CLEAN DEVELOPMENT MECHANISM
PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-PoA-DD) Version 01

CONTENTS

Annexes

NOTE:

This form is for the submission of a CDM PoA whose CPAs apply a large scale approved methodology.

At the time of requesting registration this form must be accompanied by a CDM-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-CPA-DD (using a real case).

SECTION A. General description of programme of activities (PoA)

A.1 Title of the programme of activities:

BWC Sustainable Landfill Gas Recovery Programme of Activities in Indonesia
Version: 06
Date: 04/12/2012

A.2. Description of the programme of activities:

PoA Description
The "**BWC Sustainable Landfill Gas Recovery Programme of Activities in Indonesia**" later on referred to as "**The PoA**", supports investment in the Municipality Solid Waste (MSW) Management activities. It aims to intensify Indonesia's landfill gas capture project activities, where the baseline scenario is total atmospheric release of the landfill gas containing methane. The PoA is a voluntary action being coordinated and managed by the Coordinating and Managing Entity (CME) named PT Blue World Indonesia (BWC) which is a privately owned entity. The CME invites parties to participate in the PoA and reduce emissions through the construction and operation of landfill gas recovery project activities. The landfill gas can be destructed in a flare or utilised for the generation of electricity.

1. General operating and implementing framework of PoA
The PoA is operated and implemented by PT Blue World Indonesia (hereinafter referred to as BWC). BWC is the "Coordinating / Managing Entity" (hereinafter referred to as CME). The landfill gas capture activities as per applicable scenarios shall be addressed as Project Activities and the facility owner(s) shall be addressed as "CPA operator(s)" for this PoA.

This PoA will include: (i) Landfill gas capture and flaring and/or (ii) Landfill gas capture and utilization.

BWC will take the following steps for the PoA implementation:
Step 1: Collect information of Project Activities.
Step 2: Scrutiny of information for eligibility as CDM Programme Activity (Hereinafter referred to as CPA) as per Section A.4.2.2.
Step 3: Listing eligible CPAs.
Step 4: Propose DOE to check for the consistency of these CPAs.
Step 5: Inclusion of the eligible CPA(s) under PoA, as per the consistency check by DOE.
Step 6: Verify that Monitoring Instruments & System to be installed at Project Site as per the Section E.7.2
Step 7: Undertaking periodic verification by DOE.

BWC will work with landfill developers to promote and support sustainable landfill gas project activities in a way to reduce greenhouse gas emissions and to improve environmental standards of landfills. Periodically the CME will consolidate an undefined number of project activities and bundle them in a CPA for the inclusion of these activities in the programme.

2. Policy/measure or stated goal of the PoA
The goal of this PoA is to intensify investment in the MSW management sector by promoting sustainable landfill gas recovery practices for existing landfills that fall within the boundaries of the programme of activities.

Municipality solid waste in Indonesia is currently often being disposed at unmanaged landfills or open dumpsites creating environmental undesired situations around such disposal sites. Although the Law on Solid Waste Management (no. 18/2008), article 22 defines implementation of environmentally friendly technology for final waste treatment and the requirement of safe landfill practices., there are currently no regulations in place mandating landfill capture and/or utilization for the Municipality Solid Waste Management. This has led to an underinvestment in the waste management sector compared to other countries in the region.[1]

At present, Indonesia's 384 cities are jointly producing 80,235 tonnes of garbage per day of which almost all of it ultimately is disposed on a landfill. Predictions are that by 2020 this amount will increase by a factor 5 implying a huge increase in the future the waste disposal. Waste disposal in Indonesia is mostly done in one of its 460 open dumping landfills which are relatively cheaper than sanitary landfills in which the liquid drainage of the landfill is collected and treated and the landfill gas is captured and converted into CO2 and is therefore a considerable improvement with respect to local and global environmental impacts.[2]

A typical CPA will apply modern, efficient technologies and the environmental impact will be managed better than in the existing situation, since landfill gas is captured. Moreover, the CPA will follow the sustainable development criterion and Indicators which have been published by the Clean Development Mechanism Designated National Authority of Indonesia (Komisi Nasional Mekanisme Pembangunan Bersih)[3]. Table below shows compliance of sustainable development criterion and indicators within the project. The project contributes to sustainable development by meeting the following targets:

Environment:
A typical CPA included in this PoA contribute to improving health conditions and reducing the environmental impact of the landfill site by destroying landfill gas, which contains local air pollutants and odours. A typical CPA complies with all applicable laws and regulations, including those for health and safety and land use planning.

Economy:
A typical CPA under the PoA will contribute to economic development through employment opportunities for people living near the landfill site for operation and maintenance of the CPA facilities. CPAs may also involve in other activities that benefit the local economy, for example supporting the development of the landfill site or implementing voluntary support activities for local communities. Details of such activities will vary per CPA and will be elaborated in each CPA-DD.

Social:

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[1] Development in waste management practices in Indonesia; Meidiana and Gamse; 2010

[2] Source: Landfill gas for energy: Its status and prospects in Indonesia, Kardono and Wahyu Purwanta (BPPT), 2007 Web: http://www.esi.nagoya-u.ac.jp/h/isets07/Contents/Session05/1139Kardono.pdf

[3] http://pasarkarbon.dnpi.go.id/web/index.php/dnacdm/cat/5/sustainable-development-criteria-.html

A typical CPA will conduct a stakeholder consultation meeting prior prior to inclusion of the PoA. Comments received and how these comments were addressed shall be elaborated in each CPA-DD document. CPA shal be implemented in a diligent manner and in harmony with local communities.

Technology:
A typical CPA will use new, reliable and advanced technology but be operated by local entities and staff. Components for CPA are normally sourced from the local region whenever possible.

3. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.
The PoA is a voluntary action and the CME is not in any way enforced to accomplish its objectives. There are currently no laws or regulations in place in Indonesia that mandate landfill gas projects to seek CDM services. Likewise, no mandatory laws or regulations exist requiring the CME or any other party to develop a PoA for landfill gas projects in Indonesia.

A.3. Coordinating/managing entity and participants of POA:

1. Coordinating or managing entity of PoA as the entity which communicates with the Board

Project participants being registered in relation to the proposed PoA are:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	the Party involved wishes to be considered as project participant (Yes/No)
Indonesia (host)	Private Entity: PT Blue World Indonesia	No
Netherlands	Private Entity: Blue World Carbon SEA Pte Ltd	No

2. Project participants being registered in relation to the PoA. Project participants may or may not be involved in one of the CPAs related to the PoA.
   - PT Blue World Indonesia (BWC) is a private company, the Coordinating or Managing Entity (CME) and participant of PoA
   - Blue World Carbon SEA Pte Ltd is a private company and participant of the PoA.

A.4. Technical description of the programme of activities:

A.4.1. Location of the programme of activities:

A.4.1.1. Host Party(ies):

Indonesia

A.4.1.2. Physical/ Geographical boundary:

The PoA will be implemented within the geographical boundaries of Indonesia (see figure A4.1.1).

National and sectoral policies in the relevant sector are the same within the geographical boundaries of Indonesia. With regard to this PoA there is no difference in the national or sectoral policies between regions or provinces.

Figure A4.1.1 Map of Indonesia

A.4.2. Description of a typical CDM programme activity (CPA):

A typical CDM Programme Activity (CPA) consists of the capture of LFG, flaring and/or use for electricity production at a specific landfill site identified in the CPA-DD. A typical CPA will comply with the Baseline and Monitoring Methodology ACM0001 Version 12. This is further elaborated in section E.2. CPA's that (partial) utilize LFG for generation of heat in a boiler, air heater or kiln (brick firing only) and/or supplying the LFG to consumers through a natural gas distribution network are not eligible for inclusion under this PoA.

The CPA is constructed by the CPA implementer and consists of one or a combination of the following technologies:

Project Scenario	Description of scenario
1	Landfill gas capture and flaring
2	Landfill gas capture and utilization for electricity generation

A.4.2.1. Technology or measures to be employed by the CPA:

A typical CPA under this PoA will involve the installation of the landfill gas collection and flaring/use system to an existing landfill. A monitoring plan and data recording and archiving system will be implemented, where BWC will keep all records for the elaboration of the monitoring reports. Technology employed as part of a typical CPA is environmental sound and safe. CPA may or may not involve

technology transfer from other countries. Details regarding technology transfer shall be elaborated in section A.2 of each specific CPA-DD.

In this PoA, a typical CPA can consist of up to 2 scenarios or any combination of them:

Scenario 1 – Landfill gas capture and flaring:
This CPA will not have an electricity generation and all LFG generated will be flared. It consists of a LFG collecting system and an enclosed or open flare. The landfill gas will be collected and directed to a flare through transportation pipes. The technical parameters of the installed systems will be provided in each specific CPA-DD.

Figure A.4.2.1.1 – diagram of technology scenario 1

Scenario 2 – Landfill gas capture and utilization for electricity generation:
This scenario consists of a LFG collecting system, pre-treatment system (optional), electricity generation system, a flaring system and grid connection system (optional). First, the landfill gas will be collected, and then through transportation pipes, the landfill gas will reach pre-treatment system (optional), in which the moisture and impurity of landfill gas will be removed. After this the landfill gas, it will be fed into an electricity generation system; the electricity generated will be connected to a local grid through transformer substation system.

The system may also have a flare that will be used to combust LFG when the power generation system is down (e.g. due to maintenance) and the excess of collected gas. The technical parameters of the installed systems will be provided in each specific CPA-DD.

Scenario 2 may consist of two phases. In the first phase a flaring system will be installed which will flare 100% of the LFG will be captured. When the landfill gas captured is sufficient for efficient power generation the electricity equipment will be installed.

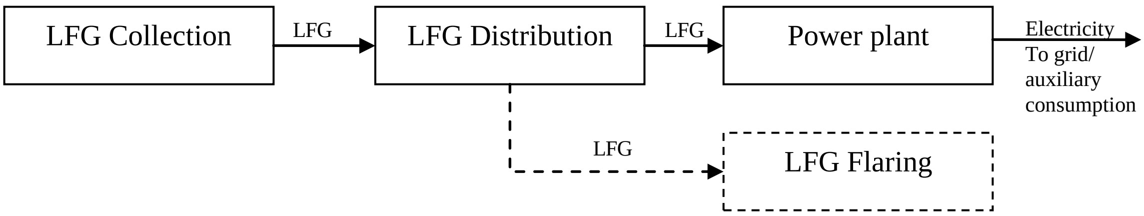

Figure A.4.2.1.2 – diagram of technology scenario 2

Technology description
The components used in these scenarios are briefly described below.

Landfill gas collection system (all scenarios):

State-of-the-art gas collection technology includes the items listed below. Each CPA will have its LFG collection system described in a more detailed fashion.

- Vertical wells used to extract gas and leachate.
- Horizontal wells used to extract gas.
- Optimal well spacing for maximum gas collection whilst minimizing costs.

Landfill gas flaring system (all scenarios):
Despite the final use of the LFG gas, all CPAs may have a flaring system to destroy the LFG collected in case any problem occurs. The LFG flare system includes the items provided below.

- Flare with controlled combustion system.
- Blower system used to cause negative pressure in the pipeline (before blower) and positive pressure (after blower) to direct gas for flare.
- Equipment for monitoring of gas composition, flow and burn temperature, as per relevant CDM Tools and Methodology requirements

Electricity Generation Equipment (scenario 2):
A modular engine facility will be installed. Small modular engine generator units make it possible to adapt the equipment to the site specific gas volumes.

Monitoring system (all scenarios)
Each CPA will have state-of-the-art monitoring equipment that will be calibrated as per the applied approved monitoring methodology. Staff involved will be trained to properly operate the monitoring system. Detailed description of the monitoring system is provided in each CPA-DD.

The data of the operational and monitoring parameters will be collected by each site operator and forwarded to BWC. Data will be recorded electronically (kept for two years after the end of the crediting period) and recorded separately. The monitoring data will be printed periodically as a backup procedure.

A.4.2.2. Eligibility criteria for inclusion of a CPA in the PoA:

The CME in their management system has all competencies to check the features of potential CPAs and ensure that each CPA meets all requirements and eligibility criteria before inclusion in the registered PoA. The relevant documents for the compliance of para 17 (for development and implementation of management system) annex 3 of EB 65 has been provided to the DOE for validation.

A CPA to be included in the proposed PoA shall meet the criteria as imposed by CME:

Table A.4.2.2.1 Eligibility criteria for inclusion of a CPA in the PoA

Nr.	Eligibility criteria description	Information requirement
A.	The CPA implementer is aware of its participation in the PoA and has provided a declaration to confirm/accept relevant terms and conditions in relation to inclusion in the PoA	The following document shall be provided: • Declaration from the CPA Implementer confirming its participation in the PoA and affirmation of relevant terms and conditions.

B.	CME has permitted participation and inclusion of the CPA implementer into the PoA.	The following document shall be provided: • Declaration by CME to permit participation of the CPA Implementer into the PoA.
C.	The CPA shall confirm to one or both of the two scenarios described in section A.4.2 of the PoA-DD (Projects that (partial) utilize LFG for generation of heat in a boiler, air heater or kiln (brick firing only) and/or supplying the LFG to consumers through a natural gas distribution network are not eligible for inclusion under this PoA.)	The following document shall be provided: • Confirmation by the CME regarding the applicable project scenario of the CPA. • Third party evidence on the situation that existed at the landfill site prior to implementation of the CPA. Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology.
D.	The CPA shall be located in Indonesia	All of the following documents shall be provided: • Business license of the CPA Implementer issued by Indonesian local authorities. • Declaration from the CPA implementer confirm that the boundary of the implemented CPA is within the geographical territory of Indonesia, including information regarding geographic reference (latitude and longitude), name and address of the CPA.
E.	The CPA shall meet the applicability and other requirements of the methodology ACM0001 Version 12.	As described in section E.2 of the PoA DD, the CPA shall meet relevant requirement of the meth and the required document shall be supplied to the DOE at the time of inclusion. Compliance with the methodology shall be demonstrated in tabular format for each CPA.
F.	Confirmation that the CPA is not registered or being registered as a stand-alone CDM project outside of this PoA, a bundled CDM Project Activity or another registered PoA. The CPA shall not lead to double counting of	The following document shall be provided: • Declaration from the CPA Implementer confirming that the project is not registered or in the process of being registered as a

	emission reductions.	stand-alone CDM project, outside of the PoA, a bundled CDM Project Activity or another registered PoA. And: • Confirmation described in the CPA-DD that states that the project is not registered or in the process of being registered as a stand-alone CDM project, outside of the PoA. • Confirmation check by reviewing the website of the UNFCCC.
G.	Confirmation on involvement of public funding or ODA from Annex I Parties in CPA	The following document shall be provided: • Declaration from the CPA Implementer regarding the no involvement of public funding or ODA from Annex I Parties. And: • Confirmation in the CPA-DD regarding no involvement of public funding or ODA from Annex I Parties.
H.	The start date of the CPA shall not be before the commencement of validation of the PoA as a whole (the date the PoA was published for global stakeholders consultation).	One of the following documents shall be provided: • In case available, the earliest signed equipment or (sub) contractor agreement with a total contract value that is significant to the project activity (the date of signing the purchase order by CPA Implementer shall constitute the starting date of the CPA). • Declaration of from the CPA Implementer that no contracts have been signed with a total contract value that is significant to the project activity
I.	A CPA level local stakeholder's consultation and environmental impact assessment (if applicable) has to be carried out prior to inclusion.	The following documents shall be provided: • Meeting minutes of the stakeholder consultation. • Attendance list If available: • Relevant other documentation, *for example*, pictures, feedback forms

		of the stakeholder meeting. If an environmental impact assessment is required: • Copy of the environmental impact assessment • Approval document of the environmental impact assessment If an environmental impact assessment is not required: Justification described in the CPA-DD to explain why an environmental impact assessment has not been conducted.
J.	The CPA implementer shall be duly registered by the Indonesian authorities prior to inclusion	The following document shall be provided: • Business license of the CPA Implementer issued by Indonesian local authorities.
K.	The CPA shall be in conformance to statutory requirements of Indonesia.	The following document shall be provided: • Approval document from the Indonesian local authorities for relevant statutory clearances.
L.	Confirmation on the crediting period of the CPA which shall not exceed the length of the PoA (28 years) regardless of the time of inclusion of CPA in the PoA	Confirmation described in the CPA-DD that states that the crediting period of the CPA shall not exceed the length of the PoA.
M.	Demonstration of additionality of the scenario implemented under the CPA in accordance with the "*Tool for the Demonstration and Assessment of Additionality"* and relevant information provided in section E.5.1 of the PoA-DD.	The following documents shall be provided: • Investment analysis including relevant supporting evidence • Description in the CPA-DD detailing the technology employed under the CPA, the identified baseline scenario and information to demonstrate the additionality of the CPA.
N.	At the start date of the CPA, no law/regulation has been issued or contract has been signed that forces the entity in charge of the management of the landfill to capture, destroy or use LFG or if such law/regulation exists, it can be still demonstrated that such law/regulation/contract is systematically not enforced. The baseline scenario is total atmospheric release of the LFG).	The following document shall be provided: • Declaration from the CPA implementer to confirm the baseline scenario and confirmation that no law/regulation has been issued or contract has been signed that forces the entity in charge of the management of the landfill to capture, destroy or use LFG.

		• Third party evidence on the situation that existed at the landfill site prior to implementation of the CPA, confirming that there is no (partial) capture of the LFG. • Confirmation described in the CPA-DD that states that no law/regulation has been issued or contract has been signed that forces the entity in charge of the management of the landfill to capture, destroy or use LFG and a description of the baseline scenario. • CME assessment report of the pre-project activity situation, including existing practice of LFG recovery (if any).
O.	CPA shall involve the installation a new LFG capture system in an existing solid waste disposal site	The following document shall be provided: • Declaration from the CPA implementer to confirm the baseline scenario and confirmation that no law/regulation has been issued or contract has been signed that forces the entity in charge of the management of the landfill to capture, destroy or use LFG • Third party evidence on the situation that existed at the landfill site prior to implementation of the CPA with information to determine if the landfill is existing or new. AND Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology.

Table A.4.2.2.2 - Applicability conditions of methodology ACM0001 Version 12.0.0

Applicability Conditions	**Documentation required**
This methodology is applicable to landfill gas capture project activities, where the baseline scenario is the partial or total atmospheric release of the gas and the project activities include situations such as:	
(a) Install a new LFG capture system in a new or existing SWDS	Per eligibility criteria C of the PoA, the PoA is only open for inclusion of CPA that involves installation of a new LFG capture system at an existing landfill.

	The following document shall be provided: • Declaration from the CPA implementer to confirm the baseline scenario and confirmation that no law/regulation has been issued or contract has been signed that forces the entity in charge of the management of the landfill to capture, destroy or use LFG • Third party evidence on the situation that existed at the landfill site prior to implementation of the CPA. • CME assessment report of the pre-project activity situation, including existing practice of LFG recovery (if any). AND Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology.
(b) Make an investment into an existing LFG capture system to increase the recovery rate or change the use of the captured LFG, provided that: (i) The captured LFG was only vented or flared and not used prior to the implementation of the project activity; and (ii) In the case of an existing active LFG capture system for which the amount of LFG can not be collected separately from the project system after the implementation of the project activity and its efficiency is not impacted on by the project system: historical data on the amount of LFG capture and flared is available.	Not applicable since the PoA only allows CPA that install a new LFG recovery system at an existing landfill site to be included as CPA under the PoA (refer to eligibility criteria “O” of the PoA.
(c) Flare the LFG and/or use the captured LFG in any (combination) of the following ways: (i) Generating electricity; (ii) Generating heat in a boiler, air heater or kiln (brick firing only); and/or (iii) Supplying the LFG to consumers through a natural gas distribution network.	Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology. • Power Purchase agreement (if available).
(d) Do not reduce the amount of organic waste that would be recycled in the absence of the project activity.	The following documents shall be provided: • CME assessment report of the pre-project activity situation, including arrangement of

	recycling of organic waste and quantities thereof in the pre-project situation (if any).
ACM0001 is only applicable if the application of the procedure to identify the baseline scenario confirms that the most plausible baseline scenario is:	
(a) Partial or total release of the LFG from the SWDS; and	The following document shall be provided: • Declaration from the CPA implementer to confirm the baseline scenario and confirmation that no law/regulation has been issued or contract has been signed that forces the entity in charge of the management of the landfill to capture, destroy or use LFG • Third party evidence on the situation that existed at the landfill site prior to implementation of the CPA • Confirmation described in the CPA-DD that states that no law/regulation has been issued or contract has been signed that forces the entity in charge of the management of the landfill to capture, destroy or use LFG and a description of the baseline scenario.
(b) In the case that the LFG is used in the project activity for generating electricity and/or generating heat in a boiler, air heat or kiln; (i) For electricity generation: that electricity would be generated in the grid or in captive fossil fuel fired power plants; and/or (ii) For heat generation: that heat would be generated using fossil fuels in on-site equipment.	Projects that (partial) utilize LFG for generation of heat in a boiler, air heater or kiln (brick firing only) and/or supplying the LFG to consumers through a natural gas distribution network <u>are not eligible</u> for inclusion under this PoA.) Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology. • Power Purchase agreement (if available). • Electricity purchase invoice(s) • Electricity sales invoice(s)/receipts
ACM0001 is not applicable:	
(a) In combination with other approved methodologies. For instance ACM0001 cannot be used to claim emission reductions for the displacement of fossil fuels in a kiln, where that purpose of the CDM project activity is to implement energy efficiency measures at the kiln;	Not applicable.
(b) If the management of the SWDS in the project activity is deliberately changed in order to increase methane generation compared to the situation prior to the implementation of the project activity (e.g. other to meet a technical or regulator requirement). For example, this may apply to the addition of liquids to a SWDS, pre-	Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology. AND: • Site visit of validation team during time of

treating waste to seed it with bacteria for the purpose of increasing the anaerobic degradation environment of the SWDS or changing the shape of the SWDS to increase that methane Correction Factor.	inclusion.

Applicability of “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01):

Table A.4.2.2.3 -: Tool to calculate baseline, project and/or leakage emissions from electricity consumption

Applicability Conditions	Documentation required
Scenario The tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: Scenario A: Electricity consumption from the grid. The electricity is purchased form the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any on-site captive power plant exists, it is not operating or it can physically not provide electricity to the source of electricity consumption. Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid. Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumption source. The captive power plant(s) can provide electricity to the electricity consumption source. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumption source can be provided with electricity from the captive	The following documents shall be provided: • Feasibility Study / Project Proposal of the project that describes the project technology. • CME assessment report of the pre-project activity situation.

power plant(s) and the grid.	
This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO2 emission.	Any of the following documents shall be provided: • Feasibility Study / Project Proposal of the project that describes the project technology.

Table A.4.2.2.4: Applicability of "Emissions from disposal of waste at a solid waste disposal site" (version 06.0.1):

Applicability Conditions	
Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS. Application B: The CDM project activity avoids or involves the disposal of waste at a SWDS.	Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology. AND: • Third party evidence on the situation that existed at the landfill site prior to implementation of the CPA

Table A.4.2.2.5: Applicability of "Tool to calculate the emission factor for an electricity system" Version 2.2.1:

Applicability Conditions	Documentation required
The tool is not applicable if the project electricity system is located partially or totally in an Annex-I country.	Any of the following documents: • (Pre) Power Purchase Agreement, • Letter from grid operator on acceptance of purchase of electricity from CPA. • Feasibility Study / • Technical Proposal of the project

Table A.4.2.2.6: Applicability of "Tool to determine project emission from flaring gases containing methane" (version 01):

Applicability Conditions	Documentation required
The residual gas stream to be flared contains no other combustible gases than methane, carbon monoxide and hydrogen;	Any of the following documents: • Feasibility Study / • Technical Proposal of the project
The residual gas stream to be flared shall be obtained from decomposition of organic material (through landfills, bio-digesters or anaerobic lagoons, among others) or from gases vented in coal mines (coal mine methane and coal bed methane).	Any of the following documents: • Feasibility Study / • Technical Proposal of the project

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

(i) The proposed PoA is a voluntary coordinated action;

The PoA is a voluntary action and the CME is not in any way enforced to accomplish its objectives. There are currently no laws or regulations in place in Indonesia that mandate landfill gas projects to seek CDM services. Likewise, no mandatory laws or regulations exist requiring the CME or any other party to develop a PoA for landfill gas projects in Indonesia. Except CDM there is no other method in which CME is able to provide a platform for the development of landfill gas capture and utilization activities.

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;

In the absence of the PoA, which means in the absence of the CDM financial support, CPA under this PoA would not be implemented. According to paragraph 07, Annex 3 of EB 65, "Standard for demonstration of additionality of GHG Emission reductions achieved by a Programme of Activities" version 01.0: "additionality shall be demonstrated by establishing that in the absence of the CDM, none of the implemented CPAs would occur." As per eligibility criteria of this PoA each CPA is required to demonstrate the additionality. This is appropriate since there are various prohibitive barriers to landfill gas utilization in Indonesia, as described in detail in section E.5.1. These barriers may apply differently to different CPAs under the PoA. Therefore, additionality analysis is best performed at CPA level. This CPAs additionality implies PoA additionality, because, if CPAs were feasible without CDM, then the promoters of the CPAs would not need to participate in the PoA, and there would be no scope for it.

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;

Not applicable, the proposed PoA's objective is not considered mandatory policy/regulation in Indonesia.

(iv) If mandatory a policy/regulation are enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

Not applicable, the proposed PoA's objective is not considered mandatory policy/regulation in Indonesia.

A.4.4. Operational, management and monitoring plan for the programme of activities:

A.4.4.1. Operational and management plan:

The CME in their management system has all competencies to check the features of potential CPAs and ensure that each CPA meets all requirements and eligibility criteria before inclusion in the registered PoA. The relevant documents for the compliance of para 17 (for development and implementation of management system) annex 3 of EB 65 has been provided to the DOE for validation.

(a) **A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies;**

As its operation and management plan the CME establish and maintain an electronic database that containing information of all the CPA's in the programme. Details of the operation and monitoring plan are as follows:

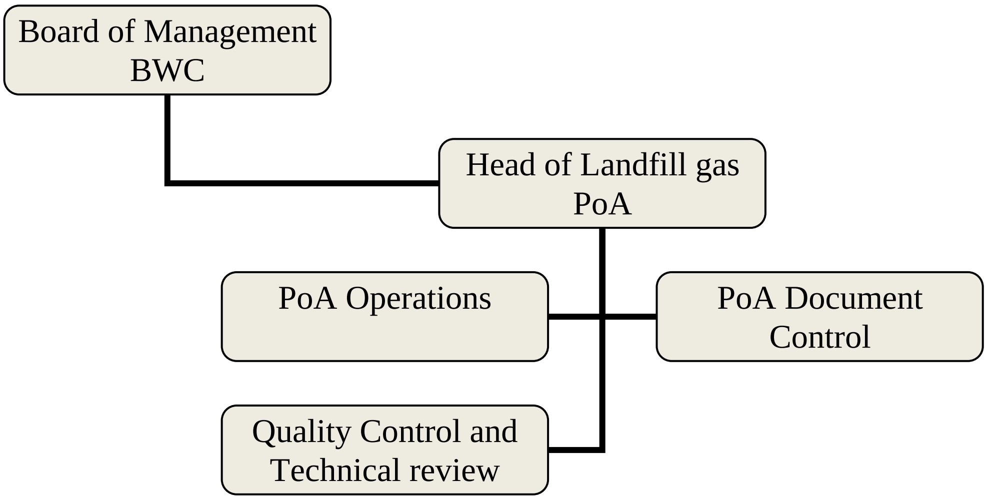

Figure A.4.4.1.1 - CME organisation chart for PoA Management and development

Based on the above defined chart the roles and responsibilities can be defined as shown in the table below:

Department	**Management Responsibilities and Arrangements**
Board of Management	▪ Registration of the PoA ▪ Implementation of the Program objectives ▪ Ensuring proper overall management of the PoA ▪ CER issuance
Head of Landfill gas PoA	▪ Program operation as per CDM guidelines and board of management strategy. ▪ Proper and timely validation of the the PoA ▪ Review of program compliance as per guidelines ▪ Awareness creation and promotion of the PoA ▪ Ensuring proper CDM project operation and management as per required guidelines and board of management strategy throughout the crediting period.

PoA Operations	This department has two main objectives: securitizing and preparation of documentation for initial inclusion of a CPA and monitoring an verification of included CPAs. (Pre) inclusion activities: ▪ Inclusion of CPA under the PoA ▪ Review of CPA compliance as per guidelines ▪ Ensure verification of CPAs ▪ Identification of CPA ▪ Listing of eligible CPA's ▪ Inclusion of eligible CPAs under PoA ▪ CPA-DD and PoA-DD Development ▪ Investment analysis for CPA's Validation and verification activities: ▪ Validation / verification support ▪ Site support to CPA implementers (validation and verification) ▪ Validation and verification support to CPA implementer throughout the crediting period. ▪ Preparation of monitoring report for Emission Reduction ▪ CPA onsite monitoring support ▪ Development and implementation of monitoring system of each CPA ▪ Monitoring training of CPA ▪ Monitoring and record keeping and data backup / archival of monitoring parameters. ▪ Ensuring and implementing emergency preparedness program for monitoring ▪ Review and improvement suggestions of monitoring system and plan ▪ Site support to CPA implementers (monitoring)
PoA Document Control	▪ Collecting information and documentation of the CPA ▪ Collection and scrutiny of all documents related to the eligibility criteria of CPA inclusion ▪ Collection of necessary statutory approvals from CPA implementers ▪ General document control
Quality Control and Technical review	▪ Internal quality audit, ▪ Process and continuous improvement proposal reporting to stakeholders and management. ▪ Quality control of supporting documents and site information ▪ Technical review of the CPA-DD documentation.

Information regarding the assignment of roles on organizational level, as well as procedures and documentation to review the competences of staff involved in the CPA inclusion and PoA development process will be forwarded to the DOE at time of validation of the PoA and CPA inclusion.

(b) **Records of arrangements for training and capacity development for personnel;**

The CME will maintain and provide the DOE with a record of past training and a plan for the training and capacity development of its personnel at time of validation of the PoA-DD.

(c) **Procedures for technical review of inclusion of CPAs;**

A technical review procedure and associated forms have been developed. These are provided to the DOE for assessment during validation of the PoA-DD and at time of validation of CPA inclusion.

(d) **A procedure to avoid double counting**

The CME will confirm as per EB 55 Annex 38 Paragraph 6(i), that the Project activities included in the CPA is not registered in any other CPA of a PoA or any other registered CDM Project activity through following procedure to avoid double counting of CPA under any other CDM or PoA activity.

As part of the requirements of EB 65, annex 3 paragraph 17, CME has prepared a double counting procedure that will be subject to continuous improvement to accommodate additional measures (where applicable) to avoid double counting. This procedure has been provided to DOE for assessment. In particular the double counting procedure will take into account:

1. At time of CPA eligibility check, CME will seek confirmation of CPA and also check any-double counting using public information sources like UNFCCC website data.
2. The CME will publish the unique identification information on the CME website

Furthermore at the time of inclusion the CME is taking a declaration from the CPA implementer (as a part of mandate) as below-

Mandate by CPA operators shall state that "there is no double counting of CERs from this CPA under any CDM Project or CPA in another PoA".

(e) **Records and documentation control process for each CPA under the PoA;**

In order to unambiguously identify CPA participating in the PoA a serial numbering system will be implemented that uniquely identify each CPA through numbers for the CPA and the CPA owner. This serial numbering system will be used to record baseline and monitoring data on a continuous basis using an Excel database. In this way, the PoA CME will be able to track the emission reduction of each CPA over the full duration of the crediting period.

In summary, BWC will record and document CPA detail information as follows:

- Name of the CPA and its production capacity
- The name, address, and CPA owner details of each participating CPA
- The geographical coordinates of each CPA
- The record of technical specification of CPA participating in the PoA

BWC will be responsible for the management of records and data associated with each CPA. The database will be updated manually using the data supplied by the participating CPA. It will form the basis for the verification of CPAs and be available for inspection by the DOE at any point in time.

The record keeping will be carried out by using the field instruments, hardware and software installed at every Project site and/or manual data recording in the log book. The captured data will be transferred to the server of CME, which will have provision to archive the data as per individual CPAs. Each CPA operator will carry out a periodic analysis (quarterly) of data for the individual Project. In case of any anomalies identified during the review by the CPA operator, appropriate corrective actions will be taken. The review report will be submitted to the CME & DOE.

(f) **Measures for continuous improvements of the PoA management system;**

Measures for the continuous improvement of the PoA management system are described in the designated CME Management System Manual that is available during validation of the PoA-DD and provided to the DOE for assessment at time of CPA Inclusion validation.

(g) **Any other relevant elements.**

To ensure that the CPA Implementers are aware and have agreed that their activity is being subscribed to the PoA the following provisions are provided:

The CPA implementer will provide the mandate to CME stating that, they are aware and have agreed that their activity is subscribed to the PoA. The CPA implementer has to give a declaration to CME that the CPA is not a de-bundled component of large scale Project. The CME will confirm that the Project activity is as per EB 54 Annex 13 guideline of debundling and the CPA not a de-bundled component of large scale Project.

A.4.4.2. Monitoring plan:

CME opted for each CPA to be verified individually and does not propose any statistical sampling methods or procedures. The monitoring plan for each CPA will be developed in accordance with the applied baseline and monitoring methodology at the CPA level. Data parameters will be identified and monitored in accordance with the requirement of the baseline and monitoring methodology.

Each CPA included in this PoA will have a unique identification number as a reference. To avoid double counting during the verification process, the CME will establish and maintain an electronic database explained in section A.4.4.1 that will be provided to the DOE during the inclusion of each CPA.

A.4.5. Public funding of the programme of activities:

No public funding is used to implement this Programme of activities (PoA). Furthermore the CME will ensure that, at the time of inclusion of CPA, there is no public funding from Annex - I parties received. This can be confirmed through mandate / declaration given by CPA operator to CME. In case public funding is received for CPA, an affirmation will be provided that such funding does not result in a diversion of Official Development Assistance (ODA).

SECTION B. Duration of the programme of activities

B.1. Starting date of the programme of activities:

The starting date of the PoA is 15/12/2011 (the date the PoA was published on the website of UNFCCC for Global Stakeholder Consultation).

B.2. Length of the programme of activities:

This PoA has a length of 28 years and 0 months.

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

1. Environmental Analysis is done at PoA level ☐
2. Environmental Analysis is done at CPA level √

Local and focalized impacts of each landfill gas project activity (depending on the location, size, and design) justify an LSC at CPA level.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The documentation of the analysis of environmental impacts, including trans-boundary impacts, will be conducted at CPA level.

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA),:

At the moment of writing, the Environmental Impact Assessment requirements for landfill are defined in Decree Concerning Types Of Businesses Or Activities Required To Prepare An Environmental Impact Assessment, Decree Ministry of Environmental No 11 Year 2006. APPENDIX I, List Of Activities Requiring Environmental Impact Assessment

CPAs included in this programme of activities shall comply with this or any new regulation regarding the environmental impact assessment requirements as issued by the authorities of the Republic of Indonesia at time of inclusion.

SECTION D. Stakeholders' comments

D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

1. Local stakeholder consultation is done at PoA level ☐
2. Local stakeholder consultation is done at CPA level √

Local and focalized impacts of each landfill gas project activity (depending on the location, size, and design) justify a local stakeholder consultation at CPA level.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

Not applicable, local stakeholder consultation is conducted at CPA level.

D.3. Summary of the comments received:

Not applicable, local stakeholder consultation is conducted at CPA level.

D.4. Report on how due account was taken of any comments received:

Not applicable. Local stakeholders consultation is conducted at the CPA level.

SECTION E. Application of a baseline and monitoring methodology

This section shall demonstrate the application of the baseline and monitoring methodology to a typical - CPA. The information defines the PoA specific elements that shall be included in preparing the PoA specific form used to define and include a CPA in this PoA (PoA specific CDM-CPA-DD).

E.1. Title and reference of the approved baseline and monitoring methodology applied to each CPA included in the PoA:

ACM0001: Flaring or use of landfill gas, version 12.0.0

The methodology can be viewed by accessing the following link:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

The methodology also refers to the latest approved version of the following tools:

- "Combined tool to identify the baseline scenario and demonstrate additionality"; Version 4.0.0
- "Tool to determine project emissions from flaring gases containing methane"; Version 01
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" Version 01;
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"; Version 02 Methodological tool "Emissions from solid waste disposal sites"; Version 6.0.1
- "Tool to calculate the emission factor for an electricity system" Version 02.2.1
- Tool to determine the baseline efficiency of thermal or electric energy generation systems"; Version 01
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream". Version 02.

E.2. Justification of the choice of the methodology and why it is applicable to each CPA:

The project activities in this PoA comply with the applicability conditions as stipulated in ACM0001 Version 12.0.0 as indicated in the table below.

Table E.2.1: Applicability conditions of methodology ACM0001 Version 12.0.0

Applicability Conditions	Documentation required	CPA Status
This methodology is applicable to landfill gas capture project activities, where the baseline scenario is the partial or total atmospheric release of the gas and the project activities include situations such as:		

(a) Install a new LFG capture system in a new or existing SWDS	Per eligibility criteria C of the PoA, the PoA is only open for inclusion of CPA that involves installation of a new LFG capture system at an existing landfill. The following document shall be provided: • Declaration from the CPA implementer to confirm the baseline scenario and confirmation that no law/regulation has been issued or contract has been signed that forces the entity in charge of the management of the landfill to capture, destroy or use LFG • Third party evidence on the situation that existed at the landfill site prior to implementation of the CPA. • CME assessment report of the pre-project activity situation, including existing practice of LFG recovery (if any). AND Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology.	Each CPA will install a new LFG capture system in an existing SWDS. Therefore, this condition is fulfilled.

(b) Make an investment into an existing LFG capture system to increase the recovery rate or change the use of the captured LFG, provided that: (i) The captured LFG was only vented or flared and not used prior to the implementation of the project activity; and (ii) In the case of an existing active LFG capture system for which the amount of LFG can not be collected separately from the project system after the implementation of the project activity and its efficiency is not impacted on by the project system: historical data on the amount of LFG capture and flared is available.	Not applicable since the PoA only allows CPA that install a new LFG recovery system at an existing landfill site to be included as CPA under the PoA (refer to eligibility criteria "O" of the PoA.	Not applicable. Each CPA implementer will make investment into a new LFG capture system, not an existing one.
(c) Flare the LFG and/or use the captured LFG in any (combination) of the following ways: (i) Generating electricity; (ii) Generating heat in a boiler, air heater or kiln (brick firing only); and/or (iii) Supplying the LFG to consumers through a natural gas distribution network.	Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology. • Power Purchase agreement (if available).	As per eligibility criteria, CPAs under this PoA will involve flaring and/or use of LFG for electricity generation. Therefore, this condition is fulfilled.
(d) Do not reduce the amount of organic waste that would be recycled in the absence of the project activity.	The following documents shall be provided: • CME assessment report of the pre-project activity situation.	Under a typical scenario, CPAs do not modify the waste collection/recycling patterns/rules upstream, as they simply act downstream on the landfills. So the amount of recycled organic waste, if any, is not reduced compared to

		what would be done in the absence of each CPA. Therefore, this condition is fulfilled.
ACM0001 is only applicable if the application of the procedure to identify the baseline scenario confirms that the most plausible baseline scenario is:		
(e) Partial or total release of the LFG from the SWDS; and	The following document shall be provided: • Declaration from the CPA implementer to confirm the baseline scenario and confirmation that no law/regulation has been issued or contract has been signed that forces the entity in charge of the management of the landfill to capture, destroy or use LFG • Third party evidence on the situation that existed at the landfill site prior to implementation of the CPA • Confirmation described in the CPA-DD that states that no law/regulation has been issued or contract has been signed that forces the entity in charge of the management of the landfill to capture, destroy or use LFG and a description of the baseline scenario.	In a typical CPA, LFG from the SWDS is totally released into the atmosphere. Therefore, this condition is fulfilled.
(f) In the case that the LFG is used in the project activity for generating electricity and/or generating heat in a boiler, air heat or kiln;	Any of the following documents shall be provided: • Purchase order of equipment	The LFG is used in all CPAs only for generating electricity and/or flaring. The equivalent electricity

(i) For electricity generation: that electricity would be generated in the grid or in captive fossil fuel fired power plants; and/or (ii) For heat generation: that heat would be generated using fossil fuels in on-site equipment.	• Feasibility Study / Project Proposal of the project that describes the project technology. • Power Purchase agreement (if available). • Electricity Purchase Invoice(s) • Electricity sales invoice(s)/receipts	would be generated in the grid. Electricity will not be used for captive consumption, except for the auxiliary consumption of the project activity.
ACM0001 is not applicable:		
(g) In combination with other approved methodologies. For instance ACM0001 cannot be used to claim emission reductions for the displacement of fossil fuels in a kiln, where that purpose of the CDM project activity is to implement energy efficiency measures at the kiln;	Not applicable.	Not applicable. Each CPA applies the methodology ACM0001 without combining it with other approved methodologies.
(h) If the management of the SWDS in the project activity is deliberately changed in order to increase methane generation compared to the situation prior to the implementation of the project activity (e.g. other to meet a technical or regulator requirement). For example, this may apply to the addition of liquids to a SWDS, pre-treating waste to seed it with bacteria for the purpose of increasing the anaerobic degradation environment of the SWDS or changing the shape of the SWDS to increase that methane Correction Factor.	Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology. AND: • Site visit of validation team during time of inclusion.	The management of the SWDS in each CPA shall not deliberately be changed before and after implementation of each CPA and this shall be confirmed by review of the design documentation and during the site visit of the validation team at time of inclusion of the CPA. Hence, this condition is fulfilled.

Applicability of “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01):

Table E.2.2: Tool to calculate baseline, project and/or leakage emissions from electricity consumption

Applicability Conditions	Documentation required	CPA Status
Scenario The tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: Scenario A: Electricity consumption	Any of the following documents shall be provided: • Purchase order of equipment	For a typical CPA there is no power plant existing and the equivalent electricity was purchased from the grid only.

from the grid. The electricity is purchased form the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any on-site captive power plant exists, it is not operating or it can physically not provide electricity to the source of electricity consumption. Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid. Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumption source. The captive power plant(s) can provide electricity to the electricity consumption source. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumption source can be provided with electricity from the captive power plant(s) and the grid.	• Feasibility Study / Project Proposal of the project that describes the project technology. • Third party assessment of the pre-project activity situation (e.g. document from local government, third party consultant). • Onsite assessment by validation team.	According to “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01), the project falls in Case A: Electricity consumption from the grid.
This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO2 emission.	Any of the following documents shall be provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology.	Not applicable.

Table E.2.3: Applicability of “Emissions from disposal of waste at a solid waste disposal site” (version 06.0.1):

Applicability Conditions		CPA Status
Application A: The CDM project activity mitigates methane emissions	Any of the following documents shall be	CPA under this PoA shall mitigate methane emissions

from a specific existing SWDS. Application B: The CDM project activity avoids or involves the disposal of waste at a SWDS.	provided: • Purchase order of equipment • Feasibility Study / Project Proposal of the project that describes the project technology. AND: • Third party evidence on the situation that existed at the landfill site prior to implementation of the CPA	from specific existing SWDS, hence meeting applicability of Application A of the Tool.

Table E.2.4: Applicability of "Tool to calculate the emission factor for an electricity system" Version 2.2.1:

Applicability Conditions	Documentation required	CPA Status
The tool is not applicable if the project electricity system is located partially or totally in an Annex-I country.	Any of the following documents: • (Pre) Power Purchase Agreement, • Letter from grid operator on acceptance of purchase of electricity from CPA. • Feasibility Study / • Technical Proposal of the project	The electricity generated by the CPA is only supplied to one of the grids in Indonesia (host country). The criterion is fulfilled.

Table E.2.5: Applicability of "Tool to determine project emission from flaring gases containing methane" (version 01):

Applicability Conditions	Documentation required	CPA Status
The residual gas stream to be flared contains no other combustible gases than methane, carbon monoxide and hydrogen;	Any of the following documents: • Feasibility Study / • Technical Proposal of the project	LFG does not contain any combustible gases other than methane and hydrogen.
The residual gas stream to be flared shall be obtained from decomposition of organic material (through landfills, bio-digesters or anaerobic lagoons, among others) or from gases vented in coal mines (coal mine methane and coal bed methane).	Any of the following documents: • Feasibility Study / • Technical Proposal of the project	LFG is obtained from the decomposition of organic material in landfills.

The PoA will comply with guidance given in EB 65 Annex 05 paragraph 229 a in case the applied methodology is placed on hold / withdrawn.

E.3. Description of the sources and gases included in the CPA boundary

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According to ACM0001, the project boundary is the site of the project activity where the gas is captured and destroyed/used.

If the electricity for project activity is sourced from grid or electricity generated by the LFG captured would have been generated by power generation sources connected to the grid, the project boundary shall include all the power generation sources connected to the grid to which the project activity is connected.

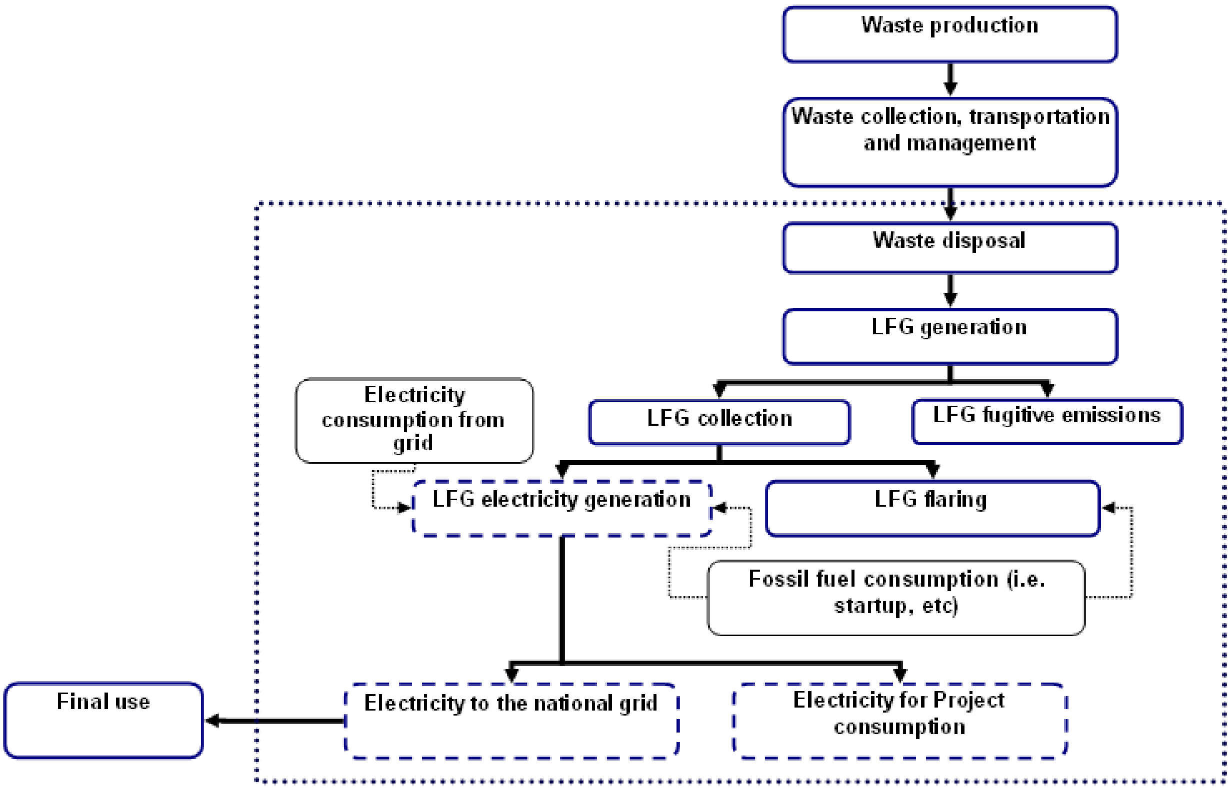

Figure E.3: Flow chart of project boundaries (staggered line indicates boundaries)

Following ACM0001, the following sources and gases are included in the CPA boundary:

	Source	Gas	Included?	Justification / Explanation
Baseline	Emissions from decomposition of waste at the SDWS site	CH_4	Yes	The major source of emissions in the baseline
		N_2O	No	N_2O emissions are small compared to CH_4 emissions from landfills. Exclusion of this gas is conservative.
		CO_2	No	CO_2 emissions from the decomposition of organic waste are not accounted
	Emissions from electricity generation	CO_2	Yes	Electricity may be consumed from the grid or generated onsite/offsite in the baseline scenario
		CH_4	No	Excluded for simplification. This is conservative.

	Source	Gas	Included?	Justification / Explanation
		N_2O	No	Excluded for simplification. This is conservative.
	Emissions from heat generation	CO_2	No	Projects that involve heat generation are not eligible for inclusion under this PoA. Hence, these emissions are not accounted for. This is conservative.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from the use of natural gas	CO_2	No	Projects that involve supply of LFG through a natural gas distribution network are not eligible for inclusion under this PoA. Hence, these emissions are not accounted for. This is conservative.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
Project Activity	Emissions from fossil fuel consumption for purposes other than electricity generation or transportation due to the project activity	CO_2	Yes	Some CPA may consume fossil fuel, e.g for operation of generators. May be an important emission source
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from electricity consumption due to the project activity	CO_2	Yes	May be an important emission source
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.

E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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Following ACM0001 version 12.0.0, the baseline scenario of the project activity is identified through the following steps of the "*Combined tool to identify the baseline scenario and demonstrate additionality*" (Version 04.0.0):

Step 0: Demonstration whether the proposed project activity is the First-of-its-kind
This step is not applied as it is assumed that none of the CPA under this PoA are first-of-its-kind.

Step 1: Identification of alternative scenarios

Step 1a. Define alternatives to the CPA:

The proposed PoA does not include any CPAs involving thermal energy generation. Hence, all the alternatives for heat generation are not included in the analysis.

Alternatives for the treatment of landfill gas in the absence of the CPA to be analysed should include, *inter alia:*

Identified alternative to the CPA	**Assessment**
LFG1. The project activity implemented without being registered as a CPA (i.e. capture and flaring or use of LFG);	This is a plausible alternative.
LFG2. Atmospheric release of the LFG or partial capture of LFG and destruction to comply with regulations or contractual requirements, or to address safety and odour concerns;	This is a plausible alternative
LFG3. LFG is partially not generated because part of the organic fraction of the solid waste is recycled and not disposed in the SWDS;	Not applicable, because each CPA will only consider existing SWDS, where the organic fraction of the solid waste is already disposed of, or planned to be disposed of (downstream of any recycling / composting / incineration activity).
LFG4. LFG is partially not generated because part of the organic fraction of the solid waste is treated aerobically and not disposed in the SWDS;	
LFG5. LFG is partially not generated because part of the organic fraction of the solid waste is incinerated and not disposed in the SWDS.	

Table E.4.1 assessment of LFG alternatives to the CPA

<u>Conclusion</u>: alternatives LFG1 and LFG2 are the possible baseline alternatives for the disposal/treatment of the LFG in the absence of each CPA.

In addition to the alternative baseline scenarios identified for the destruction of LFG, alternative scenarios for the use of LFG shall also be identified (if this is an aspect of the CPA):

(a) For electricity generation, alternative(s) shall include, *inter alia*:

Identification of alternative for electricity generation
E1: Electricity generation from LFG, undertaken without being registered as CPA project activity;
E2: Electricity generation in existing or new on-site or off-site renewable based captive power plant(s);
E3: Electricity generation in existing and/or new grid-connected power plants.

Table E.4.2 assessment of electricity generation alternatives to the CPA

The assessment of the baseline alternatives for electricity generation will be conducted at CPA level.

Identification of the baseline fuel for electricity generation by captive fossil fuel fired power plants generation

As per requirement of ACM0001 Version 12.0.0 CPA that utilize LFG for power generation shall demonstrate that the identified baseline fuel used for generation of electricity is available in abundance in the host country and there is no supply constraint. In case of partial supply constraints (seasonal supply),

the project participants shall consider the period of partial supply among potential alternative fuel(s) the one that results in the lowest baseline emissions.

Detailed justifications shall be provided and documented in the CPA-DD for the selected baseline fuel. As a conservative approach, the lowest carbon intensive fuel, such as natural gas, may be used throughout all period of the year.

Conclusion
The assessment of the baseline scenario for LFG1, LFG2 and alternatives for electricity generation will be done at the CPA level. Results of the baseline identification will be presented in each specific CPA-DD.

Sub-step 1b: Consistency with mandatory laws and regulations:
Compliance of alternatives with mandatory laws and regulations will be assessed in each specific CPA-DD.

Step 2: Barrier analysis

Step 2a: Identify barriers that would prevent the implementation of alternative scenarios.

There are no realistic and credible barriers (other than insufficient financial returns and barrier due to prevailing practice) that prevent the alternative scenarios to occur.

Outcome of Step 2a*:* No barrier (other than insufficient financial returns and barrier due to prevailing practice) is identified.

Step 2b: Eliminate alternative scenarios which are prevented by the identified barrier.

None of the scenarios is eliminated as there are no realistic and credible barriers (other than insufficient financial returns and barrier due to prevailing practice) that prevent the alternative scenarios to occur.

Outcome of Step 2b*:* the alternatives to be taken into considerations are LFG1, LFG2 and optionally alternatives E1, E2, E3.

Outcome of Step 2*:* As there are still several alternative scenarios remaining, including the proposed project activity undertaken without being registered as a CDM project activity, the investment analysis is carried out to demonstrate that the proposed CDM project activity is not financially attractive option.

Step 3: Investment analysis
In the CPA-DD, steps 1 to 3 (above) are repeated for alternatives LFG1, LFG2 and optionally alternatives E1, E2, E3.

In the Section B.3 of each CPA DD, a financial analysis with benchmark comparison is performed for all remaining alternatives, in accordance with the "Combined tool to identify the baseline scenario and demonstrate additionality". CPA are eligible for inclusion under the PoA only if the IRR or NPV without considering CDM revenue of the measure implemented as CPA is lower than the applicable sectoral benchmark. In other words, each CPA undertaken without being registered as a CDM project activity cannot be the baseline scenario (see details in Section B.3 of each CPA DD).

Step 4: Common practice analysis
Common practice analysis will be conducted at CPA-level within the below defined framework:

CPAs destroy the methane in LFG, which would be released into the atmosphere and optionally generate electricity. Therefore, the CPAs belong to the measures (b) "Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies)" and (c) "Methane destruction" defined in the latest version of the tool for the "Guidelines on Common Practice".

Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.
For scenario 1, the applicable output range shall be +/-50% of the flaring capacity of the CPA
For scenario 2, the applicable output range shall be +/-50% of the electricity generation capacity of the CPA.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project.
As per the definition of applicable geographical area, Indonesia is chosen for the common practice as a default.

In each CPA-DD a list with identified plants that deliver the same output or capacity and that started commercial operation before the start date of the project shall be provided and parameters N_{all}, N_x, N_y and N_{same} shall be determined.

Step 3: *Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.*

In each CPA-DD the factor F shall be calculated and N_{diff} shall be determined.

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

In each CPA-DD the factor F shall be calculated and $N_{all}-N_{diff}$ shall be determined.
According to the conditions listed for demonstration of common practice of the project, a project is common practice if:

(a) the factor F is greater than 0.2; and
(b) $N_{all}-N_{diff}$ is greater than 3.

Each CPA shall provide a description of the result of the common practice assessment and CPA are only eligible for inclusion when it can be demonstrated that they are not a common practice within Indonesia.

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the CPA being included as registered PoA (assessment and demonstration of additionality of CPA): >>

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The sections below explain how the projects included within the PoA will reduce GHG sources below those that would have occurred in the absence of the project.

E.5.1. Assessment and demonstration of additionality for a typical CPA:

>>
The CPA will be following "Combined tool to identify the baseline scenario and demonstrate additionality Version 04.0.0". The key steps are:

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

Sub-step 1a. Define alternatives to the CPA:
As described previously in Section E.4, baseline scenario of each CPA of the PoA includes only alternatives LFG1, LFG2, and identified plausible alternatives for electricity generation.

Sub-step 1b. Consistency with mandatory laws and regulations:
Alternatives LFG2, E2 or E3, for each CPA to be included in the proposed PoA, are in compliance with all mandatory applicable legal and regulatory requirements of Indonesia.

Step 2: Investment analysis

Sub-step 2a. Determine appropriate analysis method:
In the case of a technology scenario 1 (LFG flaring), the CPA additionality is fully justified by the fact that there is no regulation or incentive scheme in place covering the LFG mandatory management and in the absence of the CDM, there is no incentives for municipalities to invest into flaring stations. Since there are no revenues other than CDM, the simple cost analysis in this case is applicable.

In the case of the use of LFG for electricity, the project will receive proceeds from power sales as well as from emission reduction credits, so Option I - Simple Cost Analysis stated in the *Tool for the Demonstration and Assessment of Additionality* is not applicable.

Since the alternatives (LFG2, E2 or E3) to the proposed CPA are identified as the baseline scenario, accordingly, the baseline scenario, which is the continuing atmospheric release of LFG and of providing electricity by existing grid-connected power plants is not a specific investment project. Therefore, Option II – Investment Comparison Analysis is not applicable, because the alternative to the investment is not identified.

As a result, Option III – Benchmark Analysis must be used, where the project IRR (or NPV) of total investment of each CPA is to be compared to the relevant benchmark IRR (or NPV) as applicable to the specific CPA.

Technology Scenario 1: CPAs with LFG flaring only.

1. Sub-step 2b: Option I. Simple cost analysis will be applied to the CPA

Technology scenario 2: CPAs with electricity generation

1. An appropriate benchmark (Sub-step 2b);
2. The financial project returns (Sub-step 2c);
3. Sensitivity analysis (sub-step 2d).

Step 3: Barrier analysis
Since additionality is demonstrated by using step 2 of the tool, barrier analysis is not undertaken.

Step 4: Common practice analysis

Conducted to assess how well the technology for each respective CPA is established within the National MSW management sector at the time of CPA inclusion.

E.5.2. Key criteria and data for assessing additionality of a CPA:

>>
In the case of flaring only (technology scenario 1) (without electricity and/or heat production envisioned at any time), the simple cost analysis will be used. The additional investment cost of the CPA will thus justify the CPA's additionality.

In the case of electricity and/or heat generation (technology scenario 2), as stated in paragraph E.5.1 above, the IRR or NPV based benchmark analysis will be used for assessing the CPAs' additionality. The key criteria for the CPA additionality assessment will thus be the IRR or NPV evaluated on the basis of the relevant benchmark.

The criteria for assessing the additionality of each CPA shall be done as per the requirements outlined in section E.5.1 and section A.4.2.2):

Based on the above section related to additionality criteria of CPA, CME has delineated the additionality argument in this PoA DD. Subsequently CPAs of the PoA (at the time of inclusion) shall only be required to confirm that this additionality argument (as mentioned in section E.5.1, above) is valid for their CPAs by means of eligibility criteria confirmation. Hence, subsequent CPAs of the PoA would be additional if they are able to demonstrate the eligibility compliance.

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical CPA:

>>
In this PoA, emissions reductions achieved by each CPA will be calculated according the procedures described in the version 12.0.0 of approved methodology ACM0001 "Flaring or use of landfill gas" and referred tools (see Section E.1 of this PoA-DD).

Baseline Emissions
The methodology ACM0001 (Version 12.0.0) is applicable when the baseline scenario atmospheric release of the landfill gas. This condition is listed as one of the inclusion criteria for new CPA.

The ex-ante baseline emissions are calculated taking into account the amount of methane generated from the landfill, which are determined as per the Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 06.0.1), and baseline energy consumption (electricity).

The ex-post baseline emissions will be calculated based on monitoring of the amount of methane captured, flared and used for electricity generation.

Based on methodology applied, the approved methodology ACM0001 version 12.0.0, the emission reductions achieved by each CPA will be measured as the difference between the baseline emissions and sum of the project emission and leakage.

Baseline emissions

Baseline emissions associated with heat generation and natural gas usage are not included in the PoA.

Baseline emissions are determined according to equation 1 and comprise the following sources:
(A) Methane emissions from the SWDS in the absence of the project activity;
(B) Electricity generation using fossil fuels or supplied by the grid in the absence of the project activity;

$BE_y = BE_{CH4,y} + BE_{EC,y} + BE_{HG,y} + BE_{NG,y}$ ACM0001 version 12.0.0 equation **(1)**

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2e)
$BE_{CH4,y}$	=	Baseline emissions of methane from the SWDS in year *y* ($t\ CO_2e/yr$)
$BE_{EC,y}$	=	Baseline emissions associated with electricity generation in year *y* ($t\ CO_2/yr$)
$BE_{HG,y}$	=	Baseline emissions associated with heat generation in year *y* ($t\ CO_2/yr$)
$BE_{NG,y}$	=	Baseline emissions associated with natural gas use in year *y* ($t\ CO_2/yr$)

Step (A): Baseline emissions of methane from the SWDS ($BE_{CH4,y}$)

$\mathbf{BE_{CH4,y} = (1-OXt_{op\_layer}) \cdot (F_{CH4,PJ,y} - F_{CH4,BL,y}) \cdot GWP_{CH4}}$ ACM0001 version 12.0.0 equation **(2)**

Where:

$BE_{CH4,y}$	=	Baseline emissions of LFG from the SWDS in year *y* ($t\ CO_2e/yr$)
OX_{top_layer}	=	Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline (dimensionless)
$F_{CH4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used in the project activity in year *y* ($t\ CH_4/yr$)
$F_{CH4,BL,y}$	=	Amount of methane in the LFG that would be flared in the baseline in year *y* ($t\ CH_4/yr$)
GWP_{CH4}	=	Global warming potential of CH_4 ($t\ CO_2e/t\ CH_4$)

Step A.1: Ex post determination of $F_{CH4,PJ,y}$

During the crediting period, $F_{CH4,PJ,y}$ is determined as the sum of the quantities of methane flared and used in power plant(s), boiler(s), air heater(s), kiln(s) and natural gas distribution network, as follows:

$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,HG,y} + F_{CH4,NG,y}$ ACM0001 version 12.0.0 equation **(3)**

Where:

$F_{CH4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used in the project activity in year *y* ($t\ CH_4/yr$)
$F_{CH4,flared,y}$	=	Amount of methane in the LFG which is destroyed by flaring in year *y* ($t\ CH_4/yr$)
$F_{CH4,EL,y}$	=	Amount of methane in the LFG which is used for electricity generation in year *y* ($t\ CH_4/yr$)
$F_{CH4,HG,y}$	=	Amount of methane in the LFG which is used for heat generation in year *y* ($t\ CH_4/yr$)
$F_{CH4,NG,y}$	=	Amount of methane in the LFG which is sent to the natural gas distribution network in year *y* ($t\ CH_4/yr$)

Since the CPA under this PoA involve flaring and/or power generation, only $F_{CH4,flared,y}$ and $F_{CH4,EL,y}$ need to be determined.

The equation can therefore be simplified as follows:

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} \quad \textbf{(3.1)}$$

The working hours of the power plant(s), should be monitored and no emission reduction should be claimed for methane destruction during non-working hours.

$F_{CH4,EL,y}$, is determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The following requirements apply:

- The gaseous stream the tool shall be applied to is the LFG delivery pipeline to each item of electricity generation equipment *j*
- CH_4 is the greenhouse gases for which the mass flow should be determined;
- The flow of the gaseous stream should be measured on continuous basis;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 or 17 in the tool); and
- The mass flow should be summed to a yearly unit basis (t CH_4/yr).

For a typical CPA temperature of gaseous streams (T_t) of a typical CPA is lower than 333.15K (60°C) at flow measurement points. According to the measurement options in "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" Option A can be used. However, in case a CPA cannot demonstrate that the gaseous stream is dry, then the flow measurement shall be assumed to be on a wet basis and option B shall be applied (i) for the relevant time interval in which it cannot be demonstrated that the gaseous stream is dry only, or (ii) continuously.

Option	Flow of gaseous system	Volumetric fraction
A	Volume flow – dry basis	Dry or wet basis
B	Volume flow – wet basis	dry basis

Option A:
Flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. There are two ways to do this:

a) Measure the moisture content of the gaseous stream ($C_{H2O,t,db,n}$) and demonstrate that this is less or equal to 0.05 kg H_2O/m^3 dry gas; or
b) Demonstrate that the temperature of the gaseous stream (T_t) is less than 60°C (333.15 K) at the flow measurement point.

CPA under this PoA shall apply method B and demonstrate that the temperature of the gaseous stream (T_t) is less than 60°C (333.15 K) at the flow measurement point.

$$F_{i,t} = V_{t,db} \times v_{i,t,db} \times \rho_{i,t}$$ **(5)**[4]

With:

$$\rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t}$$ **(6)**[5]

$F_{i,t}$	=	Mass flow of greenhouse gas *i* in the gaseous stream in time interval *t* (kg gas/h)
$V_{t,db}$	=	Volumetric flow of the gaseous stream in time interval *t* on a dry basis (m³ dry gas/h)
$v_{i,t,db}$	=	Volumetric fraction of greenhouse gas *i* in the gaseous stream in a time interval *t* on a dry basis (m³ gas *i*/m³ dry gas)
$\rho_{i,t}$	=	Density of greenhouse gas *i* in the gaseous stream in time interval *t* (kg gas *i*/m³ gas *i*)
P_t	=	Absolute pressure of the gaseous stream in time interval *t* (Pa)
MM_i	=	Molecular mass of greenhouse gas *i* (kg/kmol)
R_u	=	Universal ideal gases constant (Pa.m^3/kmol.K)
T_t	=	Temperature of the gaseous stream in time interval *t* (K)

CH_4 is the greenhouse gases for which the mass flow should be determined; therefore $F_{i,t} = F_{CH4,t}$ and $\rho_{i,t} = \rho_{CH4,t}$

Option B:
Option B shall be applied if in a particular time interval the temperature of the LFG exceeds 60°C and therefore it cannot be demonstrated that the volumetric flow of the LFG is monitored on a dry basis.

The mass flow of the CH4 shall be determined using equations (5) and (6) above. The volumetric flow of the gaseous stream in time interval t on a dry basis ($V_{t,db}$) shall be determined by converting the measured volumetric flow from wet basis to dry basis as follows:

$$V_{t,tb} = V_{t,wb} / (1 + v_{H2O,t,db})$$ (7)

Where:

$V_{t,db}$	=	Volumetric flow of the gaseous stream in time interval *t* on a dry basis (m³ dry gas/h)
$V_{t,wb}$	=	Volumetric flow of the gaseous stream in time interval *t* on a wet basis (m³ wet gas/h)
$v_{H2O,t,db}$	=	Volumetric fraction of H_2O in the gaseous stream in time interval *t* on a dry basis (m³ H_2O/m³ dry gas)

The volumetric fraction of H2O in time interval t on a dry basis ($v_{H2O,t,db}$) is estimated according to the following equation[6]:

[4] Numbered as per Tool to determine the mass flow of a greenhouse gas in a gaseous stream

[5] Numbered as per Tool to determine the mass flow of a greenhouse gas in a gaseous stream

$$v_{H2O,t,db} = \frac{m_{H2O,t,db} * MM_{t,db}}{MM_{H2O}} \quad \textbf{(8)}$$

Where:

$v_{H2O,t,db}$ = Volumetric fraction of H_2O in the gaseous stream in time interval *t* on a dry basis (m^3 H_2O/m^3 dry gas)
$m_{H2O,t,db}$ = Absolute humidity in the gaseous stream in time interval *t* on a dry basis (kg H_2O/kg dry gas)
$MM_{t,db}$ = Molecular mass of the gaseous stream in time interval *t* on a dry basis (kg dry gas/kmol dry gas)
MM_{H2O} = Molecular mass of H_2O (kg H_2O/kmol H_2O)

The absolute humidity of the gaseous stream ($m_{H2O,t,db}$) is determined using either Option 2[7] specified below:

$$m_{H2O,t,db,Sat} = \frac{p_{H2O,t,Sat} * MM_{H2O}}{(P_t - p_{H2O,t,Sat}) * MM_{t,db}} \quad \textbf{(4)}$$

Where:

$m_{H2O,t,db,sat}$ = Saturation absolute humidity in time interval *t* on a dry basis (kg H_2O/kg dry gas)
$p_{H20,t,Sat}$ = Saturation pressure of H_2O at temperature T_t in time interval t (Pa)
T_t = Temperature of the gaseous stream in time interval *t* (K)
P_t = Absolute pressure of the gaseous stream in time interval *t* (Pa)
MM_{H2O} = Molecular mass of H_2O (kg H_2O/kmol H_2O)
$MM_{t,db}$ = Molecular mass of the gaseous stream in a time interval *t* on a dry basis (kg dry gas/kmol dry gas)

Parameter $MM_{t,db}$ is estimated using equation (3) [8]

$$MM_{t,db} = \sum_k (v_{k,t,db} * MM_k) \quad \textbf{(3)}$$

Where:

$MM_{t,db}$ = Molecular mass of the gaseous stream in time interval *t* on a dry basis (kg dry gas/kmol dry gas)
$v_{k,t,db}$ = Volumetric fraction of gas *k* in the gaseous stream in time interval *t* on a dry basis (m^3 gas k/m^3 dry gas)
MM_k = Molecular mass of gas *k* (kg/kmol)
k = All gases, except H_2O, contained in the gaseous stream (e.g. N_2, CO_2, O2, CO, H2, CH_4, N_2O, NO, NO2, SO_2, SF_6 and PFCs). See available simplification below

As a simplification, the project participants shall monitor only the volumetric fraction of CH4 , which is the only greenhouse gas in LFG that is considered in the emission reduction calculation by the

[6] Numbered as per Tool to determine the mass flow of a greenhouse gas in a gaseous stream

[7] Numbered as per Tool to determine the mass flow of a greenhouse gas in a gaseous stream

[8] Numbered as per Tool to determine the mass flow of a greenhouse gas in a gaseous stream

underlying methodology (ACM0001) and assume that the difference to 100% is pure nitrogen. This simplification is valid under ACM0001.

Amount of methane destroyed by flaring ($F_{CH4,flared,y}$)

$F_{CH4,flared,y}$ is determined as the difference between the amount of methane supplied to the flare(s) and any methane emissions from the flare(s), as follows:

$$F_{CH4,flared,y} = F_{CH4,sent\_flare,y} - \frac{PE_{flare,y}}{GWP_{CH4}}$$ ACM0001 version 12.0.0 equation **(1)**

Where:

$F_{CH4,flared,y}$	=	Amount of methane in the LFG which is destroyed by flaring in year *y* (t CH_4/yr)
$F_{CH4,sent\_flare,y}$	=	Amount of methane in the LFG which is sent to the flare in year *y* (t CH_4/yr)
$PE_{flare,y}$	=	Project emissions from flaring of the residual gas stream in year *y* (t CO_2e/yr)
GWP_{CH4}	=	Global warming potential of CH_4 (t CO_2e/t CH_4)

$F_{CH4,sent\_flare,y}$ is determined directly using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". For a typical CPA the temperature of gaseous streams (T_t) is lower than 333.15K (60°C) at flow measurement points, the equation of Option A for $F_{CH4,EL,y}$, above is used to calculate $F_{CH4,sent\_flare,y.}$ Alternatively, option B can be applied as explained above if it cannot be demonstrated that the temperature of the gaseous stream is less than 60°C.

$PE_{flare,y}$ shall be determined using the "Tool to determine project emissions from flaring gases containing methane". If LFG is flared through more than one flare, then $PE_{flare,y}$ is the sum of the emissions for each flare determined separately. The *ex post* emission reduction will be calculated as per "Tool to determine project emissions from flaring gases containing methane" by using actual monitored data.

Methane may be released as a result of incomplete combustion in the flare. To calculate project emissions from flaring of the landfill gas (PE_{flare}), the "Tool to determine project emissions from flaring gases containing methane" (version 01 approved at EB28) is applied.

Note that either an open or enclosed flare may be employed by the CPA. For determination of the flare efficiency, a default value of 50% will be used for the calculation of project emissions from flaring gases if the CPA uses an open flare and a default flare efficiency of 90% will be employed if the CPA uses an enclosed flare.

The tool specifies 7 steps for calculation.

<u>Step 1: Determination of the mass flow rate of the residual gas that is flared</u>

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas.

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas. Alternatively, the tool provides a simplified approach to only measure the volumetric fraction of methane and to consider the deference to 100% as being nitrogen. The proposed project activity adopts this simplified approach.

Step 2 is not applicable because of the simplified approach taken where only the volumetric fraction of methane is measured.

Steps 3 & 4 are only applicable if the combustion efficiency of the flare is continuously monitored and are therefore not considered.

Step 5: Determination of methane mass flow rate in the residual gas on a dry basis

The quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions (normal conditions and dry or wet basis).

$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n}$ **Eq. 13 of Flaring Tool Version 01**

Where:

Parameter	**Description**	**Unit**
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour *h*	kg/h
$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour *h*	m^3/h
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the residual gas on dry basis in hour *h*	m^3/h
$\rho_{CH4,n}$	Density of methane at normal conditions	kg/m^3

Step 6: Determination of the hourly flare efficiency

In case the project uses an open flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

• 0% if the flame is not detected for more than 20 minutes during the hour *h*.
• 50%, if the flare is detected for more than 20 minutes during the hour *h*.

In case the project uses an enclosed flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour *h* .
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h*, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour *h*.
- 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h* and the manufacturer's specifications on proper operation of the flare are met continuously during the hour *h*.

Step 7: Calculation of annual project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions from each hour *h*, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour *h* ($\rho_{flare,h}$), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times \left(1 - \eta_{flare,h}\right) \times \frac{GWP_{CH4}}{1000}$$

Eq. 15 of Flaring Tool Version 01

Where:

Parameter	**Description**	**Unit**
$PE_{flare,y}$	Project emissions from flaring of the residual gas stream in year *y*	tCO_2e/yr
$TM_{RG,h}$	Mass flow rate of the methane in the residual gas in the hour *h*	kg/h
$\eta_{flare,h}$	Flare efficiency in hour *h*	fraction

Step A.1.1: Ex ante estimation of $F_{CH4,PJ,y}$

An *ex ante* estimate of $F_{CH4,PJ,y}$ is required to estimate baseline emission of methane from the SWDS (according to equation 2) in order to estimate the emission reductions of the proposed project activity in the CDM-PDD. It is determined as follows:

$$F_{CH4,PJ,y} = \eta_{PJ} \cdot BE_{CH4,SWDS,y} / GWP_{CH4}$$

ACM0001 version 12.0.0 equation **(2)**

Where:

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (t CH_4/yr)

$BE_{CH4,SWDS,y}$ = Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* (t CO_2e/yr)

η_{PJ} = Efficiency of the LFG capture system that will be installed in the project activity

GWP_{CH4} = Global warming potential of CH_4 (t CO_2e/t CH_4)

$BE_{CH4,SWDS,y}$ is determined using the methodological tool “Emissions from solid waste disposal sites”. The following guidance should be taken into account when applying the tool:

- f_y in the tool shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for in equation 2 of this methodology;
- In the tool, x begins with the year that the SWDS started receiving wastes (e.g. the first year of SWDS operation); and
- Sampling to determine the fractions of different waste types is not necessary because the waste composition can be obtained from previous studies.

Determination of $BE_{CH4,SWDS,y}$

According to the adopted methodology, $BE_{CH4,SWDS,y}$ is determined using the tool "Emissions from solid waste disposal sites". CPAs will mitigate methane emissions by capturing and combusting the methane emitted by an existing landfill. Therefore, CPAs belong to "Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS".

The emissions are calculated as follows:

$$\left.\begin{matrix} BE_{CH4,SWDS,y} \\ PE_{CH4,SWDS,y} \\ LE_{CH4,SWDS,y} \end{matrix}\right\} = \varphi_y \cdot (1-f_y) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_{f,y} \cdot MCF_y \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot \left(1-e^{-k_j}\right) \quad \textbf{(1)}$$

$BE_{CH4,SWDS,y}$ $PE_{CH4,SWDS,y}$ $LE_{CH4,SWDS,y}$	Baseline, project or leakage methane emissions occurring in year *y* generated from waste disposal at a SWDS during a time period ending in year *y* (t CO_2e / yr)
x	Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (*x* = 1) to year *y* (*x* = *y*).
y	Year of the crediting period for which methane emissions are calculated (*y* is a consecutive period of 12 months)
$DOC_{f,y}$	Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year y (weight fraction)
$W_{j,x}$	Amount of solid waste type *j* disposed or prevented from disposal in the SWDS in the year *x* (t)
φ_y	Model correction factor to account for model uncertainties for year *y*
f_y	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year *y*
GWP_{CH4}	Global Warming Potential of methane
OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
F	Fraction of methane in the SWDS gas (volume fraction)
MCF_y	Methane correction factor for year *y*
DOC_j	Fraction of degradable organic carbon in the waste type *j* (weight fraction)
k_j	Decay rate for the waste type *j* (1 / yr)
j	Type of residual waste or types of waste in the MSW

Determining the parameters required to apply the first order decay (FOD) model

Overview of the applied parameters

Parameter	Application A
φ_y	Project or leakage emission: default values Baseline emissions: default values or project specific value estimated yearly
OX	Default value
F	Default value
$DOC_{f,y}$	Default value

MCF_y	Default value (based on SWDS type)
k_j	Default value (based on waste type)
$W_{j,x}$	Estimated once
DOC_j	Default value (based on waste type)
F_y	Estimated once

Determining the model correction factor (φ_y)

The model correction factor (φ_y) depends on the uncertainty of the parameters used in the FOD model.

As baseline emissions are being calculated, then project participants may choose between two options to calculate (φ_y). Option 1: Use a default value; Option 2: Determine φ_y based on specific situation of the project activity. Since the specific situation of each CPA cannot be identified at PoA level, Option 1 is chosen for all CPAs.

Option 1: Use a default value

Use a default value: $\varphi_y = \varphi_{default}$. Default values for different applications and climatic conditions are provided in the section “Data and parameters not monitored” below.

Determining the amounts of waste types j disposed in the SWDS ($W_{j,x}$)

The landfill provided the evaluations of total amount of solid waste disposed in every year of its lifetime and average fractions of different waste types in the waste, which are used to calculate $W_{j,x}$.

The equation of Application B is used as reference.

$$W_{j,x} = W_x \cdot p_{j,x} \qquad \textbf{(5)}$$

Where:

$W_{j,x}$	Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x (t)
W_x	Total amount of solid waste disposed or prevented from disposal in the SWDS in year *x* (t)
$p_{j,x}$	Average fraction of the waste type *j* in the waste in year *x* (weight fraction)
j	Types of solid waste
x	Years in the time period for which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y)

Step A.2: Determination of $F_{CH4,BL,y}$

This step provides a procedure to determine the amount of methane that would have been captured and destroyed (by flaring) in the baseline due to regulatory or contractual requirements, or to address safety and odour concerns (collectively referred to as *requirement* in this step). The four cases in Table 2 are distinguished. The appropriate case should be identified and the corresponding instructions followed.

Table 2: Cases for determining methane captured and destroyed in the baseline

Situation at the start of the project activity:	Requirement to destroy methane	Existing LFG capture system
Case 1	No	No
Case 2	Yes	No
Case 3	No	Yes
Case 4	Yes	Yes

As per eligibility criteria, only CPA that are implemented at facilities where there is no requirement to destroy methane and where no existing LFG capture system is present are eligible for inclusion under this PoA. Therefore:

Case 1: No requirement to destroy methane exists and no existing LFG capture system

In this situation:

$$F_{CH4,BL,y} = 0$$

Step B: Baseline emissions associated with electricity generation ($BE_{EC,y}$)

The baseline emissions associated with electricity generation in year *y* ($BE_{EC,y}$) shall be calculated using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". When applying the tool:

- The electricity sources *k* in the tool correspond to the sources of electricity generated identified in the selection of the most plausible baseline scenario; and
- $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated using LFG in year *y*.

$$BE_{EC,y} = \sum_{j} EC_{BE,k,y} \times EF_{EL,k,y} \times \left(1 + TDL_{k,y}\right)$$ **Eq. 1 of the Tool** [9]

Where:

$BE_{EC,y}$	Baseline emissions from electricity generated in year y (tCO_2e/yr)
$EC_{BE,k,y}$	Quantity of electricity consumed by the project electricity generation source k in year y (MWh/yr)
$EF_{EL,k,y}$	Emission factor for electricity generation for source k in year y (tCO_2/MWh)
$TDL_{k,y}$	Average technical transmission and distribution losses for providing electricity to source k in year y

Under scenario A of the tool, option A1 is being used to calculate the CO_2 emission factor of grid electricity. As per scenario A1, the emission factor is the combined margin emission factor of the grid, calculated as per the guidelines provided under the latest version of "Tool to calculate emission factor for an electricity emission".

[9] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

Scenario B: In case the electricity consumption is from an off-grid captive power plant: The emission factor $EF_{EL,k,y}$ is determined as zero if all equipment/devices in the project treatment facility are powered with power gained from landfill gas. Else and corresponding to option B2 offered by the tool an emission factor of 0.4 tCO_2e/MWh will be assumed.

Scenario C: In case of baseline electricity consumption from the grid and (a) fossil fuel fired captive power plant(s): The emission factor $EF_{ELk,y}$ is determined according to Scenario A, if the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant or according to Scenario B, if the project activity only affects the quantity of electricity that is supplied from the captive power plant and not the quantity of electricity that is supplied from the grid. Else, i.e. both sources are affected by the project activity, the more conservative value between Scenario A and Scenario B is determined as $EF_{EL,k,y}$. Under current conditions this is the value from Scenario B: $EF_{ELk,y} = 1.3$ tCO_2e/MWh

General: In the CPA-DD the scenario which applies to the project activity will be clearly described and relevant evidence will be provided to the DOE. In case of doubts the more conservative value among the values of Scenarios A and B shall be adopted.

In line with Scenario B, when all project equipment is powered with power from captured landfill gas this project emission source can be neglected as long as the electricity export to the grid is the net electricity export or CERs are not claimed for the electricity export.

CPAs of the PoA shall calculate the combined margin emission factor at the time of inclusion and that emission factor shall be fixed ex-ante for the CPA.

For the Average technical transmission and distribution losses for providing electricity to source j in year y ($TDL_{k,y}$), CPAs of the PoA shall consider the default value as mentioned in the tool, as a conservative and simplified approach. Specific information regarding the actual default value applied shall be defined in the specific CPA-DD of each CPA.

Step C: Baseline emissions associated with heat generation ($BE_{HG,y}$)

Baseline emissions associated with heat generation in year *y* ($BE_{HG,y}$) are not eligible for inclusion under this PoA.

Therefore, $BE_{HG,y} = 0$ t CO_2/yr.

Step D: Baseline emissions associated with natural gas use ($BE_{NG,y}$)

Baseline emissions associated with natural gas use in year ($BE_{NG,y}$) is not included under this PoA, therefore

$BE_{NG,y} = 0$ t CO_2/yr.

Project Emissions

The project emissions consist of emissions related to consumption of electricity of each CPA. Those will be calculated following the Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01) and/or the Tool to calculate project or leakage CO2 emissions from fossil fuel

combustion (Version 02). In case of flaring of LFG the project emissions related to flaring will be determined ex-post using the Tool to determine project emissions from flaring gases containing methane (Version 01).

Project emissions are calculated as follows:

$$PE_y = PE_{EC,y} + PE_{FC,y} \quad \textbf{(3)}$$

Where:

PE_y = Project emissions in year *y* (t CO_2/yr)

$PE_{EC,y}$ = Emissions from consumption of electricity due to the project activity in year *y* (t CO_2/yr)

$PE_{FC,y}$ = Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year *y* (t CO_2/yr)

Project emissions may occur due to CPA that consume electricity from the grid or due to the usage of fossil fuels (for example, in order to operate electricity generators due to grid power outages). These are accounted for using the appropriate tools, as shown below:

CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

Since fossil fuel may be consumed for the operation of diesel generators in case of grid power failure or operation of other auxiliaries, CO_2 emission from fossil fuel combustion ($PE_{FC,y}$) should be calculated using the latest approved version of the "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*" Version 02 (EB41, Annex 11), hereafter referred to as the "Fossil Fuel Tool". According to this Tool, CO_2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad \text{(Fossil Fuel Tool:1)}$$

Where

Parameter	Description	Unit
$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during year *y*	(t CO_2e/yr)
$FC_{i,j,y}$	Is the quantity of fuel type *i* combusted in process *j* during year *y*	(mass or volume unit/year)
$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *j*	(t CO_2/mass or volume unit)
i	Are the fuel types combusted in process *j* during the year *y*	

As the data on the chemical composition of the fossil fuel type *i* used by the project activity is not available. Thus, the option B of the Tool is adopted for calculation of the CO_2 emission coefficient

$COEF_{i,y}$. The $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i , as follows:

$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$ (Fossil Fuel Tool: 4)

Where:

Parameter	Description	Unit
$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *j*	(t CO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type *i* in year *j*	(GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type *i* in year *y*	(t CO_2/GJ)
I	Are the fuel types combusted in process *j* during the year *y*	

CO_2 emissions from electricity consumption by the project activity using the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

A typical CPA of the PoA will consume electricity at the project site to run various equipment. The emission on the account of electricity consumption has been designed to calculate in accordance with the "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01).

The tool is applicable if one out of the following three scenarios applies to the sources of electricity consumption:

- Scenario A: Electricity consumption from the grid
- Scenario B: Electricity consumption from (an) off grid fossil fuel fired captive power plant
- Scenario C: Electricity consumption from the grid and fossil fuel fired captive power plant.

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$$ **Eq. 1 of the Tool** [10]

Where:

$PE_{EC,y}$ Project emissions from electricity consumption in year y (tCO2e/yr)

$EC_{PJ,j,y}$ Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)

[10] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

Under scenario A of the tool, option A1 is being used to calculate the CO_2 emission factor of grid electricity. As per scenario A1, the emission factor is the combined margin emission factor of the grid, calculated as per the guidelines provided under the latest version of "Tool to calculate emission factor for an electricity emission".

Scenario B: In case the electricity consumption is from an off-grid captive power plant: The emission factor $EF_{EL,j,y}$ is determined as zero if all equipment/devices in the project treatment facility are powered with power gained from landfill gas. Else and corresponding to option B2 offered by the tool an emission factor of 0.4 tCO_2e/MWh will be assumed.

Scenario C: In case of baseline electricity consumption from the grid and (a) fossil fuel fired captive power plant(s): The emission factor $EF_{EL,j,y}$ is determined according to Scenario A, if the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant or according to Scenario B, if the project activity only affects the quantity of electricity that is supplied from the captive power plant and not the quantity of electricity that is supplied from the grid. Else, i.e. both sources are affected by the project activity, the more conservative value between Scenario A and Scenario B is determined as $EF_{EL,j,y}$. Under current conditions this is the value from Scenario B: $EF_{EL,j,y}$ = 1.3 tCO_2e/MWh

General: In the CPA-DD the scenario which applies to the project activity will be clearly described and relevant evidence will be provided to the DOE. In case of doubts the more conservative value among the values of Scenarios A and B shall be adopted.

In line with Scenario B, when all project equipment is powered with power from captured landfill gas this project emission source can be neglected as long as the electricity export to the grid is the net electricity export or CERs are not claimed for the electricity export.
CPAs of the PoA shall calculate the combined margin emission factor at the time of inclusion and that emission factor shall be fixed ex-ante for the CPA.

For the Average technical transmission and distribution losses for providing electricity to source j in year y($TDL_{j,y}$), CPAs of the PoA shall consider the default value as mentioned in the tool, as a conservative and simplified approach.

$$PE_y = PE_{EC,y} + PE_{FC,j,y} \quad \textbf{(4)}$$

Where:

$PE_{EC,y}$	=	Emissions from consumption of electricity in the project case. The project emissions from electricity consumption ($PE_{EC,y}$) will be calculated following the latest version of "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". If in the baseline a part of LFG was captured then the electricity quantity used in calculation is electricity used in project activity net of that consumed in the baseline
$PE_{FC,j,y}$	=	Emissions from consumption of heat in the project case. The project emissions

from fossil fuel combustion ($PE_{FC,j,y}$) will be calculated following the latest version of "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". For this purpose, the processes j in the tool corresponds to all fossil fuel combustion in the landfill, as well as any other on-site fuel combustion for the purposes of the project activity. If in the baseline part of a LFG was captured then the heat quantity used in calculation is fossil fuel used in project activity net of that consumed in the baseline.

Leakage
With reference to the methodology ACM0001 (Version 12.0.0) no leakage effects need to be accounted for each of the CPAs.

Emission Reduction

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad \textbf{(5)}$$

Where:
ER_y = Emission reductions in year *y* (tCO_2e/yr)
BE_y = Baseline emissions in year *y* (tCO2e/yr)
PE_y = Project emissions in year *y* (tCO_2/yr)

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a CPA:

>>

Baseline emissions

Baseline emissions associated with heat generation and natural gas usage are not included in the PoA.

Baseline emissions are determined according to equation 1 and comprise the following sources:
(A) Methane emissions from the SWDS in the absence of the project activity;
(B) Electricity generation using fossil fuels or supplied by the grid in the absence of the project activity;

$BE_y = BE_{CH4,y} + BE_{EC,y} + BE_{HG,y} + BE_{NG,y}$ ACM0001 version 12.0.0 equation **(1)**

Where:

Parameter	**Explanation / Source**	**Value**	**Unit**
BE_y	Baseline emissions in year *y*	[Value]	tCO_2e
$BE_{CH4,y}$	Baseline emissions of methane from the SWDS in year *y*	[Value]	tCO_2e
$BE_{EC,y}$	Baseline emissions associated with electricity generation in year *y*	[Value]	tCO_2e
$BE_{HG,y}$	Baseline emissions associated with heat generation and natural gas usage are not included in the PoA. Hence, this parameter is not calculated and the value is 0 for each CPA.	0	tCO_2e
$BE_{NG,y}$	Baseline emissions associated with heat generation and natural gas usage are not included in the PoA. Hence, this parameter	0	tCO_2e

	is not calculated and the value is 0 for each CPA.		

[insert additional comment / information / table (if any) here]

Step (A): Baseline emissions of methane from the SWDS ($BE_{CH4,y}$)

$$\mathbf{BE_{CH4,y} = (1\text{-}OXt_{op\_layer}) \cdot (F_{CH4,PJ,y} - F_{CH4,BL,y}) \cdot GWP_{CH4}}$$ ACM0001 version 12.0.0 equation **(2)**

Where:

Parameter	Explanation / Source	Value	Unit
$BE_{CH4,y}$	Baseline emissions of LFG from the SWDS in year *y*	[Value]	t CO_2e/yr
OX_{top_layer}	Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline	[Value]	dimensionless
$F_{CH4,PJ,y}$	Amount of methane in the LFG which is flared and/or used in the project activity in year *y*	[Value]	t CH_4/yr
$F_{CH4,BL,y}$	Amount of methane in the LFG that would be flared in the baseline in year *y*	[Value]	t CH_4/yr
GWP_{CH4}	Global warming potential of CH_4	[Value]	t CO_2e/t CH_4

[insert additional comment / information / table (if any) here]

Step A.1: Ex post determination of $F_{CH4,PJ,y}$

During the crediting period, $F_{CH4,PJ,y}$ is determined as the sum of the quantities of methane flared and used in power plant(s), boiler(s), air heater(s), kiln(s) and natural gas distribution network, as follows:

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,HG,y} + F_{CH4,NG,y}$$ ACM0001 version 12.0.0 equation **(3)**

Where:

Parameter	Explanation / Source	Value	Unit
$F_{CH4,PJ,y}$	Amount of methane in the LFG which is flared and/or used in the project activity in year *y*	[Value]	(t CH_4/yr)
$F_{CH4,flared,y}$	Amount of methane in the LFG which is destroyed by flaring in year *y*	[Value]	(t CH_4/yr)
$F_{CH4,EL,y}$	Amount of methane in the LFG which is used for electricity generation in year *y*	[Value]	(t CH_4/yr)
$F_{CH4,HG,y}$	Amount of methane in the LFG which is used for heat generation in year *y*	0	t CH_4/yr
$F_{CH4,NG,y}$	Amount of methane in the LFG which is sent to the natural gas distribution network in year *y*	0	t CH_4/yr

[insert additional comment / information / table (if any) here]

Since the CPA under this PoA involve flaring and/or power generation, only $F_{CH4,flared,y}$ and $F_{CH4,EL,y}$ need to be determined.

The equation can therefore be simplified as follows:

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y}$$ **(3.1)**

The working hours of the power plant(s), should be monitored and no emission reduction should be claimed for methane destruction during non-working hours.

$F_{CH4,EL,y}$, is determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The following requirements apply:

- The gaseous stream the tool shall be applied to is the LFG delivery pipeline to each item of electricity generation equipment *j*
- CH_4 is the greenhouse gases for which the mass flow should be determined;
- The flow of the gaseous stream should be measured on continuous basis;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 or 17 in the tool); and
- The mass flow should be summed to a yearly unit basis (t CH_4/yr).

For a typical CPA temperature of gaseous streams (T_t) of a typical CPA is lower than 333.15K (60°C) at flow measurement points. According to the measurement options in "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" Option A can be used. However, in case a CPA cannot demonstrate that the gaseous stream is dry, then the flow measurement shall be assumed to be on a wet basis and option B shall be applied (i) for the relevant time interval in which it cannot be demonstrated that the gaseous stream is dry only, or (ii) continuously.

Option	Flow of gaseous system	Volumetric fraction
A	Volume flow – dry basis	Dry or wet basis
B	Volume flow – wet basis	dry basis

Option A:
Flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. There are two ways to do this:

a) Measure the moisture content of the gaseous stream ( ) and demonstrate that this is less or equal to 0.05 kg H_2O/m^3 dry gas; or
b) Demonstrate that the temperature of the gaseous stream (T_t) is less than 60°C (333.15 K) at the flow measurement point.

CPA under this PoA shall apply method B and demonstrate that the temperature of the gaseous stream (T_t) is less than 60°C (333.15 K) at the flow measurement point.

$$F_{i,t} = V_{t,db} \times v_{i,t,db} \times \rho_{i,t} \quad \textbf{(5)}^{11}$$

[11] Numbered as per Tool to determine the mass flow of a greenhouse gas in a gaseous stream

With:

$$\rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t}$$ **(6)**[12]

Parameter	Explanation / Source	Value	Unit
$F_{i,t}$	Mass flow of greenhouse gas *i* in the gaseous stream in time interval *t*	[Value]	kg gas/h
$V_{t,db}$	Volumetric flow of the gaseous stream in time interval *t* on a dry basis	[Value]	m³ dry gas/h
$v_{i,t,db}$	Volumetric fraction of greenhouse gas *i* in the gaseous stream in a time interval *t* on a dry basis	[Value]	m³ gas *i*/m³ dry gas
$\rho_{i,t}$	Density of greenhouse gas *i* in the gaseous stream in time interval *t*	[Value]	kg gas *i*/m³ gas *i*
P_t	Absolute pressure of the gaseous stream in time interval *t*	[Value]	Pa
MM_i	Molecular mas s of greenhouse gas *i*	[Value]	kg/kmol
R_u	Universal ideal gases constant	[Value]	$Pa.m^3/kmol.K$
T_t	Temperature of the gaseous stream in time interval *t*	[Value]	K

CH_4 is the greenhouse gases for which the mass flow should be determined; therefore $F_{i,t} = F_{CH4,t}$ and $\rho_{i,t} = \rho_{CH4,t}$

[insert additional comment / information / table (if any) here]

Option B:
Option B shall be applied if in a particular time interval the temperature of the LFG exceeds 60°C and therefore it cannot be demonstrated that the volumetric flow of the LFG is monitored on a dry basis.

The mass flow of the CH4 shall be determined using equations (5) and (6) above. The volumetric flow of the gaseous stream in time interval t on a dry basis ($V_{t,db}$) shall be determined by converting the measured volumetric flow from wet basis to dry basis as follows:

$$V_{t,tb} = V_{t,wb} / (1 + v_{H2O,t,db}) \quad (7)$$

Where:

Parameter	Explanation / Source	Value	Unit
$V_{t,db}$	Volumetric flow of the gaseous stream in time interval *t* on a dry basis	[Value]	m³ dry gas/h
$V_{t,wb}$	Volumetric flow of the gaseous stream in time interval *t* on a wet basis	[Value]	(m³ wet gas/h)
$v_{H2O,t,db}$	Volumetric fraction of H_2O in the gaseous stream in time interval *t* on a dry basis	[Value]	(m³ H_2O/m³ dry gas)

[12] Numbered as per Tool to determine the mass flow of a greenhouse gas in a gaseous stream

[insert additional comment / information / table (if any) here]

The volumetric fraction of H2O in time interval t on a dry basis ($v_{H2O,t,db}$) is estimated according to the following equation[13]:

$$v_{H2O,t,db} = \frac{m_{H2O,t,db} * MM_{t,db}}{MM_{H2O}} \quad \textbf{(8)}$$

Where:

Parameter	Explanation / Source	Value	Unit
$v_{H2O,t,db}$	Volumetric fraction of H_2O in the gaseous stream in time interval *t* on a dry basis	[Value]	(m^3 H_2O/m^3 dry gas)
$m_{H2O,t,db}$	Absolute humidity in the gaseous stream in time interval *t* on a dry basis	[Value]	(kg H_2O/kg dry gas)
$MM_{t,db}$	Molecular mass of the gaseous stream in time interval *t* on a dry basis	[Value]	(kg dry gas/kmol dry gas)
MM_{H2O}	Molecular mass of H_2O	[Value]	(kg H_2O/kmol H_2O)

[insert additional comment / information / table (if any) here]

The absolute humidity of the gaseous stream ($m_{H2O,t,db}$) is determined using either Option 2[14] specified below:

$$m_{H2O,t,db,Sat} = \frac{p_{H2O,t,Sat} * MM_{H2O}}{(P_t - p_{H2O,t,Sat}) * MM_{t,db}} \quad \textbf{(4)}$$

Where:

Parameter	Explanation / Source	Value	Unit
$m_{H2O,t,db,sat}$	Saturation absolute humidity in time interval *t* on a dry basis	[Value]	(kg H_2O/kg dry gas)
$p_{H20,t,Sat}$	Saturation pressure of H_2O at temperature T_t in time interval t	[Value]	(Pa)
T_t	Temperature of the gaseous stream in time interval *t*	[Value]	(K)
P_t	Absolute pressure of the gaseous stream in time interval *t*	[Value]	(Pa)
MM_{H2O}	Molecular mass of H_2O	[Value]	(kg H_2O/kmol H_2O)
$MM_{t,db}$	Molecular mass of the gaseous stream in a time interval *t* on a dry basis	[Value]	(kg dry gas/kmol dry gas)

[13] Numbered as per Tool to determine the mass flow of a greenhouse gas in a gaseous stream

[14] Numbered as per Tool to determine the mass flow of a greenhouse gas in a gaseous stream

Parameter $MM_{t,db}$ is estimated using equation (3) [15]

$$MM_{t,db} = \sum_{k} (v_{k,t,db} * MM_k) \quad \textbf{(3)}$$

Where:

Parameter	Explanation / Source	Value	Unit
$MM_{t,db}$	Molecular mass of the gaseous stream in time interval *t* on a dry basis	[Value]	(kg dry gas/kmol dry gas)
$v_{k,t,db}$	Volumetric fraction of gas *k* in the gaseous stream in time interval *t* on a dry basis	[Value]	(m^3 gas k/m^3 dry gas)
MM_k	Molecular mass of gas *k*	[Value]	(kg/kmol)
k	All gases, except H_2O, contained in the gaseous stream See available simplification below	[Value]	(e.g. N_2, CO_2, O2, CO, H2, CH_4, N_2O, NO, NO2, SO_2, SF_6 and PFCs).

[insert additional comment / information / table (if any) here]

As a simplification, the project participants shall monitor only the volumetric fraction of CH4 , which is the only greenhouse gas in LFG that is considered in the emission reduction calculation by the underlying methodology (ACM0001) and assume that the difference to 100% is pure nitrogen. This simplification is valid under ACM0001.

Amount of methane destroyed by flaring ($F_{CH4,flared,y}$)

$F_{CH4,flared,y}$ is determined as the difference between the amount of methane supplied to the flare(s) and any methane emissions from the flare(s), as follows:

$$F_{CH4,flared,y} = F_{CH4,sent\_flare,y} - \frac{PE_{flare,y}}{GWP_{CH4}}$$

ACM0001 version 12.0.0 equation **(12)**

Where:

Parameter	Explanation / Source	Value	Unit
$F_{CH4,flared,y}$	Amount of methane in the LFG which is destroyed by flaring in year *y*	[Value]	t CH_4/yr
$F_{CH4,sent\_flare,y}$	Amount of methane in the LFG which is sent to the flare in year *y*	[Value]	t CH_4/yr
$PE_{flare,y}$	Project emissions from flaring of the residual gas stream in year *y*	[Value]	t CO_2e/yr
GWP_{CH4}	Global warming potential of CH_4	[Value]	t CO_2e/t CH_4

$F_{CH4,sent\_flare,y}$ is determined directly using the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. For a typical CPA the temperature of gaseous streams (T_t) is lower than 333.15K (60°C) at flow measurement points, the equation of Option A for $F_{CH4,EL,y}$, above is used to calculate $F_{CH4,sent\_flare,y}$. Alternatively, option B can be applied as explained above if it cannot be demonstrated that the temperature of the gaseous stream is less than 60°C.

[15] Numbered as per Tool to determine the mass flow of a greenhouse gas in a gaseous stream

$PE_{flare,y}$ shall be determined using the "Tool to determine project emissions from flaring gases containing methane". If LFG is flared through more than one flare, then $PE_{flare,y}$ is the sum of the emissions for each flare determined separately. The *ex post* emission reduction will be calculated as per "Tool to determine project emissions from flaring gases containing methane" by using actual monitored data.

Methane may be released as a result of incomplete combustion in the flare. To calculate project emissions from flaring of the landfill gas (PE_{flare}), the "Tool to determine project emissions from flaring gases containing methane" (version 01 approved at EB28) is applied.

Note that either an open or enclosed flare may be employed by the CPA. For determination of the flare efficiency, a default value of 50% will be used for the calculation of project emissions from flaring gases if the CPA uses an open flare and a default flare efficiency of 90% will be employed if the CPA uses an enclosed flare.

The tool specifies 7 steps for calculation.

Step 1: Determination of the mass flow rate of the residual gas that is flared

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas.

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas. Alternatively, the tool provides a simplified approach to only measure the volumetric fraction of methane and to consider the deference to 100% as being nitrogen. The proposed project activity adopts this simplified approach.

Step 2 is not applicable because of the simplified approach taken where only the volumetric fraction of methane is measured.

Steps 3 & 4 are only applicable if the combustion efficiency of the flare is continuously monitored and are therefore not considered.

Step 5: Determination of methane mass flow rate in the residual gas on a dry basis

The quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions (normal conditions and dry or wet basis).

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n}$$ **Eq. 13 of Flaring Tool Version 01**

Where:

Parameter	Explanation / Source	Value	Unit
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour *h*	[Value]	kg/h

$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour *h*	[Value]	m^3/h
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the residual gas on dry basis in hour *h*	[Value]	m^3/h
$\rho_{CH4,n}$	Density of methane at normal conditions	[Value]	kg/m^3

Step 6: Determination of the hourly flare efficiency

In case the project uses an open flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the flame is not detected for more than 20 minutes during the hour *h*.
- 50%, if the flare is detected for more than 20 minutes during the hour *h*.

In case the project uses an enclosed flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour *h* .
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h*, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour *h*.
- 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h* and the manufacturer's specifications on proper operation of the flare are met continuously during the hour *h*.

[insert additional comment / information / table (if any) here]

Step 7: Calculation of annual project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions from each hour *h*, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour *h* ($\rho_{flare,h}$), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times \left(1-\eta_{flare,h}\right) \times \frac{GWP_{CH4}}{1000}$$

Eq. 15 of Flaring Tool Version 01

Where:

Parameter	Explanation / Source	Value	Unit
$PE_{flare,y}$	Project emissions from flaring of the residual gas stream in year *y*	[Value]	tCO_2e/yr
$TM_{RG,h}$	Mass flow rate of the methane in the residual gas in the hour *h*	[Value]	kg/h
$\eta_{flare,h}$	Flare efficiency in hour *h*	[Value]	fraction

[insert additional comment / information / table (if any) here]

Step A.1.1: Ex ante estimation of $F_{CH4,PJ,y}$

An *ex ante* estimate of $F_{CH4,PJ,y}$ is required to estimate baseline emission of methane from the SWDS (according to equation 2) in order to estimate the emission reductions of the proposed project activity in the CDM-PDD. It is determined as follows:

$$F_{CH4,PJ,y} = \eta_{PJ} \cdot BE_{CH4,SWDS,y} / GWP_{CH4}$$ ACM0001 version 12.0.0 equation **(5)**

Where:

$F_{CH4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (t CH_4/yr)
$BE_{CH4,SWDS,y}$	=	Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* (t CO_2e/yr)
η_{PJ}	=	Efficiency of the LFG capture system that will be installed in the project activity
GWP_{CH4}	=	Global warming potential of CH_4 (t CO_2e/t CH_4)

$BE_{CH4,SWDS,y}$ is determined using the methodological tool "Emissions from solid waste disposal sites". The following guidance should be taken into account when applying the tool:

- f_y in the tool shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for in equation 2 of this methodology;
- In the tool, x begins with the year that the SWDS started receiving wastes (e.g. the first year of SWDS operation); and
- Sampling to determine the fractions of different waste types is not necessary because the waste composition can be obtained from previous studies.

Determination of $BE_{CH4,SWDS,y}$

According to the adopted methodology, $BE_{CH4,SWDS,y}$ is determined using the tool "Emissions from solid waste disposal sites". CPAs will mitigate methane emissions by capturing and combusting the methane emitted by an existing landfill. Therefore, CPAs belong to "Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS".

The emissions are calculated as follows:

$$\left.\begin{array}{l} BE_{CH4,SWDS,y} \\ PE_{CH4,SWDS,y} \\ LE_{CH4,SWDS,y} \end{array}\right\} = \varphi_y \cdot (1 - f_y) \cdot GWP_{CH4} \cdot (1 - OX) \cdot \frac{16}{12} \cdot F \cdot DOC_{f,y} \cdot MCF_y \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot (1 - e^{-k_j})$$

(1)

Parameter	Explanation / Source	Value	Unit
$BE_{CH4,SWDS,y}$	Baseline, project or leakage methane emissions	[Value]	tCO_2e/yr

$PE_{CH4,SWDS,y}$ $LE_{CH4,SWDS,y}$	occurring in year *y* generated from waste disposal at a SWDS during a time period ending in year *y*		
x	Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (*x* = 1) to year *y* (*x* = *y*).	[Value]	[Value]
y	Year of the crediting period for which methane emissions are calculated (*y* is a consecutive period of 12 months)	[Value]	year
$DOC_{f,y}$	Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year y (weight fraction)	[Value]	[Value]
$W_{j,x}$	Amount of solid waste type *j* disposed or prevented from disposal in the SWDS in the year *x* (t)	[Value]	t
φ_y	Model correction factor to account for model uncertainties for year *y*	[Value]	fraction
f_y	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year *y*	[Value]	fraction
GWP_{CH4}	Global Warming Potential of methane	[Value]	--
OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)	[Value]	fraction
F	Fraction of methane in the SWDS gas (volume fraction)	[Value]	fraction
MCF_y	Methane correction factor for year *y*	[Value]	fraction
DOC_j	Fraction of degradable organic carbon in the waste type *j* (weight fraction)	[Value]	[Value]
k_j	Decay rate for the waste type *j* (1 / yr)	[Value]	[Value]
j	Type of residual waste or types of waste in the MSW	[Value]	[Value]

[insert additional comment / information / table (if any) here]

Determining the parameters required to apply the first order decay (FOD) model

Overview of the applied parameters

Parameter	**Explanation / Source**	**Value**	**Unit**
φ_y	Project or leakage emission: default values Baseline emissions: default values or project specific	[Value]	[Value]
OX	Default value	[Value]	[Value]
F	Default value	[Value]	[Value]
$DOC_{f,y}$	Default value	[Value]	[Value]
MCF_y	Default value (based on SWDS type)	[Value]	[Value]
k_j	Default value (based on waste type)	[Value]	[Value]
$W_{j,x}$	Estimated once	[Value]	[Value]
DOC_j	Default value (based on waste type)	[Value]	[Value]
F_y	Estimated once	[Value]	[Value]

[insert additional comment / information / table (if any) here]

Determining the model correction factor (φ_y)

The model correction factor (φ_y) depends on the uncertainty of the parameters used in the FOD model.

As baseline emissions are being calculated, then project participants may choose between two options to calculate (φ_y). Option 1: Use a default value; Option 2: Determine φ_y based on specific situation of the project activity. Since the specific situation of each CPA cannot be identified at PoA level, Option 1 is chosen for all CPAs.

Option 1: Use a default value

Use a default value: $\varphi_y = \varphi_{default}$. Default values for different applications and climatic conditions are provided in the section "Data and parameters not monitored" below.

Determining the amounts of waste types j disposed in the SWDS ($W_{j,x}$)

The landfill provided the evaluations of total amount of solid waste disposed in every year of its lifetime and average fractions of different waste types in the waste, which are used to calculate $W_{j,x}$.

The equation of Application B is used as reference.

$$W_{j,x} = W_x \cdot p_{j,x} \quad \textbf{(5)}$$

Where:

Parameter	Explanation / Source	Value	Unit
$W_{j,x}$	Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x (t)	[Value]	[Value]
W_x	Total amount of solid waste disposed or prevented from disposal in the SWDS in year *x* (t)	[Value]	[Value]
$p_{j,x}$	Average fraction of the waste type *j* in the waste in year *x* (weight fraction)	[Value]	[Value]
j	Types of solid waste	[Value]	[Value]
x	Years in the time period for which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y)	[Value]	[Value]

[insert additional comment / information / table (if any) here]

Step A.2: Determination of $F_{CH4,BL,y}$

This step provides a procedure to determine the amount of methane that would have been captured and destroyed (by flaring) in the baseline due to regulatory or contractual requirements, or to address safety

and odour concerns (collectively referred to as *requirement* in this step). The four cases in Table 2 are distinguished. The appropriate case should be identified and the corresponding instructions followed.

Table 2: Cases for determining methane captured and destroyed in the baseline

Situation at the start of the project activity:	Requirement to destroy methane	Existing LFG capture system
Case 1	No	No
Case 2	Yes	No
Case 3	No	Yes
Case 4	Yes	Yes

As per eligibility criteria, only CPA that are implemented at facilities where there is no requirement to destroy methane and where no existing LFG capture system is present are eligible for inclusion under this PoA. Therefore:

Case 1: No requirement to destroy methane exists and no existing LFG capture system

In this situation:

$$F_{CH4,BL,y} = 0$$

Step B: Baseline emissions associated with electricity generation ($BE_{EC,y}$)

The baseline emissions associated with electricity generation in year *y* ($BE_{EC,y}$) shall be calculated using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". When applying the tool:

- The electricity sources *k* in the tool correspond to the sources of electricity generated identified in the selection of the most plausible baseline scenario; and
- $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated using LFG in year *y*.

$$BE_{EC,y} = \sum_{j} EC_{BE,k,y} \times EF_{EL,k,y} \times \left(1 + TDL_{k,y}\right)$$ **Eq. 1 of the Tool** [16]

Where:

Parameter	Explanation / Source	Value	Unit
$BE_{EC,y}$	Baseline emissions from electricity generation in year y (tCO_2e/yr)	[Value]	tCO_2e/yr
$EC_{BE,k,y}$	Quantity of electricity generated by the project electricity consumption source k in year y (MWh/yr)	[Value]	MWh/yr
$EF_{EL,k,y}$	Emission factor for electricity generation for source k in year y (tCO_2/MWh)	[Value]	tCO_2/MWh

[16] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

$TDL_{k,y}$	Average technical transmission and distribution losses for providing electricity to source k in year y	[Value]	fraction

Under scenario A of the tool, option A1 is being used to calculate the CO_2 emission factor of grid electricity. As per scenario A1, the emission factor is the combined margin emission factor of the grid, calculated as per the guidelines provided under the latest version of "Tool to calculate emission factor for an electricity emission".

Scenario B: In case the electricity consumption is from an off-grid captive power plant: The emission factor $EF_{EL,k,y}$ is determined as zero if all equipment/devices in the project treatment facility are powered with power gained from landfill gas. Else and corresponding to option B2 offered by the tool an emission factor of 0.4 tCO_2e/MWh will be assumed.

Scenario C: In case of baseline electricity consumption from the grid and (a) fossil fuel fired captive power plant(s): The emission factor $EF_{ELk,y}$ is determined according to Scenario A, if the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant or according to Scenario B, if the project activity only affects the quantity of electricity that is supplied from the captive power plant and not the quantity of electricity that is supplied from the grid. Else, i.e. both sources are affected by the project activity, the more conservative value between Scenario A and Scenario B is determined as $EF_{EL,k,y}$. Under current conditions this is the value from Scenario B: $EF_{ELk,y}$ = 1.3 tCO_2e/MWh

General: In the CPA-DD the scenario which applies to the project activity will be clearly described and relevant evidence will be provided to the DOE. In case of doubts the more conservative value among the values of Scenarios A and B shall be adopted.

In line with Scenario B, when all project equipment is powered with power from captured landfill gas this project emission source can be neglected as long as the electricity export to the grid is the net electricity export or CERs are not claimed for the electricity export.

CPAs of the PoA shall calculate the combined margin emission factor at the time of inclusion and that emission factor shall be fixed ex-ante for the CPA.

For the Average technical transmission and distribution losses for providing electricity to source j in year y ($TDL_{k,y}$), CPAs of the PoA shall consider the default value as mentioned in the tool, as a conservative and simplified approach.

Step C: Baseline emissions associated with heat generation ($BE_{HG,y}$)

Baseline emissions associated with heat generation in year *y* ($BE_{HG,y}$) are not eligible for inclusion under this PoA.

Therefore, $BE_{HG,y}$ = 0 t CO_2/yr.

Step D: Baseline emissions associated with natural gas use ($BE_{NG,y}$)

Baseline emissions associated with natural gas use in year ($BE_{NG,y}$) is not included under this PoA, therefore

$BE_{NG,y}$ = 0 t CO_2/yr.

Project Emissions

The project emissions consist of emissions related to consumption of electricity of each CPA. Those will be calculated following the Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01) and/or the Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 02). In case of flaring of LFG the project emissions related to flaring will be determined ex-post using the Tool to determine project emissions from flaring gases containing methane (Version 01).

Project emissions are calculated as follows:

$$PE_y = PE_{EC,y} + PE_{FC,y}$$ ACM0001 version 12.0.0 equation **(21)**

Where:

Parameter	Explanation / Source	Value	Unit
PE_y	Project emissions in year *y* (t CO_2/yr)	[Value]	[Value]
$PE_{EC,y}$	Emissions from consumption of electricity due to the project activity in year *y* (t CO_2/yr)	[Value]	[Value]
$PE_{FC,y}$	Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year *y* (t CO_2/yr)	[Value]	[Value]

Project emissions may occur due to CPA that consumes electricity from the grid or due to the usage of fossil fuels (for example, in order to operate electricity generators due to grid power outages). These are accounted for using the appropriate tools, as shown below:

CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

Since fossil fuel may be consumed for the operation of diesel generators in case of grid power failure or operation of other auxiliaries, CO_2 emission from fossil fuel combustion ($PE_{FC,y}$) should be calculated using the latest approved version of the "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*" Version 02 (EB41, Annex 11), hereafter referred to as the "Fossil Fuel Tool". According to this Tool, CO_2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$ (Fossil Fuel Tool:1)

Where

Parameter	Explanation / Source	Value	Unit

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during year *y*	[Value]	(t CO_2e/yr)
$FC_{i,j,y}$	Is the quantity of fuel type *i* combusted in process *j* during year *y*	[Value]	(mass or volume unit/year)
$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *j*	[Value]	(t CO_2/mass or volume unit)
i	Are the fuel types combusted in process *j* during the year *y*	[Value]	[Value]

[insert additional comment / information / table (if any) here]

As the data on the chemical composition of the fossil fuel type *i* used by the project activity is not available. Thus, the option B of the Tool is adopted for calculation of the CO_2 emission coefficient $COEF_{i,y}$. The $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i* , as follows:

$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$ (Fossil Fuel Tool: 4)

Where:

Parameter	**Explanation / Source**	**Value**	**Unit**
$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *j*	[Value]	(t CO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type *i* in year *j*	[Value]	(GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type *i* in year *y*	[Value]	(t CO_2/GJ)
I	Are the fuel types combusted in process *j* during the year *y*	[Value]	[Value]

CO_2 emissions from electricity consumption by the project activity using the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

A typical CPA of the PoA will consume electricity at the project site to run various equipment. The emission on the account of electricity consumption has been designed to calculate in accordance with the "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01).

[insert additional comment / information / table (if any) here]

The tool is applicable if one out of the following three scenarios applies to the sources of electricity consumption:

- Scenario A: Electricity consumption from the grid

- Scenario B: Electricity consumption from (an) off grid fossil fuel fired captive power plant
- Scenario C: Electricity consumption from the grid and fossil fuel fired captive power plant.

$PE_{EC,y} = \sum_{j} EC_{PJ,j,y} \times EF_{EL,j,y} \times \left(1 + TDL_{j,y}\right)$ **Eq. 1 of the Tool**[17]

Where:

Parameter	Explanation / Source	Value	Unit
$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO2e/yr)	[Value]	[Value]
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)	[Value]	[Value]
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)	[Value]	[Value]
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y	[Value]	[Value]

Under scenario A of the tool, option A1 is being used to calculate the CO_2 emission factor of grid electricity. As per scenario A1, the emission factor is the combined margin emission factor of the grid, calculated as per the guidelines provided under the latest version of "Tool to calculate emission factor for an electricity emission".

Scenario B: In case the electricity consumption is from an off-grid captive power plant: The emission factor $EF_{EL,j,y}$ is determined as zero if all equipment/devices in the project treatment facility are powered with power gained from landfill gas. Else and corresponding to option B2 offered by the tool an emission factor of 0.4 tCO_2e/MWh will be assumed.

Scenario C: In case of baseline electricity consumption from the grid and (a) fossil fuel fired captive power plant(s): The emission factor $EF_{EL,j,y}$ is determined according to Scenario A, if the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant or according to Scenario B, if the project activity only affects the quantity of electricity that is supplied from the captive power plant and not the quantity of electricity that is supplied from the grid. Else, i.e. both sources are affected by the project activity, the more conservative value between Scenario A and Scenario B is determined as $EF_{EL,j,y}$. Under current conditions this is the value from Scenario B: $EF_{EL,j,y}$ = 1.3 tCO_2e/MWh

General: In the CPA-DD the scenario which applies to the project activity will be clearly described and relevant evidence will be provided to the DOE. In case of doubts the more conservative value among the values of Scenarios A and B shall be adopted.

[17] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

In line with Scenario B, when all project equipment is powered with power from captured landfill gas this project emission source can be neglected as long as the electricity export to the grid is the net electricity export or CERs are not claimed for the electricity export.
CPAs of the PoA shall calculate the combined margin emission factor at the time of inclusion and that emission factor shall be fixed ex-ante for the CPA.

For the Average technical transmission and distribution losses for providing electricity to source j in year y($TDL_{j,y}$), CPAs of the PoA shall consider the default value as mentioned in the tool, as a conservative and simplified approach.

Leakage
With reference to the methodology ACM0001 (Version 12.0.0) no leakage effects need to be accounted for each of the CPAs.

Emission Reduction

[insert additional comment / information / table (if any) here]

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$ ACM0001 version 12.0.0 equation **(22)**

Where:

Parameter	Explanation / Source	Value	Unit
ER_y	Emission reductions in year *y* (tCO_2e/yr)	[Value]	tCO2e/yr
BE_y	Baseline emissions in year *y* (tCO2e/yr)	[Value]	tCO2e/yr
PE_y	Project emissions in year *y* (tCO_2/yr)	[Value]	tCO2e/yr

[insert additional comment / information / table (if any) here]

E.6.3. Data and parameters that are to be reported in CDM-CPA-DD form:

The following data and parameters are defined in ACM0001 version 12 and are available at validation:

Data / Parameter:	OX_{top_layer}
Data unit:	Dimensionless
Description:	Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
Source of data used:	*Default value as per ACM0001 (ver. 12.0.0), "Emissions from solid waste disposal sites" (version 6.0.1)*
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Applicable to Step A.*
Any comment:	*Applicable to Step A of approved methodology ACM0001 (ver. 12.0.0), ex ante estimation of BECH4,SWDS,y in accordance with "Emissions from solid waste disposal sites" (version 6.0.1).*

Data / Parameter:	D_{CH4}
Data unit:	tCH_4/m^3CH_4
Source of data used:	Methane density
Value applied:	"Tool to determine project emissions from flaring gases containing methane". Version 1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	0.0007168
Any comment:	At standard T and P (0 degrees C and 1,013 bar)

Data / Parameter:	**f**
Data unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data used:	According to the "Emissions from solid waste disposal sites" –Version 6.0.1
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	All the methane generated was directly vented to the atmosphere prior to the CPA implementation, as per eligibility criteria.
Any comment:	

Data / Parameter:	η_{PJ}
Data unit:	Dimensionless
Source of data used:	Efficiency of the LFG capture system that will be installed in the project

	activity
Value applied:	To be specified for each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	Technical specifications of the LFG capture system to be installed (if available) or a default value of 50%.
Any comment:	Applicable to Step A.1.1

Data / Parameter:	φdefault
Data unit:	-
Description:	Default value for the model correction factor to account for model uncertainties
Source of data used:	as per Methodological Tool Emissions from solid waste disposal sites (Version 06.0.1)
Value applied:	For project or leakage emissions: φdefault = 1. For baseline emissions: CPa apply Application A. Thus: (see table below)
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	-

	Humid/wet conditions	Dry conditions
Application A	0.75	0.75

Data / Parameter:	OX
Data unit:	-
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data used:	Conduct a site visit at the solid waste disposal site in order to assess the type of cover of the solid waste disposal site. Use the IPCC 2006 Guidelines for National Greenhouse Gas Inventories for the choice of the value to be applied
Value applied:	Use 0.1 for managed solid waste disposal sites that are covered with oxidizing material such as soil or compost. Use 0 for other types of solid waste disposal sites
Justification of the choice of data or description of measurement methods and procedures actually applied :	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO2. The oxidation factor represents the proportion of methane that is oxidized to CO2 This should be distinguished from the methane correction factor (MCF) which is to account for the situation that ambient air might intrude into the SWDS and prevent methane from being formed in the upper layer of SWDS
Any comment:	

Data / Parameter:	F
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC

Data / Parameter:	$DOC_{f,default}$
Data unit:	Weight fraction
Description:	Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS. This default value can only be used for i) Application A;

Data / Parameter:	$MCF_{default}$
Data unit:	-
Description:	Methane correction factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	In case that the SWDS does not have a water table above the bottom of the SWDS and in case of application A, then select the applicable value from the following: • 1.0 for anaerobic managed solid waste disposal sites. These must have controlled placement of waste (i.e. waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) leveling of the waste; • 0.5 for semi-aerobic managed solid waste disposal sites. These must have controlled placement of waste and will include all of the following structures for introducing air to the waste layers: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation

	system; • 0.8 for unmanaged solid waste disposal sites – deep. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters; • 0.4 for unmanaged-shallow solid waste disposal sites or stockpiles that are considered SWDS. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 meters. This includes stockpiles of solid waste that are considered SWDS (according to the definition given for a SWDS)
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	The MCF accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.

Data / Parameter:	**Wj,x**
Data unit:	t
Description:	Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x
Source of data used:	Estimated based on total amount of waste prevented from disposal and average weight fraction of the waste type collected
Value applied:	[Values are provided at CPA level]
Justification of the choice of data or description of measurement methods and procedures actually applied :	Estimated once based on total amount of waste prevented from disposal and average weight fraction of the waste type collected: $W_{j,x} = W_x \times p_{j,x}$
Any comment:	The MCF accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.

Data / Parameter:	DOCj
Data unit:	
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j*
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value applied:	Apply the following values for the different waste types *j*:

Waste type *j*	**DOCj (% wet waste)**
Wood and wood products	43

	<table><tr><td>Pulp, paper and cardboard (other than sludge)</td><td>40</td></tr><tr><td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr><tr><td>Textiles</td><td>24</td></tr><tr><td>Garden, yard and park waste</td><td>20</td></tr><tr><td>Glass, plastic, metal, other inert waste</td><td>0</td></tr></table> If a waste type is not comparable to MSW and can not clearly be described as a combination of waste types in the table above, project participants should measure DOCj in an ignition loss test according to the procedure in EN 15169 or similar national or international standards. This measurement is only required once for each waste type j and the value determined for DOCj remains valid during the crediting period For disposal of residual wastes, DOCj will need to be measured in most situations, with the following default values available for some types of residual wastes: • Empty fruit brunches (EFB), as their characteristics are similar to garden waste, the parameter value correspondent of garden shall be used; • Industrial sludge, a value of 9% (% wet sludge) shall be used, assuming an organic dry matter content of 35 percent; • Domestic sludge, a value of 5% (wet sludge) shall be used, assuming an organic dry matter content of 10 percent
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	The procedure for the ignition loss test is described in BS EN 15169:2007 Characterization of waste. Determination of loss on ignition in waste, sludge and sediments. The percentages listed in Table 4 are based on a wet waste basis which are concentrations in the waste as it is delivered to the SWDS. The IPCC Guidelines also specify DOC values on a dry waste basis, which are the concentrations after complete removal of all moist from the waste, which is not believed practical for this situation

Data / Parameter:	k_j
Data unit:	-
Description:	Decay rate for the waste type *j*
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Value applied:	Apply the following default values for the different waste types *j*

	<table><tr><td colspan="2" rowspan="2">**Waste type *j***</td><td colspan="2">**Boreal and Temperate (MAT≤20°C)**</td><td colspan="2">**Tropical (MAT>20°C)**</td></tr><tr><td>Dry (MAP/PET <1)</td><td>Wet (MAP/PET >1)</td><td>Dry (MAP< 1000mm)</td><td>Wet (MAP> 1000mm)</td></tr><tr><td rowspan="2">Slowly degrading</td><td>Pulp, paper, cardboard (other than sludge), textiles</td><td>0.04</td><td>0.06</td><td>0.045</td><td>0.07</td></tr><tr><td>Wood, wood products and straw</td><td>0.02</td><td>0.03</td><td>0.025</td><td>0.035</td></tr><tr><td>Moderately degrading</td><td>Other (non-food) organic putrescible garden and park waste</td><td>0.05</td><td>0.10</td><td>0.065</td><td>0.17</td></tr><tr><td>Rapidly degrading</td><td>Food, food waste, sewage sludge, beverages and tobacco</td><td>0.06</td><td>0.185</td><td>0.085</td><td>0.40</td></tr></table> NB: MAT . mean annual temperature, MAP . Mean annual precipitation, PET . potential evapotranspiration. MAP/PET is the ratio between the mean annual precipitation and the potential evapotranspiration. If a waste type, prevented from disposal by the proposed CDM project activity, can not clearly be attributed to one of the waste types in the table above, project participants should choose, among the waste types that have similar characteristics, the waste type where the values of *DOCj* and *kj* result in a conservative estimate (lowest emissions), or request a revision of/deviation from this methodology. In the case of empty fruit bunches (EFB), as their characteristics are similar to garden waste, the parameter values correspondent of garden waste shall be used. In case of sludge from pulp and paper industry, a conservative value of 0.03 shall be used for all precipitation and temperature combinations
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Document in the CDM-PDD the climatic conditions at the SWDS site (temperature, precipitation and, where applicable, evapotranspiration). Use long-term averages based on statistical data, where available. Provide references

Data / Parameter:	GWP_{CH4}
Data unit:	t CO2e / t CH4
Description:	Global Warming Potential of methane
Source of data used:	IPCC
Value applied:	21
Justification of the choice of data or	

description of measurement methods and procedures actually applied :	
Any comment:	For the first commitment period. Shall be updated for future commitment periods according to any future COP/MOP decisions

Data / Parameter:	P_n
Data unit:	Pa
Description:	Total pressure at normal conditions
Source of data used:	Methodology ACM0001 (Version 12.0.0) and As per Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)
Value applied:	101,325
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	T_n
Data unit:	K
Description:	Temperature at normal conditions
Source of data used:	Methodology ACM0001 (Version 12.0.0) and As per Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)
Value applied:	273.15
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	R_u
Data unit:	$Pa.m^3/kmol.K$
Description:	Universal ideal gases constant
Source of data used:	As per Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)
Value applied:	8,314
Justification of the choice of data or description of measurement methods	-

and procedures actually applied :	
Any comment:	

Data / Parameter:	MM_i
Data unit:	kg/kmol
Description:	Molecular mass of greenhouse gas *i*
Source of data used:	As per Methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Value applied:	>

Compound	Structure	Molecular mass (kg / kmol)
Carbon dioxide	CO_2	44.01
Methane	CH_4	16.04
Nitrous oxide	N_2O	44.02
Sulfur hexafluoride	SF_6	146.06
Perfluoromethane	CF_4	88.00
Perfluoroethane	C_2F_6	138.01
Perfluoropropane	C_3F_8	188.02
Perfluorobutane	C_4F_{10}	238.03
Perfluorocyclobutane	c-C_4F_8	200.03
Perfluoropentane	C_5F_{12}	288.03
Perfluorohexane	C_6F_{14}	338.04

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

Data / Parameter:	MM_k
Data unit:	kg/kmol
Description:	Molecular mass of gas *k*
Source of data used:	As per Methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Value applied:	For gases *k* that are greenhouse gases apply values for MM_i.

Compound	Structure	Molecular mass (kg / kmol)
Nitrogen	N_2	28.01
Oxygen	O_2	32.00
Carbon monoxide	CO	28.01
Hydrogen	H_2	2.02
Nitric oxide	NO	30.01

	Nitrogen dioxide — NO_2 — 46.01 Sulfur dioxide — SO_2 — 64.06
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	MM_{H2O}
Data unit:	kg/kmol
Description:	Molecular mass of water
Source of data used:	As per Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)
Value applied:	18.0152 kg/kmol
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$\mathbf{EF_{el,j,y}}$
Data unit:	tCO_2/MWh
Description:	Emission factor for electricity consumption by project activity in year y
Source of data used:	Calculated in accordance with the version 02.2.1 of the "Tool to calculate the emission factor for an electricity system"
Value applied:	[Values are provided at CPA level]
Justification of the choice of data or description of measurement methods and procedures actually applied :	[Values/description are provided at CPA level]
Any comment:	All data used to calculate the emission factor is described in section B.6.1. The grid emission factor applied ex-ante is fixed for the entire crediting period. [Values/description are provided at CPA level]

Data / Parameter:	$\mathbf{EF_{Co2,j,y}}$
Data unit:	tCO_2/GJ
Description:	CO2 emission factor of the fossil fuel *j*
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 2,

	chapter 2, table 2.2, page 2.16, CO2 emission factor 95% at upper level of confidence interval for fuel type j
Value applied:	[Values are provided at CPA level]
Justification of the choice of data or description of measurement methods and procedures actually applied :	In case CO2 emission factor information is available from the fuel supplier, this value will be used. In other cases the default IPCC value will be used at the upper level of the 95% confidence interval. [Values/description are provided at CPA level]
Any comment:	Used to calculate emission from using fossil fuel [Values/description are provided at CPA level]

E.7. Application of the monitoring methodology and description of the monitoring plan:

The following sections indicate the parameters to be monitored as per the methodology as well as the procedures to be undertaken under the monitoring plan.

E.7.1. Data and parameters to be monitored by each CPA:

The following parameters may be monitored by each CPA and used for calculated emissions reductions. Values applied will dependent on the individual CPA.

Data / Parameter:	$LFG_{total,y}$
Data unit:	m^3
Description:	Total amount of landfill gas captured at Normal Temperature and Pressure
Source of data to be used:	Onsite measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values/description are provided at CPA level]
Description of measurement methods and procedures to be applied:	Continuous Measured by a flow meter. Data to be aggregated monthly and yearly (average value in a time interval not greater than an hour shall be used in the calculations of emission reductions)
QA/QC procedures to be applied:	Flow meters should be subject to a regular maintenance and testing regime to ensure accuracy
Any comment:	[Values/description are provided at CPA level]

Data / Parameter:	$LFG_{flare,y}$
Data unit:	m^3
Description:	Amount of landfill gas flared at Normal Temperature and Pressure
Source of data to be used:	Onsite measurements
Value of data applied for the purpose of	[Values are provided at CPA level]

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Continuous Measured by a flow meter. Data to be aggregated monthly and yearly for each flare (average value in a time interval not greater than an hour shall be used in the calculations of emission reductions)
QA/QC procedures to be applied:	Flow meters should be subject to a regular maintenance and testing regime to ensure accuracy
Any comment:	Equipment used to monitor this parameter is the same as the equipment used to monitor $FV_{RG,h}$

Data / Parameter:	$LFG_{electricity,y}$
Data unit:	m^3
Description:	Amount of landfill gas combusted in power plant at Normal Temperature and Pressure
Source of data to be used:	Onsite measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	Continuous Measured by a flow meter. Data to be aggregated monthly and yearly for each power plant (average value in a time interval not greater than an hour shall be used in the calculations of emission reductions)
QA/QC procedures to be applied:	Flow meters should be subject to a regular maintenance and testing regime to ensure accuracy
Any comment:	[Values/description are provided at CPA level]

Data / Parameter:	w_{CH4}
Data unit:	m^3 CH_4/m^3 LFG
Description:	Methane fraction in the landfill gas
Source of data to be used:	To be measured continuously by project participants using certified equipment
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	Shall be measured Continuous (average value in a time interval not greater than an hour shall be used in the calculations of emission reductions) using equipment that can directly measure methane content in the landfill gas, estimation of methane content of landfill gas based on measurement of other constituents of the landfill gas such as CO_2 is not permitted. Measured by continuous gas quality analyser
QA/QC procedures to	The gas analyser should be subject to a regular maintenance and testing regime

be applied:	to ensure accuracy
Any comment:	The equipment to monitor this parameter is the same as the monitoring equipment for Parameter: $Fv_{CH4,RG,h}$ [Values/description are provided at CPA level]

Data / Parameter:	T_t
Data unit:	°C
Description:	Temperature of the landfill gas
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	Continuous Measured to determine the density of methane D_{CH4}. No separate monitoring of temperature is necessary when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters
QA/QC procedures to be applied:	Measuring instruments should be subject to a regular maintenance and testing regime in accordance to appropriate national/international standards.
Any comment:	[Values/description are provided at CPA level]

Data / Parameter:	P_t
Data unit:	Pa
Description:	Pressure of the landfill gas
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	Continuous Measured to determine the density of methane D_{CH4}. No separate monitoring of temperature is necessary when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters
QA/QC procedures to be applied:	Measuring instruments should be subject to a regular maintenance and testing regime in accordance to appropriate national/international standards
Any comment:	[Values/description are provided at CPA level]

Data / Parameter:	**EL_{LFG}**
Data unit:	MWh
Description:	Net amount of electricity generated using LFG
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	Continuous using Electricity meter
QA/QC procedures to be applied:	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy
Any comment:	Required to estimate the emission reductions from electricity generation from LFG, if credits are claimed. [Values/description are provided at CPA level]

Data / Parameter:	Operation of the energy plant
Data unit:	Hours
Description:	Operation of the energy plant
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	Annually [Values/description are provided at CPA level]
QA/QC procedures to be applied:	[Values/description are provided at CPA level]
Any comment:	This is monitored to ensure methane destruction is claimed for methane used in electricity plant when it is operational. [Values/description are provided at CPA level]

Data / Parameter:	$EC_{BL,k,y}$
Data unit:	MWh/y
Description:	Net amount of electricity generated using LFG in year y
Source of data to be used:	The actual data will be monitored ex post and be recorded by project participants
Value of data applied for the purpose of	[Values are provided at CPA level]

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Measured continuously by electricity meter(s). This parameter represents the total electricity exported to the grid. Import from the grid ($EC_{PJ,j,y}$) is monitored separately. The data is measured and recorded hourly, and aggregated monthly.
QA/QC procedures to be applied:	[Values/description are provided at CPA level]
Any comment:	Data will be archived during the crediting period and kept until two years after. [Values/description are provided at CPA level]

Data / Parameter:	$EC_{PJ,j,y}$
Data unit:	MWh/y
Description:	Quantity of electricity consumed by the project activity from the grid in year y
Source of data to be used:	Onsite measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	Continuously measured by electricity meter(s), aggregated at least annually.
QA/QC procedures to be applied:	[Values/description are provided at CPA level]
Any comment:	[Values/description are provided at CPA level]

Data / Parameter:	TDL_y
Data unit:	%
Description:	Average technical transmission and distribution losses for providing electricity to source in year y
Source of data to be used:	“Tool to calculate baseline, project and/or leakage emissions from electricity consumption”
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	[Values/description are provided at CPA level]
QA/QC procedures to be applied:	[Values/description are provided at CPA level]
Any comment:	[Values/description are provided at CPA level]

Data / Parameter:	$FV_{RG,h}$
Data unit:	m^3/month
Description:	Flow rate of the landfill gas entering the flare.
Source of data to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	[provided for each CPA]
QA/QC procedures to be applied:	[provided for each CPA]
Any comment:	[Values/description are provided at CPA level]

Data / Parameter:	$Fv_{CH4,RG,h}$
Data unit:	-
Description:	Volumetric fraction of methane in the residual gas in the hour *h*
Source of data to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	[provided for each CPA]
QA/QC procedures to be applied:	[provided for each CPA]
Any comment:	[Values/description are provided at CPA level]

Data / Parameter:	Other flare operation parameters – Flame detector
Data unit:	On/Off or numeric value indicating On/Off
Description:	Detection unit
Source of data to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values/description are provided at CPA level]

Description of measurement methods and procedures to be applied:	[provided for each CPA]
QA/QC procedures to be applied:	[provided for each CPA]
Any comment:	[Values/description are provided at CPA level]

Data / Parameter:	Other flare operation parameters
Data unit:	[Values/description are provided at CPA level]
Description:	[Values/description are provided at CPA level]
Source of data to be used:	[Values/description are provided at CPA level]
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values/description are provided at CPA level]
Description of measurement methods and procedures to be applied:	[provided for each CPA]
QA/QC procedures to be applied:	[provided for each CPA]
Any comment:	[Values/description are provided at CPA level]

Data / Parameter:	$V_{t,wb}$
Data unit:	m³ wet gas/h
Description:	Volumetric flow of the gaseous stream in time interval *t* on a wet basis
Source of data to be used:	[Values are provided at CPA level]
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	Volumetric flow measurement should always refer to the actual pressure and temperature. Instruments with recordable electronic signal (analogical or digital) are required. Continuous if not specified in the underlying methodology.
QA/QC procedures to be applied:	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications
Any comment:	Data will be kept for at least two years after the end of the crediting period. As per Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)

Data / Parameter:	$V_{t,db}$
Data unit:	m³ dry gas/h
Description:	Volumetric flow of the gaseous stream in time interval *t* on a dry basis
Source of data to be used:	[Values are provided at CPA level]
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	Volumetric flow measurement should always refer to the actual pressure and temperature. Calculated based on the wet basis flow measurement plus water concentration measurement. Continuous measurement if not specified in the underlying methodology
QA/QC procedures to be applied:	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications
Any comment:	This parameter will be monitored in Options A As per Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)

Data / Parameter:	$v_{i,t,db}$
Data unit:	m³ gas *i*/m³ dry gas
Description:	Volumetric fraction of greenhouse gas *i* in a time interval *t* on a dry basis
Source of data to be used:	[Values are provided at CPA level]
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values/descriptions are provided at CPA level]
Description of measurement methods and procedures to be applied:	Continuous gas analyser operating in dry-basis. Volumetric flow measurement should always refer to the actual pressure and temperature. Continuous measurement if not specified in the underlying methodology.
QA/QC procedures to be applied:	Calibration should include zero verification with an inert gas (e.g. N_2) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas). All calibration gases must have a certificate provided by the manufacturer and must be under their validity period
Any comment:	This parameter will be monitored in Options C and F and may be monitored in Options A and D As per Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)

Data / Parameter:	$C_{H2O,t,db,n}$,

Data unit:	mg H_2O/m^3 dry gas
Description:	Moisture content of the gaseous stream at normal conditions, in time interval *t*
Source of data to be used:	[Values/descriptions are provided at CPA level]
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values/descriptions are provided at CPA level]
Description of measurement methods and procedures to be applied:	Measurements according to the USEPA CF42 method 4 – Gravimetric determination of water content The mean value among three consecutive measurements performed in the same day (at least 2 hours each) shall be considered. Measurements should coincide with the Annual Surveillance Test (associated with requirements of the EN 14181 standard) or the calibration of the flow meter for the gaseous stream
QA/QC procedures to be applied:	According to the USEPA CF42 method 4
Any comment:	Monitoring is required if Option 1 described in the "Determination of the absolute humidity of the gaseous stream" section of the tool is applied, or as one of the ways of proving that the gaseous stream is dry (necessary for Options A or D) As per Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)

Data / Parameter:	pH20,t,Sat
Data unit:	Pa
Description:	Saturation pressure of H_2O at temperature T_t in time interval *t*
Source of data to be used:	[Values/descriptions are provided at CPA level]
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values/descriptions are provided at CPA level]
Description of measurement methods and procedures to be applied:	This parameter is solely a function of the gaseous stream temperature T_t and can be found at reference [1] for a total pressure equal to 101,325 Pa
QA/QC procedures to be applied:	[Values/descriptions are provided at CPA level]
Any comment:	[1] Fundamentals of Classical Thermodynamics; Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke; 4º Edition 1994, John Wiley & Sons, Inc. As per Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0)

Data / Parameter:	$FC_{i,j,y}$
Data unit:	Mass or volume unit per year (e.g. ton / yr or m3 / yr)
Description:	Is the quantity of fuel type i combusted in process j during year y

Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[Values are provided at CPA level]
Description of measurement methods and procedures to be applied:	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.
QA/QC procedures to be applied:	The consistency of metered fuel consumption quantities should be cross checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Any comment:	Data will be kept for at least two years after the end of the crediting period

E.7.2. Description of the monitoring plan for a CPA:

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The monitoring plan is described in detail in the monitoring plan manual developed in conjunction with the PoA. Each of the CPA activities will develop an operations plan that defines a standard against which the project performance will be measured in terms of its emission reductions (ER) and conformance with all standards and criteria under the PoA. The objective of the monitoring plan is to:

- Establish and maintain a reliable and accurate monitoring system
- Provide guidance for the participants on the implementation of necessary measurement and record management operations
- Guidance for meeting CDM requirements for verification and certification purposes

The monitoring plan covers:

- responsibility of members of the monitoring team;
- routine reminders for site staff;
- QA/QC procedures;
- service forms for data reporting;
- corrective action plans;
- maintenance plans; and
- monitoring schedules.

Responsibilities of operational and management structure for each CPA

In order to ensure all CPAs are monitored and verified as per the applied monitoring methodology, the CME prepares a comprehensive monitoring plan for all the CPAs to be included in the PoA. Each CPA implementer will implement the respective monitoring plan, that is subject to continuous improvement, based on insights by CPA implementer and CME.

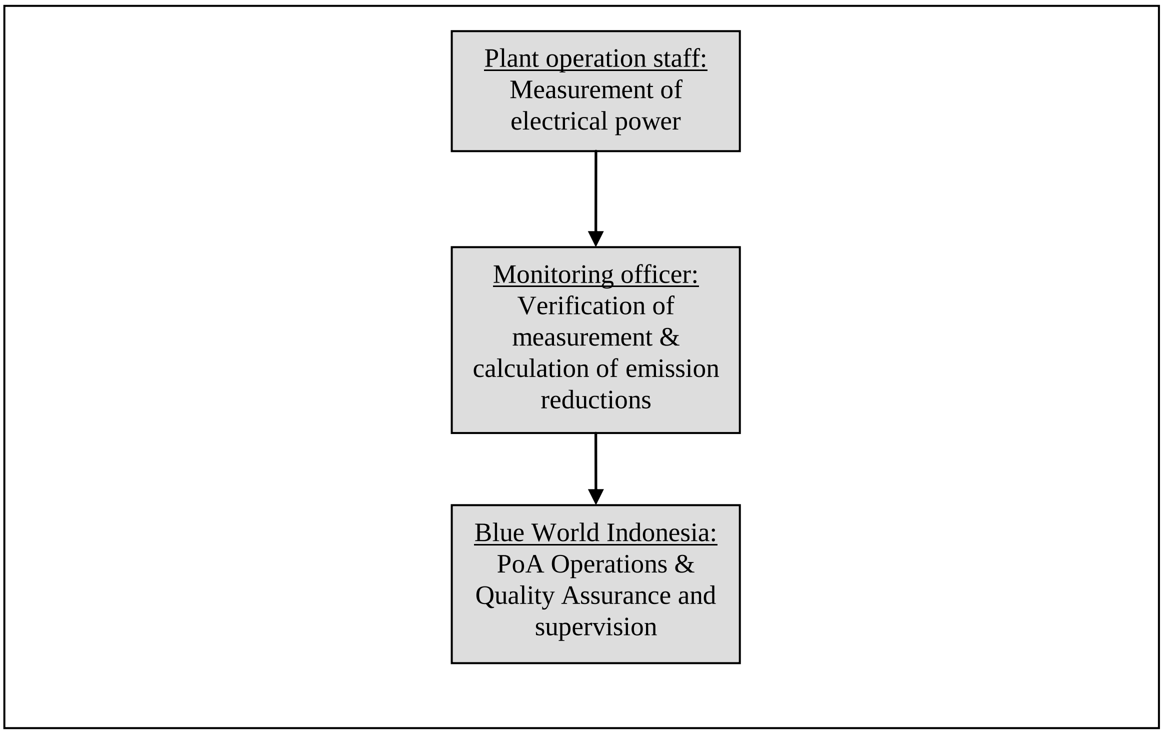

Figure E.7.2.1 Management structure in order to monitor emission reductions

At CPA level, a monitoring team is formed that reports to general management: the team sets out the responsibility of everyone in the monitoring system, and establishes the related documents. The general management ensures that staff in the monitoring system has the ability to deal with the assigned tasks.

For monitoring at CPA level, CDM Managers/coordinators are appointed for respective CPAs, specifically responsible for training, checking the daily operation, reporting forms and archiving emergency situation reports. The CDM managers will also be responsible for aggregating the monitored data monthly and yearly, archiving and keeping data during the crediting period and two years after.

The respective operators of the CPA will be in charge of data supervision, filling operation report forms and, checking and inspecting the system. If necessary, they will have the responsibility for executing the emergency plan and drafting emergency situation reports.

The relevant data will be recorded by the CPA implementers and provided to the CME at regular intervals. The data received will be archived electronically for computations of emission reductions on annual basis. Such archived data will be kept until two years after the end of the crediting period or the issuance of CERs whichever is later. Each small scale CPA shall follow all the provision of the PoA

including that related to monitoring. Only those CPA implementers who confirm to sign an agreement in this context shall be included in the PoA, as this is a part of eligibility criteria.

In section E7.2 of each CPA-DD a figure indicating the monitoring points, as well as a table indicating details for the monitoring equipment will be provided.

The CME, as the carbon finance intermediary and project participant, will take responsibility for the collection of monitored data, the emission reduction estimates, producing the monitoring reports and reporting to the DOE. The data will be checked for completeness and quality and placed in a central database located at the CME Office that includes all projects under the PoA.

BWC will conduct periodical checks to verify procedures are being followed as per the prescribed procedures.

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

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Date of completion: 06/12/2011

Responsible persons for determination of baseline study:

Blue World Carbon SEA Pte Ltd
Mr. Willem Christiaens – Head of Operations

Willem.Christiaens@blueworldcarbon.com

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Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

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Street/P.O.Box:	Jl. Rasuna Said Kav. 13
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Title:	Managing Director
Salutation:	Mr.
Last Name:	van Acht
Middle Name:	
First Name:	Joost Willem
Department:	
Mobile:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The PoA does not receive any public funding. Each CPA will check on public funding individually.

Annex 3

BASELINE INFORMATION

In each CPA-DD specific baseline information will be defined, including the grid emission factor and baseline alternative identification.

Annex 4

MONITORING INFORMATION

No additional information is needed to explain further the monitoring section. Each CPA will check the need of such information in the Annex individually.

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