VER PROJECT DESIGN DOCUMENT FORM

CONTENTS

Annexes

PDD Version 01

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SECTION A. General description of small-scale project activity

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

Title: Landfill gas flaring in Croglio, Ticino
Version: Version 02
Date: 31st March 2010

A.2. Description of the project activity:

The project supports a new technology that allows the flaring of landfill gases with low methane content and consequently a low calorific value. This leads to a reduction of the environmentally very relevant greenhouse gas methane on the old landfill site in Croglio, where municipal and industrial wastes have been disposed.

Although municipal solid waste landfill (MSW) are forbidden in Switzerland since the years 2000, the old landfills still produce an amount of methane corresponding to 12% of the anthropogenic methane emissions. Under the statutory provisions, landfills gas must be controlled for at least 15 years after closure of the site. Typically, the landfill gas is either flared or used in boilers, turbines or engines. However, the gas quality (quantity and calorific value) decreases after few years and the utilization or the combustion with a conventional flare is not possible anymore. Since Switzerland has no legal limits for methane emissions, methane containing lean gases are emitted in the atmosphere without further treatment.

The former landfill site is on the edge of the residential zone of Croglio and Ponte Tresa and adjacent the forest and the river "Lungo Tresa". The landfill was founded in 1972 by the former Zweckverband Lugano (CERL) in operation as a Class III landfill (reactor site). Until its closure in June 1991, approximately 350,000 m3 of household waste had been deposited. The landfill is made of an active gas extraction area divided in two lines. Until the year 2003, the gas was used up in a torch or in a boiler. The heat generated was used to heat the surrounding residential and farm buildings. From 2004, it became more and more difficult to flare the landfill with conventional methods because the gas volume had substantially decreased. The boiler plant was shut down and all the gas flared. In order for the flaring to dispose of a minimal methane concentration (25 vol%), the flared had to be operated intermittently. Finally, because of a further decrease in methane concentration, the flaring system could not operate anymore and the methane was released in the atmosphere.

Thanks to the newly installed Lean Gas Flare, which is based on the FLOX® technology developed in collaboration with the Ökozentrum Langenbruck, it is now possible to fairly flare landfill gases with a calorific value below the critical limit of 2.9 MJ/m3 (8 vol% from Erdgas. A conventional flare has its limit at 9 MJ/m^3). If the fuel is also preheated using a heat exchanger, it is possible to flare methane concentration of 3-4 vol%. Therefore, the emissions of methane-containing gases can be reduced for several years by burning the lean gases down to a calorific value of 2.2 MJ/m3.

In addition to methane emission reductions, additional positive effects of the project have been identified:

- The new landfill flaring can be operated at lower methane concentrations, thus the landfill can absorb more gas. Although the gas extraction system has always been part of the gas landfill, emission measurements in 2003 showed that 18 kg of methane emissions per hour were to be expected on the surface of the landfill. With the new gas flaring technology, the methane extraction benefits will be doubled and resulting in an additional reduction of methane emissions through reduced surface losses. This will allow emissions above the surface of the landfill to be reduced.

- The stronger intake generates more oxygen into the landfill body and therefore the aerobic stabilization is reached faster.
- The gas contamination in both man and nature will decrease in the area surrounding the landfill site.

A.3. Project participants:

Name of Party involved ((host) indicates a host Party)	Private and/or public enty(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant
Switzerland (host)	Ökozentrum Langenbruck	No
Switzerland	ACR, Azienda Cantonale dei Rifiuti	No
Switzerland	myclimate – The Climate Protection Partnership	No

The Ökozentrum Langenbruck (SATS) developed the plant, is responsible for the technical implementation of the project activity and remains the owner of the plant even though it is situated on the ground of the Canton Ticino. The Ökozentrum Langenbruck is therefore owner of the project (flaring installation) and owner of the carbon credits generated by the project activity

The ACR, Azienda Cantonale dei Rifiuti is the owner of the project site. The ACR is the co-owner of the carbon credits generated by the project activity in the first 0.5 year of the crediting period and therefore gets carbon revenues during this first period only. ACR provides land-fill gas to the project and electric energy as needed.

myclimate- The Climate Protection Partnership provided the carbon services (including PDD development) and is the purchaser of the carbon credits generated by the project activity.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Switzerland

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

Ticino

A.4.1.3. City/Town/Community etc:

Croglio

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

The landfill site is located in the Village of Croglio, between the river “Lungo Tresa” and the community of Purasca Inferiore. Croglio lies in Malcantone (Lugano district), has an area of 4:46 km2 and a population of 850.

Coordinates:

45°58’23,53“ N
8°51’00,99“ E

Figure 1: Project Location

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

AMS-III.G./Version 06: Landfill Methane Recovery

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

Year	**Annual estimation of emission reductions in tonnes of CO_2e**
2006	...
2007	114.47
2008	212.69
2009	447.12
2010	477.12
2011	477.12
2012	477.12
2013	477.12
Total estimated reductions (tonnes of CO_2e)	**2562.76**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO_2e)	366

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

In the beginning of 2008, the Swiss Federal Agency of Environment (BAFU/OFEV) has given a credit to overhaul the FLOX-flare and equip it with a temperature control system and a monitoring system. However, this credit will be entirely re-paid.

In addition, the credits are used for voluntary offsetting and not for the compliance of any Annex-I Country.

A.4.5. Confirmation that the project activity is not a debundled component of another project activity:

This proposed project activity is not a debundled component of another project activity as, to our knowledge, there is no other VER registered project activity or a request for registration by another VER project activity:

- By the same project participants;
- In the same project category and technology/measure; and
- 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.

SECTION B. Application of a baseline and monitoring methodology

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

The baseline scenario and monitoring Methodology of the proposed project activity follow the AMS-III.G, version 6.

Project Type	III:	Other project activities
Project Category	III.G:	Landfill Methane Recovery

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

The project activity comprises measures to capture and combust methane from landfills (i.e., solid waste disposal sites) used for disposal of residues from human activities including municipal, industrial, and other solid wastes containing biodegradable organic matter.

The recovered methane from the above measures will not be used in any further application. Hence, no other methodology from project Type I need to be included.

Aggregate emission reductions from the project activity result in aggregate emission result in less than 60 kt CO_2 equivalent annually.

B.3. Description of the project boundary:

The project boundary is the site of the project where the landfill gas is captured and destroyed. There is no leakage resulting from the project activity.

B.4. Description of baseline and its development:

Referring to the “Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories", Type III, Category III.G. Version 6, the equation to determine the baseline is given by:

$BE_y = BE_{CH4,SWDS,y} - MD_{reg,y}$,

where:

BE_y = baseline emission per year "y" in absence of the project activity
$BE_{CH4,SWDS,y}$ = methane emission potential of a solid waste disposal site per year "y"
$MD_{reg,y}$ = methane emissions that would be captured and destroyed to comply with national or local safety requirement or legal regulations in the year "y" (tCO_2e).

The concentration of methane in the landfill gas is too low to be flared with technologies currently in use. In the absence of the project activity, the methane emissions emerging from the Croglio site will be released into the atmosphere, as it has been the case from 2004 until 2006, date of beginning of the project. Hence, the baseline corresponds to continuation of the current situation.

The baseline scenario is thus the amount of methane that would have been released in the absence of the project activity at the solid waste disposal site minus the amount that would be captured or destroyed to comply with national or local safety equipment.

The estimation of the methane emission potential of a solid waste disposal site, $BE_{CH4,SWDS,y,}$ (point 8 in the methodology) is performed through a deviation from the baseline. This can be done because we dispose of real measured data and thus it makes no sense to calculate the potential by using the method expressed in the point 8 of the methodology AMSIII-G, version 6.

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 project activity:

According to the UNFCCC methodological tool „Tool for assessment and demonstration of additionality" Version 5.2, together with the additional screening of retroactivity, a stepwise approach is applied as follow.

In a TermSheet signed in September 2006 (provided to the validation institution) revenue from the sale of emission reductions were considered before the start of the project and considered crucial for the positive project decision.

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

1. Continuation of the current situation: landfill gas extraction without any flaring nor use.
2. Landfill gas extraction and treatment of the gases with a "bio-filter" to reduce the odour emissions.
3. Project activity carried on without income coming from the selling of carbon credits (A2). This scenario is not realistic because it would not take place without financial help from carbon credits.

All scenarios comply with the Swiss and the canton Ticino specific mandatory legislations and regulations. In the "Bundesgesetz vom 7. Oktober 1983 über den Umweltschutz (Umweltschutzgesetz, USG)"[1], status 1st October 2009, there is no mention of regulations that forbid any of the three scenarios. Since Switzerland has no legal limits for methane emissions, methane

[1]http://www.admin.ch/ch/d/sr/c814_01.html

containing lean gases is emitted in the atmosphere without further treatment[2].

Step 2: Investment analysis

Determine whether the proposed project activity is not:
(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of emission reductions.

Sub-step 2a: Determine appropriate analysis method

Since the project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than carbon credits related income, the simple cost analysis is applied.

Sub-step 2b: Option I. Apply simple cost analysis

The costs associated with the project activity and the alternatives identified in Step 1 are shown. It can be demonstrated that there is at least one alternative, which is less costly than the project activity. The alternative A1, continuation of the current situation: no landfill gas extraction and utilization, does not involve any additional investment and it involves only operation costs, thus this alternative is more economically viable than the project activity implemented without carbon credits. Data used for the investment analysis are provided to the validation institution. The results of the investments analysis show that a comparison between the project baseline A1 and the project activity without carbon credits A2 are:

		A1	A2
Net Present Value	CHF	-18’076	-145’253

The net capital loss associated with the project activity with respect to the baseline scenario amounts to 127’177 CHF during the entire lifetime of the project. Thus, there is at least one scenario which is most financially attractive that the project activity. The scenario A1 is the most financially attractive alternative scenario.

Step 4. Common Practice Analysis: ***Analyse other activities similar to the proposed project activity***

The project activity employs a new and poorly consolidated technology. In Switzerland there is no such a facility in operation and the current project is the first of this type. This has been declared by the Oekozentrum Langenbruck in a press release on 12 September 2006. The document is provided as a proof.

According to the analysis above, the proposed project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

For the calculation of annual emission reductions, we consider the baseline emissions minus direct project emissions and leakage. The existence of legal regulations to reduce emissions will also be included in the calculation. The corresponding formula is in the UNFCCC methodology AMS-III.G.

$E_y = BE_y – PE_y - L_y$

[2] http://www.bafu.admin.ch/klima/09570/index.html?lang=de

The exact amount of methane displaced has been measured at the landfill site by the Oekozentrum Langenbruck for the year 2006, 2007 and 2008. The measurement results are employed for the baseline assessment. Hence,

$BE_y = BE_{CH4,SWDS,y} – MD_{reg,y}$

the formula applied is (AMS-III.G. (4))

$BE_{CH4,SWDS,y} = LFG_{burnt,y} * w_{CH4,y} * D_{CH4,y} * FE * GWP_{CH4}$

During the period May 2007- April 2008, due to a defect in the temperature measurement, the siytem was shut off and thus no data are available.

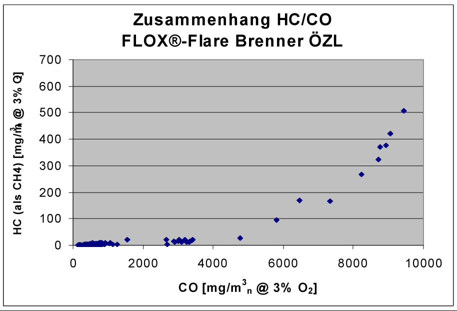
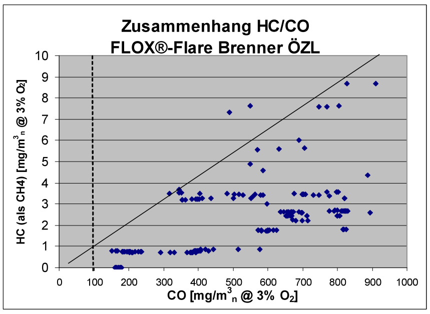
B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$LFG_{burnt,y}$
Data unit:	m^3
Description:	Landfill gas flared in the year “2006 +2007 and 17.4.2008 until 17.10.2008”
Source of data used:	Measured by Ökozentrum Langenbruck in year “2006, 2007 and 2008”
Value applied:	**68’248m3** (2006+2007), **93’103m3** (2008)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Volumetric, mechanic volume measurement device type GWF Rohrquantometer, certified from SVGW. Device measures actual real cubic meters “Betriebskubikmeter”. Device has a read contact which continuously transmits data to monitoring computer. One set of data is generated every 15 minutes.
Any comment:	Tolerance < 1%

Data / Parameter:	$w_{CH4,y}$
Data unit:	volume fraction
Description:	Methane content in landfill gas in the year “2006 +2007 and 17.4.2008 until 17.10.2008”
Source of data used:	Measured by Ökozentrum Langenbruck in year “2006 +2007 and until 17.10.2008”
Value applied:	**12.609% / 15.397%** (generated value afterwards: according data collection: “kWh of combusted CH4” are counted by calculating “WCH4 x LFG x 10” for each 15 minutes. From this sum, the above value is being generated by calculation “kWh / LFG / 10“).
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurement of volumetric CH4 (% vol) content with standard landfill gas analyser (infrared sensor technology) type Uras 3G. Data is collected every 15 minutes. Calibration recommended every 3 months.
Any comment:	Tolerance <5%

Data / Parameter:	$D_{CH4,y}$
Data unit:	(t/m3)
Description:	Density of methane at the temperature and pressure of the landfill gas in the year “2006 +2007 and 2008”
Source of data used:	Measured by Ökozentrum Lagenbruck in year “2006 +2007 and 2008”
Value applied:	**0.68877 kg/m3** (Winter 2006/2007), **0.66619 kg/m3** (17.4.2008 until 17.10.2008)
Justification of the	Temperature: the gas temperature is being measured by thermo-couples. Data is

choice of data or description of measurement methods and procedures actually applied :	collected every 15 minutes. Pressure: the real mean absolute pressure on site according meteorological data recording is 978 hPa. The guaranteed overpressure of the landfill gas supply at point of measurement is >50 hPa. Therefore an assumption (to underestimate) was made as follows: 958.2 hPa + 55 hPa = 1013.2 hPa = standard conditions. Actually, the yearly average is up to 1.95% higher and therefore the sold VER quantity underestimated.
Any comment:	Temperature-tolerance: <<1%, mean pressure estimation -1.95%

Data / Parameter:	*FE*
Data unit:	fraction
Description:	Flare efficiency in year '2006 +2007 and 2008'
Source of data used:	Measured by Ökozentrum Lagenbruck in year "2006 +2007 and 2008"
Value applied:	>99.99%
Justification of the choice of data or description of measurement methods and procedures actually applied :	If the flare is not in service, the gas is neither passing the volumetric measurement point nor the methane analysis. Therefore only combusted m3 and %vol are being recorded. The gaseous emissions have been measured being <20 mg/m3n CO @ 3% O2 and <20 mg/m3n NOx as NO2 @ 3% O2. In own research projects, the same burner type has been tested by applying FID technology according CH4-passing with the following result: 100 mg/m3n CO as a precursor equals less than 1 ppm CH4 in the exhaust. This means, that <<1 ppm CH4 will be emitted by the Flare. 
Any comment:	

Data / Parameter:	*GWP_{CH4}*
Data unit:	
Description:	Global warming potential of CH4
Source of data used:	From IPCC 2006
Value applied:	25
Justification of the choice of data or description of measurement methods and procedures actually applied :	2007 IPCC Guidelines for National Greenhouse Gas Inventories
Any comment:	

Data / Parameter:	$MD_{reg,y}$
Data unit:	tCO_2e
Description:	Methane emissions that would be captured and destroyed to comply with national or local safety requirement or legal regulations in a year.
Source of data used:	

Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

For the calculation of annual emission reductions due to the project activity, baseline emissions minus direct project emissions and emissions induced by leakage are considered. The existence of legal regulations to reduce emissions will be also included in the calculation.

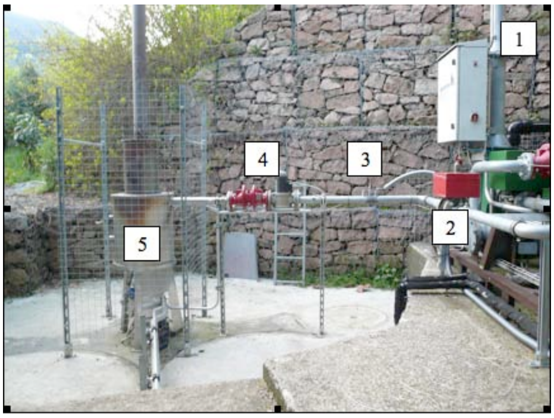
Formula		
$ER_y = BE_{CH4,SWDS,y} - MD_{reg,y} - PE_y - L_y$		*(from B.6.1)*
	Description	Reference
ER_y	*Emission reductions during the year y [t CO_2-eq.]*	
$BE_{CH4,SWDS,y}$	*Baseline emissions during the year y [t CO_2-eq.]*	*Section B.6.3.1*
PE_y	*Project emissions during the year y [t CO_2-eq.]*	*Section B.6.3.2*
L_y	*Project leakage during the year y [t CO_2-eq.]*	*Section B.6.3.3*
$MD_{reg,y}$	*Emission reductions due to legal regulations during the year y [t CO_2-eq.]*	*Section B.6.3.4*

B.6.3.1 <u>Baseline Emissions</u>

The baseline emission is given by:

$$BE_{CH4,SWDS,y} = LFG_{burnt,y} * w_{CH4,y} * D_{CH4,y} * FE * GWP_{CH4} ,$$

where the amount of landfill gas flared is multiplied by the average methane concentration, methane density, efficiency of the flare (default value is 0.90) and global warming potential of methane. The baseline emissions are estimated directly at the project site using the following procedures:



Flaring unit with

- (1) “old”, conventional flare used as exhaust pipe when magnetic valve (4) closed.
- (2) volumetric gas measurement in red boy (weather cover).
- (3) gas probe with heated line to CH_4-analysis
- (4) magnetic valve controlled by FLOX-Flare, followed by the flame safety valve (red)
- (5) FLOX Flare combustion chamber, recuperator and chimney.

The unit is leakage-free.

B.6.3.2 <u>Project Emissions</u>

The project emissions are potentially represented by three sources.

1. Methane emissions due to non captured LFG (Landfill Flaring Gas)

The main emission source of the project identified within the system boundary is the methane emissions that are not captured by the collection system. It is assumed that the gas collection system installed will capture approx 30 to 50% of the total amount of gas released by the landfill. The figures in the baseline scenario only consider the measureable, captured volumes of landfill gas and not the total production of the site. This figure is obtained considering the well efficiency 100% and the well availability 100%. Therefore **0%** of baseline emissions will be considered as project emissions $PE_{non\text{-}captured}$

2. CO2 emissions resulting from electricity used by the flaring ($PE_{electricity,y}$)

The CO2 emissions from on-site electricity use will be estimated as follow:

$PE_{electricity} = EL_{IMP} * CEF_{electricity}$

$PE_{electricity}$ is the Project Emission related to on site electricity use
EL_{IMP} is the annually used electricity for landfill gas extraction and destruction and (specify if others) (in MWh). $CEF_{electricity}$ is the CO2 emissions factor associated to the Swiss grid (only the fossil fuel part).

The power of all electric equipment is estimated to be 550 W. Over a whole year (8760 hours) results a use of electricity of 4818 kWh. Assuming 39% nuclear power, 59% hydropower and 2% fossil power equals to 14.2 gr CO2/kWh (Source: KWO-sustainability report). Using an average Swiss electricity mix, 80 g CO2/kWh will be produced, which leads to a CO2 emission of <0.39 t CO2eq/a, which is <2% of the project emissions and therefore neglected.

3. CO2 emissions resulting from combustion of CH4 ($PE_{combustion}$)

The CO2 production is calculated by the following formula
$CH_4 + 2 O_2 \Rightarrow CO_2 + 2 H_2O$; density of CO_2 = (12 + 16 + 16)/22.4 = 1.964 kg/m3n
Thus, with the standardized density of methane being (12 + 1 + 1 + 1 + 1)/22.4 = 0.714 kg/m3n, for every t of burned CH4, 2.75 t CO2 are being generated.

The emission generated are 16.31 t CO2eq (2006/2007) and 26.21 t CO2eq (17.4.2008 until 17.10.2008), totalling to 42.52 t CO2eq.

4. CO2 emissions resulting from combustion of C3H8 while heating up ($PE_{electricity,y}$)

In both reporting periods, less than 20 kg of Propane co-firing was used to re-start the Flare after stopps. Therefore, **< 0.05 t CO2eq** was generated per each reporting period and therefore neglected.

The total project emission is

$$\mathbf{PE_{total,y} = PE_{non\text{-}captured,y} + PE_{electricity,y} + PE_{combustion} + PE_{propane} = 42.52\ tCO2eq}$$

B.6.3.3 Leakage

In this project there are not induced indirect emissions, thus:

$\mathbf{L_y = 0}$

B.6.3.3 Emission reductions due to legal regulations

In Switzerland there are no regulatory limits for methane emissions from landfills, thus

$MD_{reg,y}$ **= 0**

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

The estimated emission reduction can be calculated from:

$ER_y = BE_{CH4,SWDS,y} – MD_{reg,y} – PE_y - L_y$

According to the measurement performed by the Okozentrum Langenbruck by using the ex-ante data provided in section B6.2, we have:

$BE_{CH4,SWDS,y}$ (08.11.2006-09.05.2007 = 182 days) = 130.77 tCO2
$BE_{CH4,SWDS,y}$ (17.04.2008-17.10.2008 = 182 days) = 238.90 tCO2
$BE_{CH4,SWDS,y}$ (17.10.2008-17.04.2009 = 182 days) = 244.25 tCO2
$BE_{CH4,SWDS,y}$ (17.04.2009-17.10.2009 = 182 days) = 291.87 tCO2

Thus,

$\mathbf{ER_{08.11.2006\text{-}09.05.2007} = 130.77 – 0 – 16.31 - 0 = 114.47\ tCO2}$
$\mathbf{ER_{17.4.2008\text{-}17.10.2008} = 238.90 – 0 – 26.21 - 0 = 212.69\ tCO2}$
$\mathbf{ER_{17.10.2008\text{-}17.04.2009} = 244.25 – 0 – 26.80 - 0 = 217.45\ tCO2}$
$\mathbf{ER_{17.04.2009\text{-}17.10.2009} = 291.87 – 0 – 32.02 - 0 = 259.85\ tCO2}$

The ERs for the following years are calculated assuming the full year value $\mathbf{ER_{17.10.2008\text{-}17.04.2009}}$ + $\mathbf{ER_{17.04.2009\text{-}17.10.2009}}$ = 536.12 tCO2 and extrapolating until the year 2013.

Assuming that the yearly crediting period goes from April of the first year to April of the following year and using the notation 2007 = April 2006/April 2007, we obtain:

Year	Expected Baseline Emissions (t CO_2-eq.)	Expected Project Emissions (t CO_2-eq.)	Project Emission Reduction (t CO_2-eq.)
2006	...	...	...
2007	130.77	16.31	114.47
2008	238.90	26.21	212.69
2009	536.12	59	447.12
2010	536.12	59	477.12
2011	536.12	59	477.12
2012	536.12	59	477.12

2013	536.12	59	477.12
Total	**3050.27**	**337.52**	**2562.76**

a) According literature, the gas production of a land fill site is said to be constant or growing (relative methan constant *and* volume flow) when being activated (methanisation phase) during the first 5 to 20 years – and afterwards being reduced in a asymptotic manner towards zero over a period of up to 80 years.

b) However newer studies say, that this behaviour is not the natural one but forced by constant gas pumping with collection pipes which don't reach too deep and/or are equipped with intake holes over the whole length of the piping. A much higher and much longer methanisation phase could be expected by appropriate gas collection.

c) The experience on the site in Croglio says, that the methane content has risen during almost the complete service time until now and is now (in a fourth year of operation) constant.

d) From a landfill site several well pipes can be switched to the line that transports the gas to the flare. In case of Croglio, there are 23 pipes. It is a question of capacity (volume flow) and methane content, which gas-wells are to be collected to the flare line and which are exhausted directly into the atmosphere (untreated). With the ventilator frequency signal as a part of the collected data, the still existing additional capacity of the flare and the available additional gas to be flared can be managed in a wide range. With gain of experience, the methane combustion capacity of the flare can still be increased.

Therefore it is seen as a conservative estimation to assume that the emission reduction will be constant basing on the value of 2009.

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

Monitoring is applied according to the CDM Small-Scale Methodology "Landfill Methane Recovery" III.G.

B.7.1 Data and parameters monitored:

Data / Parameter:	$LFG_{burnt,y}$
Data unit:	m^3
Description:	Landfill gas flared per year
Source of data to be used:	Flow meter in front of the flare station.
Value of data	
Description of measurement methods and procedures to be applied:	The parameter is measured continuously. The proportion of data to be monitored is 100%. Data are to be aggregated monthly and electronically archived.
QA/QC procedures to be applied:	The mechanical volume meter is being calibrated at the producer and can measure correct (<<1% error) or completely wrong if broken. The counting mechanics is cross-checked: together with the volume counter clock work, four signals per rotation of the 0.1m3 scale are being transmitted to and counted by the electronic data acquisition. Both volume-counting methods are working in parallel and are crosschecked every halfyear. The monitored difference should normally never be greater than 0.16%.
Any comment:	Please Note: An error basing on the aging of the instrument can only cause a smaller amount of gas measured than effectively processed. So the error can never be in favour of the project owner.

Data / Parameter:	$w_{CH4,y}$
Data unit:	Fraction
Description:	Methane content in landfill gas
Source of data to be used:	Gas analyzer
Value of data	
Description of measurement methods and procedures to be applied:	The parameter is measured continuously. The proportion of data to be monitored is 100%. The measurement device is based on a infrared twin sensor system. Such instruments are very stable for long time measurements. Data are aggregated monthly and electronically archived.
QA/QC procedures to be applied:	The instrument is checked every half year with a reference gas mixture (accuracy 0.05%).
Any comment:	

Data / Parameter:	T_1
Data unit:	°K
Description:	Temperature of landfill gas
Source of data to be used:	Thermocouple at gas probe located less than 1 m away from the flow meter.
Value of data	
Description of	The parameter is measured continuously. The proportion of data to be monitored

measurement methods and procedures to be applied:	is 100%. Data are to be aggregated monthly and electronically archived.
QA/QC procedures to be applied:	Thermocouples are not to be calibrated – they can only show correct or completely wrong values (6000°C) if broken. A simple cross-check with ambient temperature devices is performed at the installation.
Any comment:	

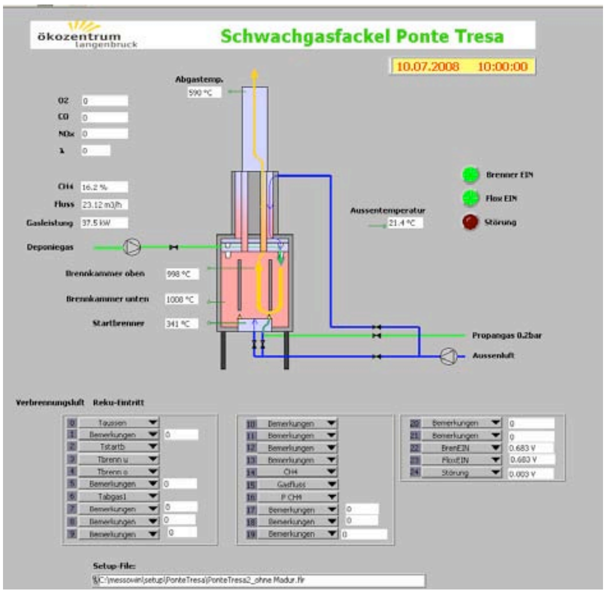
Data / Parameter:	P_1
Data unit:	Mbar
Description:	Pressure of landfill gas
Source of data to be used:	Meteorological mean pressure QFE for Ponte Tresa (978 mbar) + 55 hPa – marging = 1013.2 hPa
Value of data	
Description of measurement methods and procedures to be applied:	The parameter is not measured. However the mean pressure of the ambient at the site plus the guaranteed minimum landfill gas pressure at the gas counter (50 hPa) is as a mean value 2% higher than the ISO-standard (1013.2 hPa). The project owner has decided to renounce of the 2% of ER instead of complex measurements.
QA/QC procedures to be applied:	None
Any comment:	The flare technically only works if the landfill-gas overpressure is 50 hPa or higher. The overpressure was measured only at the installation. However, the landfill gas pump operates at constant rpm, so that a constant pressure is provided with a mostly constant flow. No separate monitoring of pressure is necessary when using flow meters that automatically measure temperature and pressure, expressing lean flared gas in normalized cubic meters.

Data / Parameter:	EL_{IM}
Data unit:	kWh
Description:	Electricity used by the project activity
Source of data to be used:	Measured at the laboratory.
Value of data	
Description of measurement methods and procedures to be applied:	The parameter is preliminarily estimated. The proportion of data to be monitored is 100%. Data are electronically archived.
QA/QC procedures to be applied:	None
Any comment:	The parameter is monitored only if the electricity used comes from fossil fuel sources. Otherwise it is assumed to be 0.

Data / Parameter:	FE
Data unit:	%
Description:	Flare efficiency
Source of data to be used:	Measured at the laboratory and cross-checked at the first service.

Value of data	
Description of measurement methods and procedures to be applied:	The parameter is preliminarily estimated. The proportion of data to be monitored is 100%. Data are electronically archived.
QA/QC procedures to be applied:	Only if the combustion chamber is hot enough to provide a complete combustion, the valve for the landfill gas is opened. No unburned gas volume can be counted. The minimum of detectable methane in the exhaust (1ppm by FID) was measured in the laboratory with artificially reduced combustion quality at >700 mg CO/m^3_n @3% O_2. The flare combustion emissions on site have measured to be lower than 15 mg CO/m^3_n @3% O_2. Therefore, the "CH_4-slip" must be below 0.1 ppm!
Any comment:	The parameter is monitored only if the default value 90% is not applied.

B.7.2 Description of the monitoring plan:



- The parameters, shown in the screenshot plus some more temperature readings are being recorded every 15 minutes. Using lab view, the data is saved to a hard disk every 15 min.
- Every 14 days, the data file is saved at Ökozentrum Langenbruck by remote transfer.
- At 17.4., 17.10. and 31.12. of each year, the value from the flow meter is read manually by ACR. The electronically generated data is to be corrected.
- Every year, the methane analyzer is to be calibrated latest.

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

The baseline and monitoring methodology was completed on July 17^{th} 2008.
The person responsible for baseline and monitoring methodology is:

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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:

8^{th} Nvember 2006

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

10 Years

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

7 Years, 0 Months

C.2.1. Renewable crediting period

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

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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