	18,000	24,000	30,000	60,000	90,000	90,000	90,000	90,000	90,000	90,000
Operational and maintenance costs	**EUR/y**	**-**	**10,158**	**13,545**	**16,931**	**33,862**	**50,792**	**50,792**	**50,792**	**50,792**	**50,792**	**50,792**

NPV analysis

Cash flow	year	year 0	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Investment	EUR	(867,445)		(151,810)								
Operaional costs	EUR		(10,158)	(13,545)	(16,931)	(33,862)	(50,792)	(50,792)	(50,792)	(50,792)	(50,792)	(50,792)
Total	EUR	(867,445)	(10,158)	(165,355)	(16,931)	(33,862)	(50,792)	(50,792)	(50,792)	(50,792)	(50,792)	(50,792)
Discount rate	%	18%										
NPV	**EUR**	**($944,246)**										

Annex 4

MONITORING INFORMATION

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