PART I. Generic component project activity (CPA)

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

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Botswana currently generates biodegradable material from the food industry, cattle abattoirs and chicken farms to mention but a few. All this waste is disposed of at centralised landfills scattered throughout the country. There is currently no legislation in Botswana, which compels this kind of waste to be used for biogas production or the combustion of landfill gas to reduce methane emissions. A typical CPA could therefore include the capturing of biodegradable matter for biogas production at a central location. Such a CPA would also include project activities at cattle abattoirs that utilise the biodegradable waste from the abattoirs that is currently being disposed of at landfills. The CPA will therefore apply the methodology AMS- III.AO Version 01 “Methane recovery through controlled anaerobic digestion”

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

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Typical CPAs for possible inclusion under this PoA include small scale project activities where the following are applicable:-

1. Project activities stipulated in AMS- III.AO: “Methane recovery through controlled anaerobic digestion ” (Version 01). The baseline and monitoring methodology in AMS- III.AO will be used for such a CPA. The methodology has four tools that can be used with this methodology i.e.
    a. “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”
        i. The tool provides a procedure to calculate the baseline, project and/or leakage emissions from electricity consumption.
    b. “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”
        i. The tool provides that methodology to calculate the CO_2 emissions from fossil fuel consumption based on the type quantity and properties of fuel used.
    c. “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site”
        i. The tool is used to calculate the emissions of the waste that would have been disposed of at a landfill in the absence of the project activities in the CPA.
    d. “Tool to determine project emissions from flaring gases containing methane”
        i. The tool will be used to calculate the project emissions from the flaring of biogas produced through the project activities.

B.2. Application of methodology(ies)

>>The CPA falling under the category of projects where the methodology AMS- III.AO is applicable includes project activities that comprise measures to avoid the emissions of methane to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site (SWDS), or in an animal waste management system (AWMS), or in a wastewater treatment system (WWTS). The CPA project activities will involve mainly controlled biological treatment of biomass or other organic matters through anaerobic digestion in closed reactors equipped with biogas recovery and combustion/flaring system where the following conditions apply :-

a) Digestion of biomass or other organic matter (excluding animal manure and sludge generated in the wastewater treatment works) as a single source;

b) Co-digestion[1] of multiple sources of biomass substrates, e.g. MSW, organic waste, animal manure, wastewater, where those organic matters would otherwise have been treated in an anaerobic treatment system without biogas recovery;

c) If for one or more sources of substrates, it cannot be demonstrated that the organic matter would otherwise been left to decay anaerobically, baseline emissions related to such organic matter shall be accounted for as zero, whereas project emissions shall be calculated according to the procedures presented in this methodology for all co-digested substrates;
The recovered biogas will be combusted through a cogeneration system to meet the electricity and thermal requirement of the CPA or flared.

B.3. Sources and GHGs

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The main sources and GHGs of the project are shown in the table below and the leakages from the CPA will be accounted for according to the baseline monitoring methodologies.

	Source	GHG	Inclusion	Justification
Baseline	Emissions from Waste	CO_2	No	Excluded for simplicity
		CH_4	Yes	Main Source
		N_2O	No	Excluded for simplicity
	Emissions from Electricity Generation	CO_2	Yes	Catered for in the grid emission factor
		CH_4	Yes	Catered for in the grid emission factor
		N_2O	Yes	Catered for in the grid emission factor
Project Activity	Biogas recovery system	CO_2	No	Excluded for simplicity
		CH_4	Yes	Main Source
		N_2O	No	Excluded for simplicity
	Waste treatment system with biogas recovery	CO_2	No	Excluded for simplicity
		CH_4	Yes	Main Source
		N_2O	No	Excluded for simplicity
	Emissions from Cogeneration plant	CO_2	Yes	Main Source
		CH_4	No	Excluded for simplicity
		N_2O	No	Excluded for simplicity

B.4. Description of baseline scenario

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The baseline scenario is that biomass or other organic matter is being left to decay anaerobically in a solid waste disposal site (SWDS), or in an animal waste management system (AWMS), or in a wastewater treatment system (WWTS). The main source of this biomass is mostly from livestock abattoirs, the food industry and chicken farms. A typical CPA will involve the use of a combination of the waste from animal manure from an abattoir and the biodegradable abattoir waste disposed of at landfill.

Currently in Botswana there is no legislation which makes it mandatory for such waste to be used for biogas production or for landfill gas to be flared. All this waste is left to biodegrade anaerobically at the landfill. However it is mandatory under law that all waste especially from large establishments such as

[1] Co-digestion is the simultaneous digestion of a homogenous mixture of two or more substrates from different sources, e.g. co-digestion of MSW (municipal solid waste) and animal manure and/or domestic/industrial wastewater. The most common situation is when a major amount of a primary basic substrate (e.g. manure) is mixed and digested together with minor amounts of other substrates.

abattoirs and the food industry should be properly disposed of at designated landfills. In the case of Gaborone, all waste is currently disposed of at a central landfill which is situated 40km from the city (i.e. Gamodubu Landfill).

Tools for Baseline calculations

Baseline emissions shall exclude emissions of methane that would have to be captured, fuelled or flared or gainfully used to comply with national or local safety requirement or legal regulations.

$$BE_y = BE_{SWDS,y} + BE_{ww,y} + BE_{manure,y} - MD_{reg,y} * GWP_{CH_4} \quad \textbf{(1)}$$

Where:

$BE_{SWDS,y}$	Where applicable, yearly methane generation potential of the solid waste anaerobically digested by the project activity during the year *x* from the beginning of the project activity (*x*=1) up to the year *y* estimated as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (tCO_2e). The tool may be used with the factor "f=0.0" assuming that no biogas is captured, flared or used. With the definition of year *x* as the base year since the project activity started diverting wastes from the SWDS/landfill site. *x* runs from the first year of the crediting period (*x*=1) to the year for which emissions are calculated (*x*=*y*). Where applicable, baseline emission determination of digested waste that would otherwise have been disposed in stockpiles shall follow relevant procedures in AMS-III.E
$BE_{manure,y}$	Where applicable, baseline emissions from the manure co-digested by the project activities, calculated as per the relevant procedures of AMS-III.D
$BE_{ww,y}$	Where applicable, baseline emissions from the wastewater co-digested, calculated as per the procedures of AMS-III.H
$MD_{reg,y}$	Amount of methane that would have to be captured and combusted in the year *y* to comply with the prevailing regulations (tonne). In Botswana's case this will be zero as there are no regulations requiring the combustion of Landfill gas.
GWP_{CH_4}	*GWP* for CH_4 (value of 21 is used)

B.5. Demonstration of eligibility for a generic CPA

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A potential CPA can be implemented under the PoA that recovers biogas from biomass or other organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site (SWDS), or in an animal waste management system (AWMS), or in a wastewater treatment system (WWTS). The CPA project activities will be limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually.

The project may include:-

- Co-digestion of multiple sources of biomass substrates, e.g. MSW, organic waste, animal manure, wastewater, where those organic matters would otherwise have been treated in an anaerobic treatment system without biogas recovery,
- Digestion of biomass or other organic matter (excluding animal manure and sludge generated in the wastewater treatment works) as a single source of substrate.

B.6. Estimation of emission reductions of a generic CPA
B.6.1. Explanation of methodological choices
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1. Project activity emissions consist of:

   (a) CO_2 emissions due to incremental transportation distances;

   (b) CO_2 emissions from electricity and/or fossil fuel consumption by the project activity facilities;

   (c) In case the residual waste from the digestion is stored under anaerobic conditions and/or delivered to a SWDS, or treated in a WWTS: the methane emissions from the disposal/storage/treatment of these residual waste;

   (d) Methane emissions from physical leakages of the anaerobic digester;

   (e) Methane emissions due to flare inefficiency;

$$PE_y = \left\{ \begin{array}{l} PE_{transp,y} + PE_{power,y} + PE_{res\ waste,y} \\ + PE_{phy\ leakage,y} + PE_{flaring,y} \end{array} \right\} \quad (2)$$

Where:

PE_y	Project activity emissions in the year y (tCO_2e)
$PE_{transp,y}$	Emissions from incremental transportation in the year y (tCO_2e)
$PE_{power,y}$	Emissions from electricity or fossil fuel consumption in the year y (tCO_2e)
$PE_{res\ waste,y}$	In case residual wastes are subjected to anaerobic storage, or disposed in a landfill: methane emissions from storage/disposal/treatment of waste (tCO_2e)
$PE_{phy\ leakage,y}$	Methane emissions from physical leakages of the anaerobic digester in year y (tCO_2e)
$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year y as per the "Tool to determine project emissions from flaring gases containing methane"(tCO_2e)

Project emissions due to incremental transport distances ($PE_{transp,y}$) are calculated based on the incremental distances between:

   (i) The collection points of biomass and/or manure and the digestion site as compared to the baseline solid waste disposal site or manure treatment site;

   (ii) When applicable, the collection points of wastewater and treatment site as compared to baseline wastewater treatment site;

(iii) Treatment sites and the sites for soil application, landfilling and further treatment of the residual waste.

$$PE_{transp,y} = (Q_y / CT_y) * DAF_w * EF_{CO2,transport} + (Q_{res waste,y} / CT_{res waste,y}) * DAF_{res waste} * EF_{CO2,transport} \quad \textbf{(3)}$$

Where:

Q_y	Quantity of raw waste/manure treated and/or wastewater co-digested in the year *y* (tonnes)
CT_y	Average truck capacity for transportation (tonnes/truck)
DAF_w	Average incremental distance for raw solid waste/manure and/or wastewater transportation (km/truck)
$EF_{CO2,transport}$	CO_2 emission factor from fuel use due to transportation (kgCO_2/km, IPCC default values or local values may be used)
$Q_{res waste,y}$	Quantity of residual waste produced in year *y* (tonnes)
$CT_{res waste,y}$	Average truck capacity for residual waste transportation (tonnes/truck)
$DAF_{res waste}$	Average distance for residual waste transportation (km/truck)

For the calculation of project emissions from electricity and/or fossil fuel consumption by the project activity facilities ($PE_{power,y}$) all the energy consumption of all equipment/devices installed by the project activity shall be included e.g. energy used for chopping of biomass for size reduction and Tool to calculate the emission factor of an electricity system and/or "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" shall be followed, respectively. If recovered biogas is used to power auxiliary equipment of the project it should be taken into account accordingly, using zero as its emission factor.

Methane emissions from anaerobic storage and/or disposal in a landfill of the residual waste from the digestion ($PE_{res\ waste,y}$) are calculated as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site".

Methane emissions due to physical leakages from the digester and recovery system ($PE_{phy\ leakage,y}$) shall be estimated using a default factor of 0.05 m³ biogas leaked/m³ biogas produced. For *ex ante* estimation the expected biogas production of the digester may be used, for *ex post* calculations the effectively recovered biogas amount shall be used for the calculation.

Leakage

In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.

Emission reductions

In determining the Emission Reductions of the CPA project activities the following steps will be followed:-

The emission reductions achieved by the project activity will be determined *ex post* through direct measurement of the amount of biogas fuelled, flared or gainfully used. It is possible that the project activity involves biomass treatment with higher methane conversion factor (MCF) than the MCF for the biomass which otherwise would have been left to decay in the baseline situation. Therefore the emission reductions achieved by the project activity is limited to the *ex post* calculated baseline emissions minus project and leakage emissions using the actual monitored data for the project activity (e.g. Q_y, and fossil fuels/electricity used). The emission reductions achieved in any year are the lowest value of the following:

$$ER_{y,ex\ post} = min\begin{bmatrix}(BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}),(MD_y - PE_{y,power,ex\ post} - \\ PE_{y,transp,ex\ post} - PE_{y,res\ waste,ex\ post} - PE_{y,phy\ leakage,ex\ post} - LE_{y,ex\ post})\end{bmatrix} \quad \textbf{(4)}$$

Where:

$ER_{y,ex\ post}$	Emission reductions achieved by the project activity based on monitored values for year *y* (tCO_2e)
$BE_{y,ex\ post}$	Baseline emissions calculated using equation (1) using *ex post* monitored values (e.g. Q_y) (tCO_2e)
$PE_{y,ex\ post}$	Project emissions calculated using equation (2) using *ex post* monitored values (e.g. Q_y, transport distances, the amount of electricity/fossil fuels used, emissions from anaerobic storage). This calculation shall include project emissions from physical leakage (tCO_2e)
$LE_{y,ex\ post}$	Leakage emissions calculated using *ex post* monitored values (tCO_2e)
MD_y	Methane captured and destroyed or used gainfully by the project activity in year *y* (tCO_2e)
$PE_{y,transp,ex\ post}$	Emissions from incremental transportation based on monitored values in the year *y* (tCO_2e)
$PE_{y,power,ex\ post}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in the year *y* (tCO_2e)
$PE_{y,res\ waste,ex\ post}$	Methane emissions from the anaerobic decay/treatment of the residual waste/products based on monitored values in the year *y* (tCO_2e)
$PE_{y,phy\ leakage,ex\ post}$	Methane emissions from physical leakages of the anaerobic digester based on monitored values in year *y* (tCO_2e)

(a) In case of flaring/combustion MD_y will be measured using the conditions of the flaring process:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP\_CH_4 \quad \textbf{(5)}$$

Where:

$BG_{burnt,y}$	Biogas[2] flared/combusted in year y (m^3)
$w_{CH4,y}$	Methane content[2] in the biogas in the year y (volume fraction)
D_{CH4}	Density of methane at the temperature and pressure of the biogas in the year y (tonnes/m^3)
FE	Flare efficiency in the year y (fraction). If the biogas is combusted for gainful purposes, e.g. fed to an engine, an efficiency of 100% may be applied

(b) The method for integration of the terms to calculate MD_y to obtain the results for one year of measurements within the confidence level, as well as the methods and instruments used for metering, recording and processing the data obtained, shall be described in the project design document and monitored during the crediting period;

(c) Project activities where a portion of the biogas is destroyed through flaring and the other portion is used for energy may consider to apply the flare efficiency to the portion of the biogas used for energy, if separate measurements are not performed; When the amount of methane that is combusted for energy and that is flared is separately monitored, a destruction efficiency of 100% can be used for the amount that is combusted for energy;

Soil application of the outflow in agriculture or related activities will be monitored as per relevant paragraph in AMS-III.F "Avoidance of methane emissions through composting".

2 Biogas and methane content measurements shall be on the same basis (wet or dry).

B.6.2. Data and parameters that are to be reported ex-ante
(Copy this table for each data and parameter.)

Data / Parameter	$MD_{reg,y}$
Unit	Tonnes
Description	Amount of methane that would have to be captured and combusted in the year *y* to comply with the prevailing regulations
Source of data	There are no regulation in Botswana requiring the combustion of landfill gas
Value(s) applied	0
Choice of data or Measurement methods and procedures	
Purpose of data	
Additional comment	

Data / Parameter	GWP_{CH4}
Unit	Fraction
Description	Global Warming Potential for methane
Source of data	IPCC value in AMS III.H./Version 16
Value(s) applied	21
Choice of data or Measurement methods and procedures	Based on IPCC value in AMS III.H./Version 16
Purpose of data	Value used to calculate global warming potential of methane
Additional comment	

Data / Parameter	Q_y
Unit	tonnes
Description	Quantity of raw waste/manure treated and/or wastewater co-digested in the year *y*
Source of data	On-site data sheets recorded monthly using weigh bridge.
Value(s) applied	To be determined by CPA
Choice of data or Measurement methods and procedures	Weigh bridge measurements.
Purpose of data	Value used to calculate project emissions
Additional comment	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)

Data / Parameter	CT_y
Unit	tonnes/truck
Description	Average truck capacity for transportation
Source of data	On site measurement
Value(s) applied	To be determined by each CPA
Choice of data or Measurement methods and procedures	On site measurement
Purpose of data	Used for calculating project emissions
Additional comment	

Data / Parameter	DAF_w
Unit	km/truck
Description	Average incremental distance for raw solid waste/manure and/or wastewater transportation
Source of data	On site measurement,
Value(s) applied	To be determined by each CPA
Choice of data or Measurement methods and procedures	On site measurement,
Purpose of data	Used for calculating project emissions
Additional comment	Assumption to be approved by DOE

Data / Parameter	$EF_{CO2,transport}$
Unit	$kgCO_2/km$
Description	CO_2 emission factor from fuel use due to transportation
Source of data	IPCC default values
Value(s) applied	To be determined by each CPA
Choice of data or Measurement methods and procedures	IPCC default values
Purpose of data	Used for calculating project emissions
Additional comment	

Data / Parameter	$Q_{res\times waste,y}$
Unit	tonnes
Description	Quantity of residual waste produced in year *y*
Source of data	On-site data sheets recorded monthly using weigh bridge.
Value(s) applied	To be determined by CPA
Choice of data or Measurement methods and procedures	Weigh bridge measurements.
Purpose of data	Value used to calculate project emissions
Additional comment	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)

Data / Parameter	$CT_{res\times waste,y}$
Unit	tonnes/truck
Description	Average truck capacity for residual waste transportation
Source of data	On site measurement
Value(s) applied	To be determined by each CPA
Choice of data or Measurement methods and procedures	On site measurement
Purpose of data	Used for calculating project emissions
Additional comment	

Data / Parameter	$DAF_{res \times waste}$
Unit	km/truck
Description	Average distance for residual waste transportation
Source of data	On site measurement,
Value(s) applied	To be determined by each CPA
Choice of data or Measurement methods and procedures	On site measurement,
Purpose of data	Used for calculating project emissions
Additional comment	Assumption to be approved by DOE

B.6.3. Ex-ante calculations of emission reductions
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Data / Parameter	$BG_{burnt,y}$
Unit	m^3
Description	Biogas volume in year *y*
Source of data	Historical Data and measurement campaign
Value(s) applied	To be determined by each CPA
Choice of data or Measurement methods and procedures	The amount of biogas recovered and fuelled, flared or used gainfully shall be monitored *ex post*, using flow meters. If the biogas flared and fuelled (or utilized) is continuously monitored separately, the two fractions can be added to determine the biogas recovered. In that case, recovered biogas need not be monitored separately. The system should be built and operated to ensure that there is no air ingress into the biogas pipeline. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place, and on the same basis (wet or dry)
Purpose of data	Used to determine Methane Captured and destroyed
Additional comment	

Data / Parameter	$w_{CH4,y}$
Unit	%
Description	Methane content in biogas in the year *y*
Source of data	Historical Data and measurement campaign
Value(s) applied	To be determined by each CPA
Choice of data or Measurement methods and procedures	The fraction of methane in the gas should be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level by following General guidelines for sampling and surveys for SSC project activities or, alternatively a default value of 60% methane content can be used. It shall be measured using equipment that can directly measure methane content in the biogas - the estimation of methane content of biogas based on measurement of other constituents of biogas such as CO_2 is not permitted. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place
Purpose of data	Used to determine Methane Captured and destroyed
Additional comment	

Data / Parameter	*FE*
Unit	fraction
Description	Flare efficiency in year *y*
Source of data	If the biogas is combusted for gainful purposes, e.g. fed to an engine, an efficiency of 100% may be applied
Value(s) applied	To be determined by CPA
Choice of data or Measurement methods and procedures	
Purpose of data	
Additional comment	
Data / Parameter	D_{CH4}
Unit	t/m^3
Description	Density of methane
Source of data	IPCC value in AMS III.D./Version 18
Value(s) applied	0.00067 t/m^3 at room temperature (20 ºC) and 1 atm pressure
Choice of data or Measurement methods and procedures	Based on IPCC value in AMS III.D./Version 18
Purpose of data	Value used to calculate baseline emissions
Additional comment	

For an adopted fixed period of 10 years, the table below shows the estimated annual emission reductions for each CPA.

	Year	Emission Reductions
1	20xx	XX XXX
2	20xx	XX XXX
3	20xx	XX XXX
4	20xx	XX XXX
5	20xx	XX XXX
6	20xx	XX XXX
7	20xx	XX XXX
8	20xx	XX XXX
9	20xx	XX XXX
10	20xx	XX XXX
Total estimated Reductions (tonnes CO2)e		XXX XXX
Total number of Crediting years		10
Annual average of the estimated reductions over the crediting period		XX XXX

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

B.7.1. Data and parameters to be monitored by each generic CPA

(Copy this table for each data and parameter)

Data / Parameter	Q_y
Unit	tonnes
Description	Quantity of raw waste/manure treated and/or wastewater co-digested in the year *y*
Source of data	On-site data sheets recorded monthly using weigh bridge.
Value(s) applied	To be determined by CPA
Measurement methods and procedures	Weigh bridge measurements.
Monitoring frequency	Monthly
QA/QC procedures	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)
Purpose of data	Value used to calculate project emissions
Additional comments	

Data / Parameter	$Q_{res \times waste,y}$
Unit	tonnes
Description	Quantity of residual waste produced in year *y*
Source of data	On-site data sheets recorded monthly using weigh bridge.
Value(s) applied	To be determined by CPA
Measurement methods and procedures	Weigh bridge measurements.
Monitoring frequency	Monthly
QA/QC procedures	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)
Purpose of data	Value used to calculate project emissions
Additional comments	

Data / Parameter	$BG_{burnt,y}$
Unit	m^3
Description	Biogas volume in year *y*
Source of data	Historical Data and measurement campaign
Value(s) applied	To be determined by each CPA
Measurement methods and procedures	The amount of biogas recovered and fuelled, flared or used gainfully shall be monitored *ex post*, using flow meters. If the biogas flared and fuelled (or utilized) is continuously monitored separately, the two fractions can be added to determine the biogas recovered. In that case, recovered biogas need not be monitored separately. The system should be built and operated to ensure that there is no air ingress into the biogas pipeline. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place, and on the same basis (wet or dry)
Monitoring frequency	Annually, based on continuous flow measurement with accumulated volume recording (e.g. hourly/daily accumulated reading)
QA/QC procedures	Instruments calibrated by according to manufacturer recommendations. The system should be built and operated to ensure that there is no air ingress into the biogas pipeline. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place, and on the same basis (wet or dry)
Purpose of data	Used to determine Methane Captured and destroyed
Additional comments	

Data / Parameter	$w_{CH4,y}$
Unit	%
Description	Methane content in biogas in the year *y*
Source of data	Historical Data and measurement campaign
Value(s) applied	To be determined by each CPA
Measurement methods and procedures	The fraction of methane in the gas should be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level by following General guidelines for sampling and surveys for SSC project activities or, alternatively a default value of 60% methane content can be used. It shall be measured using equipment that can directly measure methane content in the biogas - the estimation of methane content of biogas based on measurement of other constituents of biogas such as CO2 is not permitted. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place
Monitoring frequency	The fraction of methane in the gas should be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level.
QA/QC procedures	The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place, and on the same basis (wet or dry)
Purpose of data	Used to determine Methane Captured and destroyed
Additional comments	

Data / Parameter	*T*
Unit	^{o}C
Description	Temperature of the biogas
Source of data	Measurement campaign
Value(s) applied	To be determined by each CPA
Measurement methods and procedures	If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas
Monitoring frequency	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures	
Purpose of data	The temperature of the gas is required to determine the density of the methane combusted.
Additional comments	

Data / Parameter	P
Unit	Pa
Description	Pressure of the biogas
Source of data	Measurement campaign
Value(s) applied	To be determined by each CPA
Measurement methods and procedures	If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas
Monitoring frequency	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures	
Purpose of data	The pressure of the gas is required to determine the density of the methane combusted.
Additional comments	

Data / Parameter	FE
Unit	%
Description	The flare efficiency
Source of data	As per the "Tool to determine project emissions from flaring gases containing Methane".
Value(s) applied	To be determined by each CPA
Measurement methods and procedures	As per the "Tool to determine project emissions from flaring gases containing Methane".
Monitoring frequency	
QA/QC procedures	Regular maintenance shall be carried out to ensure optimal operation of flares
Purpose of data	Used to calculate project activity emissions
Additional comments	

Data / Parameter	CT_y
Unit	tonnes/truck
Description	Average truck capacity for transportation
Source of data	On site measurement
Value(s) applied	To be determined by each CPA
Measurement methods and procedures	On site measurement
Monitoring frequency	Annually, based on daily measurement and monthly aggregation
QA/QC procedures	
Purpose of data	Used to calculate project activity emissions
Additional comments	

Data / Parameter	$CT_{res\times waste,y}$
Unit	tonnes/truck
Description	Average truck capacity for residual waste transportation
Source of data	On site measurement
Value(s) applied	To be determined by each CPA
Measurement methods and procedures	On site measurement
Monitoring frequency	
QA/QC procedures	
Purpose of data	Used for calculating project emissions
Additional comments	

Data / Parameter	DAF_w
Unit	km/truck
Description	Average incremental distance for raw solid waste/manure and/or wastewater transportation
Source of data	On site measurement,
Value(s) applied	To be determined by each CPA
Measurement methods and procedures	On site measurement,
Monitoring frequency	Annually,
QA/QC procedures	Assumption to be approved by DOE
Purpose of data	Used for calculating project emissions
Additional comments	

Data / Parameter	$DAF_{res\times waste}$
Unit	km/truck
Description	Average distance for residual waste transportation
Source of data	On site measurement,
Value(s) applied	To be determined by each CPA
Measurement methods and procedures	On site measurement,
Monitoring frequency	Annually
QA/QC procedures	Assumption to be approved by DOE
Purpose of data	Used for calculating project emissions
Additional comments	

B.7.2. Description of the monitoring plan for a generic CPA
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This Monitoring Plan (MP) provides a standard monitoring plan for all the CPAs covered under this PoA. The managing entity, BPI, will manage the monitoring done by each CPA to ensure its compliance with data collection, processing and reporting required in this PoA. The MP shall comply with all the relevant rules and regulations of the CDM. CPAs shall make reference to this MP to facilitate accurate and consistent monitoring of the PoA's Certified Emission Reductions. This MP shall be followed during the project duration and be used for project verification in quantifying the CERs achieved by each CPA and aims to achieve the following:

- Establishing and maintaining a suitable monitoring system,
- Establishing and maintaining a reliable and accurate monitoring system,
- Guide the implementation of necessary measurement and management operations,
- Guide for meeting CDM requirements for verification and certification.

All the CPAs will be assigned a unique identification number and GPS coordinates of project location for verification and as reference to ensure single counting of the PoA or CPA.

Monitoring Obligations

To facilitate the accurate determination of CERs, each CPA will need to fulfil certain operation and data collection obligations. A CDM Operations and Monitoring Manual will be prepared before the start of the first crediting period. The objective of the manual is to ensure the accurate and transparent calculation and monitoring of CERs for each CPA. The necessary data for baseline and emission reduction determination shall be stipulated in each CPA-DD. BPI shall conduct onsite inspections for each individual digester included in the project boundary where the project activity is implemented for each verification period.

The management entity, BPI, will maintain all monitoring reports for the CPAs in accordance to the records keeping system and shall ensure that monitoring reports are available upon request by the DOE for verification purposes.

Management and Operational Systems

Each CPA shall have a well-defined management and operational system that meets the specific requirements of the project activities. The system should ensure successful execution of CPA and the credibility and verifiability of the CERs achieved and should include the following:-

Data Handling

- Each CPA will develop, implement and maintain a transparent system for the collection, computation and storage of data, which includes adequate records keeping and data monitoring system fit for independent monitoring auditing and verification.
- BPI as the management entity will oversee and ensure that each CPA will maintain standard records documentation and keep the monitored data in a secure data for the crediting period and up to two years after the crediting period for each CPA.
- Data (soft and hard copy) will be transmitted to BPI who is responsible for the compilation of the monitoring reports and BPI will conduct a data audit and compliance review with the MP atleast bi-annually for each CPA.

Quality Assurance

- Key quality assurance personnel will be assigned for overall project management, operation, monitoring and reporting required by the project activity
- A competent manager responsible and accountable for the generation of CERs including monitoring, records keeping, computation of ERs, audits and verification. The manager will sign off on all GHG Emission worksheets.
- Well defined quality control procedures will be encouraged to enhance data archiving and integrity of ERs.
- Flow meters, sampling devices and gas analysers shall be subject to regular maintenance, testing and calibration to ensure accuracy;

Training

- Training for new staff will be done to enable them to implement the requirements of this MP. Initial training will be done for all staff involved in the implementation of the MP before the start of the project and generation of CERs.
- Environment, health and safety issues will also be given priority.

The CPA will inform the management entity about the need for any corrective and enhancement measures.

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