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

CONTENTS

Annexes

NOTE:

(i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.

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

SECTION A. General description of small-scale programme of activities (PoA)

A.1 Title of the small-scale programme of activities (PoA):

Regional Biogas PoA
Version : 1.0
Date : 14/02/2012

A.2. Description of the small-scale programme of activities (PoA):

1. General operating and implementing framework of PoA

The proposed Programme of Activities (PoA) consists in the implementation of biogas recovery, flaring and/or utilization systems on palm oil mills in Malaysia and in the Asia Pacific region.

The proposed project activities will reduce greenhouse gas (GHG) emissions from palm oil mills by capturing the biogas generated in the wastewater treatment systems, instead of allowing it to escape into the atmosphere. In Malaysia, more than 85% of palm oil mills are utilizing open based lagoons system and it is considered the prevailing practice for palm oil industry to treat the POME. The open lagoons system is an effective and low-tech solution that can easily meet the water discharge limits applicable to the palm oil industry[1, 2].

The PoA and the inclusion of each CPA will be managed by Ably Carbon Sdn Bhd as a coordinating / managing entity (CME). The palm oil mill or the mill owner, or other authorized third party, will sign an agreement with Ably Carbon prior to the inclusion of the corresponding CPA in the PoA.

The CPAs themselves will be implemented by the CME, the CPA implementer, or any relevant third party, including the palm oil mill or mill owner. The PoA will be launched in Malaysia (host country), and may include CPAs in Papua New Guinea and/or Solomon Islands.

The equipment that is planned to be installed in the proposed project activities includes *inter alia* new biogas treatment pond(s) or digester tank(s), flaring system, adapting biogas burner(s) to the biomass boiler(s) and/or a power plant consisting of a pre-treatment system and electricity generators.

2. Policy/measure or stated goal of the PoA

The proposed PoA will reduce the greenhouse gas (GHG) emissions from palm oil mills by the installation of biogas recovery system and destroying the biogas generated instead of allowing it to escape into the atmosphere. This would result in a better POME treatment and management of the wastewater. It wills also promote biogas utilization and renewable energy generation in the host country especially from palm oil industry.

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1 SD 01 - Yeoh, B. G., 2004. A Technical and Economic Analysis of Heat and Power Generation from Biomethanation of Palm Oil Mill Effluent. *Electrcity Supply Industry in Transition: Issues and Prospect for Asia.*

2 SD 02 - Eco-Ideal Consulting Sdn. Bhd. (Eco-Ideal), 2004. MEWC/PTM/DANIDA: *Study on Clean Development Mechanism Potential in the Waste Sectors in Malaysia*. Unpublished

The PoA will contribute to sustainable development in the host country:

The benefits of the proposed project activity regarding to the sustainable development as compared to the baseline are the following:

Environmental criterion

- The reduction of CH_4 emissions will improve the quality of the air.
- It will also reduce the GHG emissions and results in the preservation of the climate.
- The new treatment plant is expected to improve the quality of the discharge water due to better management.

Social criterion

- By reducing the methane emission, the project will contribute to the health of the population in the area and nearby.
- Besides providing job opportunities, the project will also set in motion a *demonstration effect* leading to other units adopting similar activity, which would go to improve the job opportunity;
- The increased job opportunity will reduce social disparity in the society and thereby contribute to peace in the society.

Economic criterion

- The project involves a technology transfer into host country. Indeed, the anaerobic lagoons are replaced by either bio-digester or covered lagoon.
- Training will be provided to the locals to ensure them to be able to execute and manage the project. It leads to the increase of the local skills.
- Provide job opportunities especially for the local community live nearby.

3. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.

The CME is not obliged by any local legislation and does not have any contractual obligation to implement the PoA although all parties understand that the PoA can only be developed with the financial support of the Certified Emission Reductions (CERs).

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

Ably Carbon will be the Coordinating / Managing Entity for the CDM Programme of Activities (PoA) and will communicate with the CDM Executive Board.

Name of Party involved ((host) indicates a host Party)	Private and/or public entity (ies) project participants (as applicable)	Kindly indicate if the Party wishes to be considered as project participant (Yes/No)
Malaysia (Host)	Private entities: Felda Palm Industrial Sdn. Bhd. Ably Carbon Sdn Bhd.	No

France	Private entity: Ably Carbon SAS	No

A.4. Technical description of the small-scale programme of activities:

A.4.1. Location of the programme of activities:

The PoA will cover all the states in Malaysia, as well as Papua New Guinea and Solomon Islands.

A.4.1.1. Host Party(ies):

Malaysia, Papua New Guinea, Solomon Islands

A.4.1.2. Physical/ Geographical boundary:

The boundary of a PoA is defined as the geographical area within which all the CPAs included in the PoA will be implemented. The geographical boundary of the PoA will cover all the states in Malaysia, as well as Papua New Guinea and the Solomon Islands.

Figure A.1: Map of Malaysia

Figure A.2: Map of Papua New Guinea and Solomon Islands

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

A typical CDM Programme Activity (CPA) consists of the bio-digester or covered lagoon, flaring and/or utilization system.

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

The project activity will apply AMS-III.H. "Methane recovery in wastewater treatment[3]", Version 16, under Type III (other project activities). Additional emission reductions may also be claimed under Type I (Renewable energy projects) at each project site depending on the technologies applied.

A typical CPA consists of the installation of biogas recovery system either bio-digester or covered lagoon, flaring and/or utilization system at individual palm oil mill that will implement the project activity. It is expected that several technologies will be available to be considered for each CPA and each technology will comprise measures that recover, flare and/or utilize the biogas for heat/power generation based on the approved methodologies.

a) The methane capture in bio-digester/covered lagoon:

The project activity involves the introduction of either bio-digester or covered lagoon for the treatment of palm oil mill effluent (POME). Treated POME will then channeled to existing lagoons (either existing anaerobic lagoons or directly to aerobic/facultives/algae lagoons/bio-polishing) for further treatment before finally being discharged to a river or as land application.

[3] Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. Type III-Other project activities: III.H/Version 16/Scope 13/EB 58

b) Flaring system:
An enclosed flare or open flare will be used to destroy the biogas in case no engine(s) are installed or to burn the excess of biogas, in case of maintenance of the gas engine(s)/boiler(s) or during emergency.

c) Gainful use of biogas
The recovered biogas may be combusted in gas engine(s) or existing biomass boiler(s) or new boiler(s) for electricity or heat generation. Whenever required (maintenance or emergency), excess biogas will be combusted in an enclosed or open flare equipped with safety features.

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

To be part of this PoA, each CPA must meet the following criteria:

N°	Criteria	Compliance Rationale
1	**Geographical boundary** The CPA takes place within the borders of Malaysia, Papua New Guinea or the Solomon Islands.	In each CPA-DD, it shall be demonstrated with GPS coordinates that the CPA does take place within the borders of Malaysia, Papua New Guinea or the Solomon Islands.
2	No **double counting** The CPA is not already included in another PoA or developed as a stand-alone CDM project.	In each CPA-DD, it shall be confirmed that the CPA is not already included in another PoA or developed as a stand-alone CDM project. Detailed procedure to avoid double-counting is formulated in A.4.4.1 of the PoA-DD.
3	Applicability conditions of AMS-III.H : a) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; b) Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; c) Introduction of biogas recovery and combustion to a sludge treatment system; d) Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an on site industrial plant; e) Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated	The project must comprise measures that recover biogas from biogenic organic matter in wastewater by means of one, or a combination, of the mentioned options.

	wastewater stream; f) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential treatment step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery)	
4(a)	The recovered methane measured may also be utilized for thermal or mechanical, electrical generation directly – AMS-III.H, para 3(a).	The recovered biogas may also be utilised for the following applications instead of combustion / flaring.
4(b)	The recovered methane measured may also be utilized for thermal or mechanical, electrical energy generation after bottling of upgraded biogas – AMS-III.H, para 3(b).	The recovered biogas may also be utilised for the following applications instead of combustion / flaring.
4(c)	The recovered methane measured may also be utilized for thermal or mechanical, electrical energy generation after upgrading and distribution – AMS-III.H, para 3(c).	The recovered biogas may also be utilised for the following applications instead of combustion / flaring.
4(d)	The recovered methane measured may also be utilized for hydrogen production – AMS-III.H, para 3(d).	The recovered biogas may also be utilised for the following applications instead of combustion / flaring.
4(e)	The recovered methane measured may also be utilized for use as fuel in transportation applications after upgrading – AMS-III.H, para 3(e).	The recovered biogas may also be utilised for the following applications instead of combustion / flaring.
5	If the recovered biogas is used for project activities covered under AMS-III.H, paragraph 3(a), that component of the project activity can use a corresponding methodology under Type I.	If the recovered methane is being utilized for thermal or mechanical, electrical generation directly, the applicability criteria will be ensured in each CPA depending on the Type I methodology to be applied.
6	Conditions that ensure compliance with applicability and other requirements of single or multiple methodology/ies applied by CPA.	According to the “Standard for demonstration of additionality, development of Eligibility criteria and application of multiple methodologies for Programme of Activities”, the combinations technologies/measures and / or methodologies are eligible. Each CPA must meet the criteria for methodology AMS-III.H and the relevant Type I SSC Methodology.
7	The project has to fulfill Host Country National CDM criteria, if any.	Requirements under DNA of Malaysia, Papua New Guinea or Solomon Islands, if they have been formulated.

8	The starting date of CPA is compliant with the latest UNFCCC guidelines.	In each CPA-DD, the start date must be indicated and supported by documentary evidence.
9	Confirmation that the CPA does not involve any public funding from Annex I Parties or that in case public funding is used, it does not result in diversion of Official Development Assistance (ODA)	In each CPA-DD, it shall be confirmed that the CPA does not involve any public funding or that in case public funding is used a confirmation that official development assistance is not being diverted to the implementation of the PoA.
10	A local Stakeholder consultation has been conducted prior to the CPA inclusion	In each CPA-DD, details pertaining to the stakeholder consultation shall be available in section D of the CPA-DD.
11	Conditions pertaining to the demonstration of additionality of each small scale CPA to be included (less than 60 $ktCO_2$ / year) for Type III and 15MW for Type I methodologies.	Each small-scale CPA shall meet the requirements of Attachment A of Appendix B of the ”Simplified modalities and procedures for small-scale CDM project activities”
12	Where applicable, the conditions that ensure that CPA in aggregate meets the small-scale threshold criteria and remain within this threshold throughout the crediting period of the CPA	The CPA implementer should be able to demonstrate that the CPA will remain within this threshold throughout the corresponding crediting period.
13	Where applicable, the requirements for the debundling check, in case CPAs belong to small-scale (SSC) project categories	The CPA implementer should be able to demonstrate that the CPA is not a debundled component of a large activity as described in the latest “Guidelines on assessment of debundling for SSC project activities”
14	Where applicable, the conditions related to sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys	Not applicable, all CPAs will be verified
15	Where applicable, target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off-grid) and distribution mechanisms (e.g. direct installation).	The target group is prospective POME plants in Malaysia. There are no specific distribution mechanisms.
16	Whether an EIA is required by local authorities	Information on EIA requirement and details pertaining to the EIA development, if any, shall be available in section C of the CPA-DD.
17	The crediting period of the CPA shall not exceed the length of the PoA (i.e. 28 years) regardless of the time of inclusion of CPA in the PoA.	In each CPA-DD, it shall be confirmed that the crediting period of the CPA does not exceed the length of the PoA.

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a SSC-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 proposed PoA is a voluntary coordinated action from Ably Carbon Sdn Bhd to promote the implementation of biogas recovery and flaring and/or utilization systems.

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

This is the additionality condition of each CPA and it will be demonstrated in each CPA-DD. If each CPA can demonstrate additionality at CPA level then it can be concluded that none of the CPA's under the PoA would occur in the absence of CDM

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

Not applicable as the proposed PoA is not implementing mandatory policies / regulations in the selected geographical boundary.

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

Not applicable as the proposed PoA is not implementing mandatory policies / regulations in the selected geographical boundary.

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

A.4.4.1. Operational and management plan:

Ably Carbon Sdn Bhd is the coordinating / managing entity of the operation and management plan. The operational plan will be implemented by a project developer for each CPA, which may include Ably Carbon. Contractual arrangements will be signed with each participating site owner, technology provider and/or Ably Carbon.

(i) Record keeping system for each CPA under the PoA,

All relevant parameters included in the monitoring plan shall be monitored and recorded in each CPA under this PoA by maintaining a record keeping system as specified in Section E below. The CME will ensure that each CPA will maintain standard records documenting, archive the monitoring data in a secure database and it will be kept for the full crediting period, plus two years after the end of the crediting period or the last issuance of CERs for this CPA (whichever occurs later). Data (electronic) will be transmitted regularly and the CME shall be responsible for the record keeping relating to production of the Monitoring Reports.

(ii) System/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as CDM project activity or as a CPA of another PoA,

Prior to including a new CPA under the proposed PoA, the CME will check the CPA and PoA databases in the UNFCCC website to ensure that a similar CPA has not been registered already.

Each CPA included in this PoA will be referenced with a unique identification number and the geographic coordinates of the corresponding facility location .

(iii) The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

Will apply “Guidance for determining the occurrence of de-bundling under a Programme of Activities (PoA)” to ensure that the proposed CPA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

(iv) The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA;

Each CPA will be implemented on one or several individual mill(s); the mill owner or a third party will sign an agreement with the CME prior to the project inclusion in the PoA informing that they are aware of and have agreed that their project is being subscribed to this proposed PoA and the project is not registered either as a CDM project activity or as a CPA of another PoA. The proposed CPA will be assessed by the CME in order to confirm that all eligibility criteria defined in the PoA are fulfilled.

A.4.4.2. Monitoring plan:

(i) Description of the proposed statistically sound sampling method/procedure to be used by DOEs for verification of the amount of reductions of anthropogenic emissions by sources or removals by sinks of greenhouse gases achieved by CPAs under the PoA.

Not applicable
All the CPAs will be verified. If several CPAs are included within a verification, the following sampling procedure may be applied by the DOE:

- Full desk review and site visit for each and every CPA included in the verification; or
- Full desk review for each CPA included in the verification and site assessment on a sample-based approach. The sampling procedure to determine the CPAs that will be verified on site will be based on a stratified random sample, the strata being the POME sites. At least one onsite assessment will be conducted. The DOE itself will chose randomly on which site(s) it will conduct a verification. Since the number of CPAs included in the proposed PoA will evolve during the crediting period, the sampling process is to be carried out for each verification.

(ii) In case the coordinating/managing entity opts for a verification method that does not use sampling but verifies each CPA (whether in groups or not, with different or identical verification periods) a transparent system is to be defined and described that ensures that no double accounting occurs and that the status of verification can be determined anytime for each CPA;

All data collected as part of the monitoring will be archived electronically and be kept at least for 2 years after the end of the last crediting period. All measurements will be conducted with calibrated measurement equipment according to relevant industry standards and/or manufacturer specifications.

The monitoring plan for parameters included in section E.7.1 will be implemented for each CPA with assistance from the CME as follows:

- the CPA operator will implement its CPA
- the CPA operator or any relevant third party will monitor and record all parameters included in section E.7.1
- the CME (or any relevant subcontractor chosen by the CME for that purpose) will provide guidance to the CPA operator on how the monitoring should be conducted and data should be collected with regards to emission reduction calculations
- the CPA operator will provide data on monitored parameters and QA/QC procedures included in section E.7.1 to the CME either directly into a database provided by the CME or by sending the information to the CME.

A more detailed description of the monitoring plan for each CPA is elaborated in section E.7.2.

A.4.5. Public funding of the programme of activities (PoA):

The PoA has not received any public funding. Any public funding that may be provided to individual CPA will be described in the corresponding CPA-DD. In case public funding is received for a CPA, an affirmation will be provided that such funding does not result in a diversion of ODA.

SECTION B. Duration of the programme of activities (PoA)

B.1. Starting date of the programme of activities (PoA):

Starting date of the PoA will be the 31/12/2012; date on which the PoA is expected to be registered by the CDM Executive Board, or when the commissioning of the first CPA occurs, whichever is later.

B.2. Length of the programme of activities (PoA):

The length of the PoA is 28 years.

SECTION C. Environmental Analysis

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 SSC-CPA level ☐

Since all the projects are similar, environmental impacts can be analyzed at the PoA level.

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

The project will not have any adverse environmental impacts, including transboundary impacts due to the project activity.

In addition, Environmental Impact Assessment is not necessary as per the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987 of the Malaysia government[4]. Indeed, the project activity is not considered as a prescribed activity for doing such environmental study. Palm oil mills are discharging their treated POME either to river or as Land Application that has to be approved by Department of Environment under the Environmental Quality Regulations (1978) Palm Oil Effluent Discharge Standard. While the discharge limit may vary from state to state, the regulations do not specify the required treatment technologies. There is also no regulation on the GHG emissions from wastewater treatment operation for the palm oil mill. Each Palm Oil Mill will continue to be regulated according to its operating permit, as the activities of the PoA will not impact the final water discharge quality.

The project activity is actually an environmental improvement project which will reduce local pollution resulting from the uncontrolled emission of methane and will also contribute in abatement of global warming through reduction in greenhouse gas emissions. The positive effects of the project activity on key environmental parameters are briefly described below.

Positive environmental impact:

Environmental Impact	Affected Means	Value of the impact	Comments
Contributes to the generation of employment	Socio-economic, generation of employment.	Positive	The project generates employment during the construction and the operation phases.
Reduction on GHGs	Atmosphere, quality of the air	Positive	The capture of the CH_4 will be either combusted or flared. The project activity reduces the emission of

[4] Document available on : http://www.doe.gov.my/portal/wp-content/uploads/2010/07/Appendix_2.pdf. Last access on the 24/05/2011.

			GHG.
Improvement of the quality of life of the population	Socio-economic	Positive	Better quality of discharge effluent and air quality
Risk of explosions or fires	Health and security of workers at the plant	Positive	Biogas recovery for gainfully use will mitigate the risks as it features safety devices for safe operation

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),:

An Environmental Impact Assessment is not necessary as per the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987 of the Malaysia government[5]. Indeed, the project activity is not considered as a prescribed activity for doing such environmental study.

If CPAs are implemented in Papua New Guinea or Solomon Islands, it shall be assessed during CPA inclusion whether an Environmental Impact Assessment is required or not.

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 SSC-CPA level √

Stakeholder consultation will be undertaken at the CPA level and for each CPA so as to ensure that a wider group of stakeholders is reached since each CPA affects different geographical positions and different groups of stakeholders.

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

This will be described at CPA level.

D.3. Summary of the comments received:

This will be addressed at the CPA level.

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

This will be addressed at the CPA level.

[5] Document available on : http://www.doe.gov.my/portal/wp-content/uploads/2010/07/Appendix_2.pdf. Last access on the 24/05/2011.

SECTION E. Application of a baseline and monitoring methodology

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

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

Table E.1: Titles and references applied to this project activity

Title	Reference	Version
Methane Recovery in Wastewater Treatment	AMS – III.H	Version 16, EB 58
Electricity generation by the user	AMS – I.A	Version 14, EB 54
Thermal energy production with or without electricity*	AMS – I.C	Version 19, EB 61
Grid connected renewable electricity generation*	AMS – I.D	Version 17, EB 61
Renewable electricity generation for captive use and mini-grid*	AMS – I.F	Version 02, EB 61
Standard for demonstration of additionality, development of Eligibility criteria and application of multiple methodologies for Programme of activities	Annex 3	Version 01.0, EB 65
General Guidelines to SSC CDM methodologies	Annex 21	Version 17, EB 61
Tool to calculate baseline, project and/or leakage emissions from electricity consumption	Annex 7	Version 01, EB 39
Tool to determine project emissions from flaring gases containing methane	Annex 13	Version 1, EB 28
Guidelines on the Assessment of Investment Analysis	Annex 5	Version 05, EB 62
Non-binding best practice examples to demonstrate additionality for SSC project activities	Annex 34	EB 35
Guidelines for Objective Demonstration and Assessment of Barriers	Annex 13	Version 01, EB 53
Attachment A of Appendix B	Annex 24	Version 08, EB 63
Guidelines on assessment of de-bundling for SSC project activities.	Annex 13	Version 03, EB 54

Note: * Choices of Type I methodology(ies) will be site specific based on the need for the gainfully use of biogas.

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

AMS-III.H

Criteria	Reference	Comments
a) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; b) Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; c) Introduction of biogas recovery and combustion to a sludge treatment system; d) Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an on site industrial plant; e) Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream; f) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential treatment step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery)	AMS – III.H., Point 1	The CPA to be implemented under this PoA will involve biogas recovery from biogenic organic matter in POME by means of one or a combination of the six options as in the Methodology.
In cases where baseline system is anaerobic lagoon the methodology is applicable if: (a) The lagoons are ponds with a depth greater than two meters, without aeration. The value for depth is obtained from engineering design documents, or through direct measurement, or by dividing the surface area by the total volume. If the lagoon filling level varies seasonally, the average of the highest and lowest levels may be taken (b) Ambient temperature above 15°C, at least during part of the year, on a monthly average basis (c) The minimum interval between two	AMS – III.H., Point 2	Open lagoon system is the common treatment method adopted by the millers. All criteria for the anaerobic lagoon will be ensuring under CPA level.

consecutive sludge removal events shall be 30 days		
The recovered methane measured may also be utilized for thermal or mechanical, electrical generation directly.	AMS – III.H., Point 3(a)	Besides flaring, the recovered biogas can also be combusted for thermal or electricity generation.
The recovered methane measured may also be utilized for thermal or mechanical, electrical energy generation after bottling of upgraded biogas	AMS – III.H., Point 3(b)	
The recovered methane measured may also be utilized for thermal or mechanical, electrical energy generation after upgrading and distribution	AMS – III.H., Point 3(c)	
The recovered methane measured may also be utilized for hydrogen production	AMS – III.H., Point 3(d)	
The recovered methane measured may also be utilized for use as fuel in transportation applications after upgrading.	AMS – III.H., Point 3(e)	
If the recovered biogas is used for project activities covered under paragraph 3(a), that component of the project activity can use a corresponding methodology under Type I.	AMS – III.H., Point 4	If it is apply, will ensure CPA complies the requirement of the methodology.
For project activities covered under paragraph 3 (b), if bottles with upgraded biogas are sold outside the project boundary, the end-use of the biogas shall be ensured via a contract between the bottled biogas vendor and the end-user. No emission reductions may be claimed from the displacement of fuels from the end use of bottled biogas in such situations. If however the end use of the bottled biogas is included in the project boundary and is monitored during the crediting period CO_2 emissions avoided by the displacement of fossil fuel can be claimed under the corresponding Type I methodology, e.g. AMS-I.C.	AMS-III.H., points 5	If it is apply, will ensure CPA complies the requirement of the methodology.
For project activities covered under paragraph 3(c)(i), emission reductions from the displacement of the use of natural gas are eligible under this methodology, provided the geographical extent of the natural gas distribution grid is within the host country boundaries.	AMS-III.H., points 6	If it is apply, will ensure CPA complies the requirement of the methodology.
For project activities covered under paragraph 3 (c) (ii), emission reductions for the displacement of the use of fuels can be claimed following the provision in the corresponding Type I methodology.	AMS-III.H., points 7	If it is apply, will ensure CPA complies the requirement of the methodology.
In particular, for the case of 3 (b) and (c) (iii), the physical leakage during storage and transportation	AMS-III.H., points 8	If it is apply, will ensure CPA complies the requirement of the

of upgraded biogas, as well as the emissions from fossil fuel consumed by vehicles for transporting biogas shall be considered. Relevant procedures in paragraph 11 of Annex 1 of AMS-III.H. Methane recovery in wastewater treatment shall be followed in this regard.		methodology.
For project activities covered under paragraph 3 (b) and (c), this methodology is applicable if the upgraded methane content of the biogas is in accordance with relevant national regulations (where these exist) or, in the absence of national regulations, a minimum of 96% (by volume).	AMS-III.H., points 9	If it is apply, will ensure CPA complies the requirement of the methodology.
If the recovered biogas is utilized for the production of hydrogen (project activities covered under paragraph 3(d)), that component of the project activity shall use corresponding methodology AMS-III.O.	AMS-III.H., points 10	If it is apply, will ensure CPA complies the requirement of the methodology.
If the recovered biogas is used for project activities covered under paragraph 3(e), that component of the project activity shall use corresponding methodology SSC-III.AQ.	AMS-III.H., points 11	If it is apply, will ensure CPA complies the requirement of the methodology.
New facilities (Greenfield projects) and project activities involving a change of equipment resulting in a capacity addition of the wastewater or sludge treatment system compared to the designed capacity of the baseline treatment system are only eligible to apply this methodology if they comply with the relevant requirements in the "General guidelines to SSC CDM methodologies". In addition the requirements for demonstrating the remaining lifetime of the equipment replaced, as described in the general guidelines shall be followed.	AMS-III.H., points 12	If it is apply, will ensure CPA complies the requirement of the methodology.
The location of the wastewater treatment plant as well as the source generating the wastewater shall be uniquely defined and described in the PDD.	AMS-III.H., point 13	The palm oil mill is the only source which generates the wastewater of the present project activity. The location of each CPA will be indentified by address, map and GPS coordinates.
Measures are limited to those that result in aggregate emissions reductions of less than or equal to 60 ktCO_2 equivalent annually from all Type III components of the project activity.	AMS-III.H., point 14	The emission reductions for the type III component will remain below 60 ktCO_{2e}/yr throughout the entire crediting period.

If/when Type I Small Scale Methodologies are applicable at CPA level, the justification of the choice of the methodology and of its applicability shall be described in the SSC-CPA-DD.

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

	Source	Gas	Included	Justification / Explanation
Baseline	Direct emissions from the wastewater treatment processes	CO_2	No	Neutral CO_2 emissions from biomass decaying
		CH_4	Yes	Methane emissions from anaerobic treatment process
		N_2O	No	Not significant. Excluded for simplification and conservativeness
	Emissions from electrical energy generation	CO_2	Yes	Main source of emission
		CH_4	No	Not significant. Excluded for simplification and conservativeness
		N_2O	No	Not significant. Excluded for simplification and conservativeness
	Emissions from thermal energy generation	CO_2	Yes	Main source of emission
		CH_4	No	Not significant. Excluded for simplification and conservativeness
		N_2O	No	Not significant. Excluded for simplification and conservativeness
Project Activity	Bio-digester / covered lagoon	CO_2	No	Neutral CO_2 emissions from biomass decaying
		CH_4	Yes	Methane emissions from anaerobic treatment process
		N_2O	No	Not significant. Excluded for simplification and conservativeness
	Existing wastewater treatment lagoons without biogas recovery	CO_2	No	Neutral CO_2 emissions from biomass decaying
		CH_4	Yes	Methane emissions from the treatment process
		N_2O	No	Not significant. Excluded for simplification and conservativeness
	Gas engine(s) (biogas combustion)	CO_2	No	Neutral CO_2 emissions from biogas combustion
		CH_4	No	Not significant and excluded from calculation. Biogas combustion efficiency is considered 100%[6]
		N_2O	No	Not significant. Excluded for simplification and conservativeness
	Biomass boilers (biogas combustion)	CO_2	No	Neutral CO_2 emissions from biogas combustion
		CH_4	No	Not significant and excluded from calculation. Biogas combustion efficiency is more than 99% in boiler.
		N_2O	No	Not significant. Excluded for simplification and conservativeness
	Emissions from electrical energy consumption	CO_2	Yes	Main source of emission
		CH_4	No	Not significant and excluded from calculation. Biogas combustion efficiency is considered 100%[7]
		N_2O	No	Not significant. Excluded for simplification and conservativeness
	Enclosed/open flaring system	CO_2	No	Neutral CO_2 emissions from biogas combustion
		CH_4	Yes	CH_4 emissions due to incomplete combustion in

[6] AMS-III.H, paragraph 35

[7] AMS-III.H, paragraph 35

				enclosed flare
		N_2O	No	Not significant. Excluded for simplification and conservativeness

Leakage emissions associated with CPAs will be accounted for in accordance with the requirements of the baseline and monitoring methodology.

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

The PoA and consequently each CPA applies the simplified baseline methodology for selected small-scale CDM project activity AMS-III.H "Methane recovery in wastewater treatment" Version 16.

Baseline shall be established on each CPA and the identified baseline must be in accordance with the procedures provided in the approved methodology of AMS-III.H. The Small-Scale CDM Programme Activity Design Document (CDM-SSC-CPA-DD) will describe in detail the baseline for each CPA after the baseline scenario has been identified.

For the avoidance of doubt, the baseline scenario corresponds to the existing wastewater treatment system without biogas recovery facility and without sludge treatment[8]. The anaerobic lagoons comply with the following characteristics[9]:

- their depth is 2.00 meters and they are not equipped with aerators;
- the ambient temperature is above 15°C (tropical area);
- the minimum interval between two (2) consecutive sludge removal events is greater than 30 days.

Baseline emissions for the systems affected by the project activity may consist of:

(i) Emissions on account of electricity or fossil fuel used ($BE_{power,y}$)
(ii) Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$)
(iii) Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$)
(iv) Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$)
(v) Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$)

Historical records of at least one year prior to the project implementation shall be used for baseline data where this is available[10]. This shall include the COD removal efficiency of the wastewater treatment systems, the amount of dry matter in sludge, power and electricity consumption per m^3 of wastewater treated, the amount of final sludge generated per tonne of COD removed and all other parameters required for determination of baseline emissions.

8 AMS-III.H, Para 1(f) and 17.
9 AMS-III.H, version 16, para 2
10 AMS-III.H, version 16, para 26

For wastewater treatment plant that has been operating for at least three years and if one year historical data is not available, the following procedures shall be followed[11]:

(a) All the available data in determining the required parameters (COD removal efficiency, specific energy consumption and specific sludge production) shall be used to determine the baseline emissions in year *y*;
(b) An *ex ante* measurement campaign shall be implemented to determine the required parameters (COD removal efficiency, specific energy consumption and specific sludge production). The measurement campaign shall be implemented in the baseline wastewater systems for at least 10 days. The measurements should be undertaken during a period that is representative for the typical operation conditions of the systems and ambient conditions of the site (temperature, etc). Average values from the measurement campaign shall be used and the result shall be multiplied by 0.89 to account for the uncertainty range (30% to 50%). The parameters from the measurement campaign are used to calculate the baseline emission in year *y*
(c) The baseline emissions in year *y* is taken as the minimum between the result of (a) and (b).

In the case of Greenfield and capacity addition projects, or existing plant without three year operating history, the following procedures shall be used to determine the baseline emissions:

(1) For existing plant without three year operating history, procedures in paragraph 27 of AMS IIIH (version 16) shall be followed

(2) For Greenfield and capacity addition projects, one of the following procedures shall be used:

(a) Value obtained from a measurement campaign in a comparable existing wastewater treatment plant i.e. having similar environmental and technological circumstances for example treating similar type of wastewater. Average values from the measurement campaign shall be used and the result shall be multiplied by 0.89 to account for the uncertainty range (30% to 50%) associated with this approach. The treatment plant and wastewater source can be considered as similar as the baseline plant, whereby the measurement campaign can be implemented when following conditions can be fulfilled:

(i) The two sources of wastewater (wastewater treated in the selected plant and from the project activity) are of the same type, e.g. either domestic or industrial wastewater;
(ii) The selected plant and the baseline plants employ the same treatment technology (e.g. anaerobic lagoons or activated sludge), and the hydraulic retention times in their biological and physical treatment systems do not vary by more than 20%; and
(iii) For project activity treating industrial wastewater, both industries have the same raw material and final products, and apply the same industrial technology. Alternatively, different industrial wastewaters may be considered as similar if the following requirements are fulfilled:

- The ratio COD/BOD (related to the proportion of biodegradable organic matter) does not differ by more than 20%; and

[11] AMS-III.H, version 16, para 27

- The ratio [total COD] / [soluble COD] (related to the proportion of suspended organic matter, and therefore to the sludge generation capacity) does not differ by more than 20%.

(a) Value provided by the manufacturer/designer of a Greenfield wastewater treatment plant using the same technology, demonstrated to be conservative, e.g. average values from the top 20 percent plants with lowest emission rate per ton COD removed among the plants installed in the last five years designed for the same country/region to treat the same type of wastewaters as the project activity.

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 SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA): >>

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

The project is a small scale project activity. As such, the provisions of Attachment A to Appendix B will apply to all CPAs that to be included ti this PoA-DD. The '*General Guidelines to SSC CDM methodologies*' require the project proponents to demonstrate that the project activity would not have occurred anyway due to *at least one* of the following barriers:

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

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

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

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

Subsequently, in its 35th and 50th Meeting, the EB had issued '*Non-binding best practice examples to demonstrate additionality for SSC project activities*', wherein EB had given best practice examples of each of the aforementioned category of barriers as well as "*Guidelines for objective demonstration and assessment of barriers*". The "*Tool for the demonstration and assessment of additionality*" can also be used to demonstrate additionality but it is not mandatory. Additionality will be assessed and demonstrated at the CPA level.

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

CPA implementers must demonstrate additionality based on the analysis contained in the previous section and should meet to *at least one* of the following barriers:

a) Investment barrier
b) Technological barrier
c) Barrier due to prevailing practice
d) Other barriers

CPA implementers that seek to recover biogas from bio-digester / covered lagoon, flaring and/or energy generation and gainfully use shall apply the criteria given in E.5.1 section and employ the sources of data indicated above to determine the additionality of the CPAs.

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 SSC-CPA:

The methodological choices that will be applied in relation to each of the CPAs to be developed under this PoA are based on the methodology AMS-III.H. (Version 16) and referred tools (see Section E.1 of this PoA-DD).

An *ex ante* estimate of emissions reductions should be provided in the CPA-DD. This requires projecting the future GHG emissions of the wastewater for the calculation of baseline emissions.

Determination of Baseline Emissions
In the context of this PoA, the methodology AMS-III.H. (Version 16) is applicable when the baseline scenario is NOT wastewater and sludge treatment systems equipped with a biogas recovery facility.

The *ex-ante* baseline emissions are calculated by taking into account of:

(i) Emissions on account of electricity or fossil fuel used ($BE_{power,y}$)

As per the procedures described in the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” and “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”

(ii) Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$)

Determined using the COD removal efficiency of the baseline plant.

(iii) Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$)

Determined using the methane generation potential of the sludge treatment systems.

(iv) Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$)

(v) Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$)

In case of flaring of biogas, the project emissions related to flaring will be determined *ex-post* using the *Tool to determine project emissions from flaring gases containing methane* (Version 1).

The *ex-post* baseline emissions will be calculated based on monitoring of the amount of methane captured, flared and/or gainfully used for thermal/power generation in year *y* and based on the amount of electricity generated using the biogas in year *y*.

Determination of Project Emissions
Project activity emissions from the systems affected by the project activity are:

(i) CO_2 emissions on account of power and fossil fuel used by the project activity facilities ($PE_{power,y}$)
(ii) Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{ww,treatment,y}$)
(iii) Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$)
(iv) Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$)
(v) Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$)
(vi) Methane fugitive emissions on account of inefficiencies in capture systems ($PE_{fugitive,y}$)
(vii) Methane emissions due to incomplete flaring ($PE_{flaring,y}$)
(viii) Methane emissions from biomass stored under anaerobic conditions which does not take place in the baseline situation ($PE_{biomass,y}$)

Determination of Leakage
No leakage effects need to be accounted.

Calculation of Emissions Reductions
Emission Reductions are calculated by subtracting project emissions from baseline emissions.

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

Baseline emissions

Source of baseline emissions	Reference
Wastewater and sludge treatment systems equipped with a biogas recovery facility shall be excluded from the baseline	AMS-III.H Point 17
Emissions on account of electricity or fossil fuel used ($BE_{power,y}$)	AMS-III.H Point 18 (i)
Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$)	AMS-III.H Point 18 (ii)
Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$)	AMS-III.H Point 18 (iii)
Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river ($BE_{ww,discharge,y}$)	AMS-III.H Point 18 (iv)
Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$)	AMS-III.H Point 18 (v)

$BE_y = (BE_{power,y}) + (BE_{ww,treatment,y}) + (BE_{s,treatment,y}) + (BE_{ww,discharge,y}) + (BE_{s,final,y})$		**Equation 1**
Where	*Description*	*Units*
BE_y	Baseline emissions in the year *y*	tCO_{2e}
$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year *y*	tCO_{2e}
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year *y*	tCO_{2e}
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year *y*	tCO_{2e}
$BE_{ww,discharge,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year *y*	tCO_{2e}
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year *y*	tCO_{2e}

Baseline emissions from electricity and fossil fuel consumption ($\boldsymbol{BE_{power,y}}$) are determined:

As per the procedures described in the "*Tool to calculate baseline, project and/or leakage emissions from electricity consumption*" and "*Tool to calculate project or leakage CO2 emissions from fossil fuel combustion*". The energy consumption shall include all equipment/devices in the baseline wastewater and sludge treatment facility. If recovered biogas in the baseline is used to power auxiliary equipment it should be taken into account accordingly, using zero as its emission factor.

$BE_{ww,treatment,y} = \sum_i (Q_{ww,i,y} * COD_{inflow,i,y} * \eta_{COD,BL,i} * MCF_{ww,treatment,BL,i}) * B_{o,ww} * UF_{BL} * GWP_{CH4}$		**Equation 2**
Where	*Description*	*Units*
$Q_{ww,i,y}$	Volume of wastewater treated in baseline wastewater treatment system *i* in year *y*	m^3 / year
$COD_{inflow,i,y}$	Chemical oxygen demand of the wastewater inflow to the baseline treatment system *i* in year *y*	$tCOD/m^3$
$\eta_{COD,BL,i}$	COD removal efficiency of the baseline treatment system *i*	-
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems *i* (MCF values as per table III.H.1.)	-
i	Index for baseline wastewater treatment system	-
$B_{o,ww}$	Methane producing capacity of wastewater (IPCC 2006 of 0.25)	$kgCH_4$ / kgCOD
UF_{BL}	Model correction factor to account for model uncertainties (0.89)	-
GWP_{CH4}	Global Warming Potential for methane (21)	-

$BE_{s,treatment,y} = \sum_j S_{j,BL,y} * MCF_{s,treatment,BL,j} * DOC_s * UF_{BL} * DOC_f * F * 16/12 * GWP_{CH4}$		**Equation 3**
Where	*Description*	*Units*
$S_{j,BL,y}$	Amount of dry matter in the sludge that would have been treated by the sludge treatment system *j* in the baseline scenario	mt / year
j	Index for baseline sludge treatment system	-
$MCF_{s,treatment,BL,j}$	Methane correction factor for the baseline sludge treatment system *j* (MCF values as per Table III.H.1)	-
DOC_s	Degradable organic content of the untreated sludge generated in the year *y* (fraction, dry basis). Default values of 0.5 for domestic sludge and 0.257 for industrial sludge shall be used	-
UF_{BL}	Model correction factor to account for model uncertainties (0.89)	-
DOC_f	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)	-
F	Fraction of CH_4 in biogas (IPCC default of 0.5)	-
GWP_{CH4}	Global Warming Potential for methane (21)	-

If the sludge is composted, the following equation shall be applied:

$BE_{s,treatment,y} = \sum_j S_{j,BL,y} * EF_{composting} * GWP_{CH4}$		**Equation 4**
Where	*Description*	*Units*
$S_{j,BL,y}$	Amount of dry matter in the sludge that would have been treated by	mt / year

	the sludge treatment system *j* in the baseline scenario	
$EF_{composting}$	Emission factor for composting organic waste (tCH_4 / t waste treated). Emission factors can be based on facility/site-specific measurements, country specific values or IPCC default values (Table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gas Inventories). IPCC default value is 0.01 tCH4 / t sludge treated on a dry weight basis.	-
GWP_{CH4}	Global Warming Potential for methane (21)	-

If the baseline wastewater treatment system is different from the treatment system in the project scenario, the sludge generation rate (amount of sludge generated per unit of COD removed) in the baseline may differ significantly from that of the project scenario. The monitored values of the amount of sludge generated during the crediting period will be used to estimate the amount of sludge generated in the baseline, as follows:

$S_{j,BL,y} = S_{l,PJ,y} * SGR_{BL} / SGR_{PJ}$		**Equation 5**
Where	*Description*	*Units*
$S_{l,PJ,y}$	Amount of dry matter in the sludge treated by the sludge treatment system *l* in year *y* in the project scenario	mt / year
SGR_{BL}	Sludge generation ratio of the wastewater treatment plant in the baseline scenario (t of dry matter in sludge / t COD removed). This ratio will be determined as per paragraphs 26, 27 or 28.	-
SGR_{PJ}	Sludge generation ratio of the wastewater treatment plant in the project scenario (t of dry matter in sludge / t COD removed). Calculated using the monitored values of COD removal and sludge generation in the project scenario.	-

$BE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,ww} * UF_{BL} * COD_{ww,discharge,BL,y} * MCF_{ww,BL,discharge}$		**Equation 6**
Where	Description	Units
$Q_{ww,y}$	Volume of treated wastewater discharged in year *y*	m^3 / year
GWP_{CH4}	Global warming potential of methane	-
$B_{o,ww}$	Methane producing capacity of wastewater (IPCC 2006 of 0.25)	$kgCH_4$ / kgCOD
UF_{BL}	Model correction factor to account for model uncertainties (0.89)	-
$COD_{ww,discharge, BL,y}$	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the baseline situation in the year *y* (tonnes/m^3). If the baseline scenario is the discharge of untreated wastewater, the COD of untreated wastewater shall be used	tonnes COD/m^3
$MCF_{ww,BL,discharge}$	Methane correction factor based on discharge pathway in the baseline situation (e.g. into sea, river or lake) of the wastewater (fraction) (MCF values as per table III.H.1)	-

$BE_{s,final,y} = S_{final,BL,y} * DOC_s * UF_{BL} * MCF_{s,BL,final} * DOC_f * F * 16/12 * GWP_{CH4}$		**Equation 7**
Where	*Description*	*Units*
$S_{final,BL,y}$	Amount of dry matter in the final sludge generated by the baseline wastewater treatment systems in the year *y*. If the baseline wastewater treatment system is different from the project system, it will be estimated using the monitored amount of dry matter in the final sludge generated by the project activity ($S_{final,PJ,y}$) corrected for the sludge generation ratios of the project and baseline systems as per equation 5.	mt / year
$MCF_{s,BL,final}$	Methane correction factor of the disposal site that receives the final sludge in the baseline situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site".	-
DOC_s	Degradable organic content of the untreated sludge generated in the year *y* (fraction, dry basis). Default values of 0.5 for domestic sludge and 0.257 for industrial sludge9 shall be used	-
DOC_f	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)	-
F	Fraction of CH_4 in biogas (IPCC default of 0.5)	-
UF_{BL}	Model correction factor to account for model uncertainties (0.89)	-
GWP_{CH4}	Global Warming Potential for methane (21)	-

<u>Project activity emissions:</u>

The project activity emission sources as per the methodology and their relevance with respect to the proposed CDM project activity are given below in a tabular format:

Source of project activity emission	**Reference**
CO_2 emissions on account of power and fossil fuel used by the project activity facilities ($PE_{power,y}$)	AMS-III.H, point 29(i)
Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{ww,treatment,y}$)	AMS-III.H, point 29 (ii)
Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$)	AMS-III.H, point 29 (iii)
Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$)	AMS-III.H, point 29 (iv)
Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$)	AMS-III.H, point 29 (v)
Methane fugitive emissions on account of inefficiencies in capture systems ($PE_{fugitive,y}$)	AMS-III.H, point 29 (vi)

Methane emissions due to incomplete flaring ($PE_{flaring,y}$)	AMS-III.H, point 29 (vii)
Methane emissions from biomass stored under anaerobic conditions which does not take place in the baseline situation ($PE_{biomass,y}$)	AMS-III.H, point 29 (viii)

Hence the formula for estimation of project activity emissions is:

$PE_y = PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww\ discharge,y} + PE_{s,final,y} + PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y}$		**Equation 8**
Where	*Description*	*Units*
PE_y	Project activity emissions in the year *y*	tCO_{2e}
$PE_{power,y}$	CO_2 emissions on account of power and fuel used by the project activity facilities	tCO_{2e}
$PE_{ww,treatment,y}$	Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y*	tCO_{2e}
$PE_{s,treatment,y}$	Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y*	tCO_{2e}
$PE_{ww,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater in year *y*	tCO_{2e}
$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge produced in year *y*	tCO_{2e}
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year *y*	tCO_{2e}
$PE_{biomass,y}$	Methane emissions from biomass stored under anaerobic conditions which would not have occurred in the baseline situation	tCO_{2e}
$PE_{flaring\ y}$	Methane emissions due to incomplete flaring	tCO_{2e}

<u>Where:</u>

Project emissions from electricity and fossil fuel consumption (**$BE_{power,y}$**) are determined:

As per the procedures described in the "*Tool to calculate baseline, project and/or leakage emissions from electricity consumption*" and "*Tool to calculate project or leakage CO2 emissions from fossil fuel combustion*".

$PE_{ww,treatment,y} = Q_{ww,k,y} * COD_{inflow,k,y} * \eta_{PJ,k,y} * MCF_{ww,treatment,PJ,k}) * B_{o,ww} * UF_{PJ} * GWP_{CH4}$		**Equation 9**
Where	*Description*	*Units*
$Q_{ww,k,y}$	Volume of wastewater treated in project activity wastewater treatment system *k* in year *y*	m^3 / year
$COD_{inflow,k,y}$	Chemical oxygen demand of the wastewater inflow to the project	$tCOD/m^3$

	activity treatment system *k* in year *y*	
$\eta_{PJ,k,y}$	Chemical oxygen demand removal efficiency of the project wastewater treatment system *k* in year *y* (t/m3), measured based on inflow COD and outflow COD in system *k*	-
$MCF_{ww,treatment,PJ,k}$	Methane correction factor for project wastewater treatment system *k* (MCF values as per table III.H.1.)	-
k	Index for project activity wastewater treatment system	-
$B_{o,ww}$	Methane producing capacity of wastewater (IPCC 2006 of 0.25)	$kgCH_4$ / kgCOD
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)	-
GWP_{CH4}	Global Warming Potential for methane (21)	-

$PE_{s,treatment,y} = S_{l,PJ,y} * MCF_{s,treatment,l} * DOC_s * UF_{PJ} * DOC_f * F * 16/12 * GWP_{CH4}$		**Equation 10**
Where	*Description*	*Units*
$S_{l,PJ,y}$	Amount of dry matter in the sludge treated by the sludge treatment system *l* in the project scenario in year *y*	mt / year
l	Index for project activity sludge treatment system	-
$MCF_{s,treatment,l}$	Methane correction factor for the project sludge treatment system *l* (MCF values as per Table III.H.1)	-
DOC_s	Degradable organic content of the untreated sludge generated in the year *y* (fraction, dry basis). Default values of 0.5 for domestic sludge and 0.257 for industrial sludge9 shall be used	-
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)	-
DOC_f	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)	-
F	Fraction of CH_4 in biogas (IPCC default of 0.5)	-
GWP_{CH4}	Global Warming Potential for methane (21)	-

If the sludge is composted, the following equation shall be applied:

$PE_{s,treatment,y} = S_{l,PJ,y} * EF_{composting} * GWP_{CH4}$		**Equation 11**
Where	*Description*	*Units*
$S_{l,PJ,y}$	Amount of dry matter in the sludge that would have been treated by the sludge treatment system *l* in the project scenario in year *y*	mt / year
$EF_{composting}$	Emission factor for composting organic waste (tCH_4 / t waste treated). Emission factors can be based on facility/site-specific measurements, country specific values or IPCC default values (Table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gas Inventories). IPCC default value is 0.01 tCH4 / t sludge treated on a dry weight basis.	-
GWP_{CH4}	Global Warming Potential for methane (21)	-

$PE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,ww} * UF_{PJ} * COD_{ww,discharge,PJ,y} * MCF_{ww,PJ,discharge}$		**Equation 12**
Where	*Description*	*Units*
$Q_{ww,y}$	Quantity of wastewater treated in year *y*	m^3 / year
$COD_{ww,discharge,PJ,,}$	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the project scenario in year *y*	Tonnes COD / m^3
$MCF_{ww,PJ,discharge}$	Chemical oxygen demand of the treated wastewater discharged into the sea, river or lake in the project scenario in year *y*	-
$B_{o,ww}$	Methane producing capacity of the treated wastewater (IPCC 2006 of 0.25)	$kgCH_4$ / kgCOD
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)	-
GWP_{CH4}	Global warming potential of methane (21)	-

$PE_{s,final,y} = S_{final,PJ,y} * DOC_s * UF_{PJ} * MCF_{s,PJ,final} * DOC_F * F * 16/12 * GWP_{CH4}$		**Equation 13**
Where	*Description*	*Units*
$S_{final,PJ,y}$	Amount of dry matter in final sludge generated by the project wastewater treatment systems in the year *y*	mt / year
$MCF_{s,PJ,final}$	Methane correction factor of the disposal site that receives the final sludge in the project situation, estimated as per the procedures described in the "*Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site*".	-
DOC_s	Degradable organic content of the untreated sludge generated in the year *y* (fraction, dry basis). Default values of 0.5 for domestic sludge and 0.257 for industrial sludge9 shall be used	-
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)	-
F	Fraction of CH_4 in biogas (IPCC default of 0.5)	-
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)	-
GWP_{CH4}	Global Warming Potential for methane (21)	-

For $\underline{PE_{fugitive,y}}$, option of a default value of 0.05 m^3 biogas leaked / m^3 biogas produced may be used as an alternative to calculations per equation 14 – 18 listed below:

$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$		**Equation 14**
Where	*Description*	*Units*
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year *y*	tCO_{2e}
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year *y*	tCO_{2e}

$PE_{fugitive,ww,y} = (1 - CFE_{ww}) * MEP_{ww,treatment,y} * GWP_{CH4}$		**Equation 15**
Where	*Description*	*Units*
CFE_{ww}	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems (default value of 0.9)	-
$MEP_{ww,treatment,y}$	Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year *y*	tonnes
GWP_{CH4}	Global warming potential of methane (21)	-

$MEP_{ww,treatment,y} = Q_{ww,y} * B_{o,ww} * UF_{PJ} * (COD_{removed,PJ,k,y} * MCF_{ww,treatment,PJ,k})$		**Equation 16**
Where	*Description*	*Units*
$Q_{ww,y}$	Quantity of wastewater treated in year *y*	m^3 / yr
$B_{o,ww}$	Methane producing capacity of the treated wastewater (IPCC 2006 of 0.25)	$kgCH_4$ / kgCOD
$COD_{removed,PJ,k,y}$	The chemical oxygen demand removed by the treatment system *k* of the project activity equipped with biogas recovery in the year *y*	tCOD / m^3
$MCF_{ww,treatment,PJ,k}$	Methane correction factor for the wastewater treatment system *k* equipped with methane recovery and combustion / flare / utilization equipment (MCF values table III.H.1)	-
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)	-

$PE_{fugitive,s,y} = (1 - CFE_s) * MEP_{s,treatment,y} * GWP_{CH4}$		**Equation 17**
Where	*Description*	*Units*
CFE_s	Capture efficiency of the biogas recovery equipment in the sludge treatment systems (default value of 0.9)	-
$MEP_{ww,treatment,y}$	Methane emission potential of sludge treatment systems equipped with a biogas recovery system in year *y*	tonnes
GWP_{CH4}	Global warming potential of methane (21)	-

$MEP_{s,treatment,y} = (S_{l,PJ,y} * MCF_{s,treatment,PJ,l}) * DOC_s * UF_{PJ} * DOC_F * F * 16/12$		**Equation 18**
Where	*Description*	*Units*
$S_{l,PJ,y}$	Amount of sludge treated in the project sludge treatment system *l* equipped with a biogas recovery system (on a dry basis) in year *y*	mt / yr
$MCF_{s,treatment,PJ,l}$	Methane correction factor for the sludge treatment system equipped with biogas recovery equipment (MCF values as per Table III.H.1)	-
DOC_s	Degradable organic content of the untreated sludge generated in the year *y* (fraction, dry basis). Default values of 0.5 for domestic sludge and 0.257 for industrial sludge9 shall be used	-
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)	-
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)	-
F	Fraction of CH_4 in biogas (IPCC default of 0.5)	-

Ex-ante calculation of $PE_{flaring,y}$

$PE_{flaring,y} = TM_{flared,y} * (1 - \eta_{flare,y}) * GWP_{CH4}$		**Equation 19**
Where	*Description*	*Units*
$PE_{flaring,y}$	Methane emissions due to incomplete flaring	tCO_{2e}/year
$TM_{flared,y}$	Quantity of methane flared in the year *y*	tonnes CH_4
$\eta_{flare,y}$	Flare efficiency during year *y*	%
GWP_{CH4}	Global warming potential of methane (21)	-

Where:

$TM_{flared,y} = BE_{ww,treatment,y} / GWP_{CH4}$		**Equation 20**
Where	*Description*	*Units*
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year *y*	tCO_{2e}
GWP_{CH4}	Global warming potential of methane (21)	-

Ex-post calculation of $PE_{flaring,y}$

$PE_{flaring,y} = \sum_{h=1}^{8,760} \{ TM_{flared,h} * (1 - \eta_{flare,h}) * GWP_{CH4} \}$		**Equation 21a**[12]
Where	*Description*	*Units*

[12] "Tool to determine project emissions from flaring gases containing methane", Annex 13, EB 28.

$PE_{flaring,y}$	Methane emissions due to incomplete flaring	tCO_{2e}/year
$TM_{flared,h}$	Mass flow rate of methane flared in the hour *h*	tCH_4/hour
$\eta_{flare,h}$	Flare efficiency in hour *h* based on default values for open flare	%
GWP_{CH4}	Global Warming Potential (GWP) of methane (21)	tCO_{2e}/tCH_4

$TM_{flared,h} = FV_{flared,h} * fv_{CH4,h} * \rho_{CH4,n} / 1,000$		**Equation 21b**
Where	*Description*	*Units*
$TM_{flared,h}$	Mass flow rate of methane flared in the hour *h*	tCH_4/hour
$FV_{flared,h}$	Volumetric flow rate of the biogas gas at normal conditions in hour *h*	Nm^3 biogas/hr
$fv_{CH4,h}$	Volumetric fraction of methane in the biogas gas in hour *h*	%
$\rho_{CH4,n}$	Density of methane at normal conditions	$kgCH_4$ / Nm^3CH_4

For $PE_{biomass,y}$, **w**ill be determined by using "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" if storage of biomass under anaerobic conditions takes place in the project and does not occur in the baseline.

Leakage emission:

If the used technology is equipment transferred from another activity, leakage effects at the site of the other activity are to be considered and estimated (LE_y).
If the project activity involves the replacement of equipment, the leakage due to the replacement in another activity is neglected as the replaced equipment will be scrapped. This will includes in the monitoring protocol. For this purpose scrapped equipment should be stored until it has been verified.

Emission reduction:

$ER_{y,ex\ ante} = BE_{y,ex\ ante} – (PE_{y,ex\ ante} + LE_{y,ex\ ante})$		**Equation 22**
Where	*Description*	*Units*
$ER_{y\ ex\ ante}$	*Ex ante* emission reduction in year *y*	tCO_{2e}
$BE_{y,ex\ ante}$	*Ex ante* baseline emissions in year *y*	tCO_{2e}
$PE_{y,ex\ ante}$	*Ex ante* project emissions in year *y*	tCO_{2e}
$LE_{y,ex\ ante}$	*Ex ante* leakage emissions in year *y*	tCO_{2e}

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

Data / Parameter:	**GWP_{CH4}**
Data unit:	tCO_2/tCH_4
Description:	Global Warming Potential, the equivalent in CO_2 of the effect of methane gas to the atmosphere
Source of data used:	IPCC 2006
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Global warming potential for methane gas since this is a methane capture project
Any comment:	

Data / Parameter:	**$MCF_{ww,treatment,BL,i}$**
Data unit:	Fraction
Description:	Methane correction factor for baseline wastewater treatment systems *i*
Source of data used:	Table III.H.1, AMS III.H version 16
Value applied:	Based on type of treatment systems
Justification of the choice of data or description of measurement methods and procedures actually applied :	Table III.H.1, AMS III.H version 16
Any comment:	

Data / Parameter:	**$B_{o, ww}$**
Data unit:	$kgCH_4$ / kgCOD
Description:	Methane generation capacity of treated wastewater
Source of data used:	IPCC 2006
Value applied:	0.25
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value as prescribed in the methodology
Any comment:	

Data / Parameter:	**UF_{BL}**
Data unit:	-
Description:	Model correction factor to account for model uncertainties (baseline)
Source of data used:	AMS III.H. version 16
Value applied:	0.89
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per methodology AMS-III.H, point 24
Any comment:	-

Data / Parameter:	**UF_{PJ}**
Data unit:	-

Description:	Model correction factor to account for model uncertainties (project activity)
Source of data used:	AMS III.H. version 16
Value applied:	1.12
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per methodology AMS-III.H, point 30(a)
Any comment:	-

Data / Parameter:	**CFE_{ww}**
Data unit:	Fraction
Description:	Capture efficiency of the biogas recovery equipment in the wastewater treatment system
Source of data used:	AMS III.H. version 16
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	A default value of 0.9 has been used as per the guidance in the methodology
Any comment:	

Data / Parameter:	**$MCF_{ww,treatment,PJ,k}$**
Data unit:	Fraction
Description:	Methane correction factor for the project wastewater treatment system equipped with biogas recovery equipment
Source of data used:	Table III.H.1, AMS III.H version 16
Value applied:	Based on type of treatment systems
Justification of the choice of data or description of measurement methods and procedures actually applied :	Table III.H.1, AMS III.H version 16
Any comment:	

Data / Parameter:	**$\eta_{COD,BL,i}$**
Data unit:	%
Description:	COD removal efficiency of the baseline system *i*
Source of data used:	10 days measurement campaign or 1 year historical records
Value applied:	10 days measurement campaign or 1 year historical records
Justification of the choice of data or description of measurement methods and procedures actually applied :	10 days measurement campaign or 1 year historical records
Any comment:	This data will be used for *ex post* emission reduction calculation

Data / Parameter:	**NCV_{CH4}**
Data unit:	MJ/kg

Description:	Net Calorific Value of methane
Source of data used:	IPCC 2006 Default Value
Value applied:	50.4
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC 2006 value is used; Volume 2, Chapter 1, Table 1.2
Any comment:	

Data / Parameter:	**NCV_{FF}**
Data unit:	MJ/kg
Description:	Net Calorific Value of fossil fuel
Source of data used:	IPCC 2006 Default Value
Value applied:	Depend on type of fossil fuel
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC 2006 value is used; Volume 2, Chapter 1, Table 1.2
Any comment:	

Data / Parameter:	**DOC_s**
Data unit:	fraction
Description:	Degradable organic content of the untreated sludge generated in the year *y* (dry basis)
Source of data used:	Default value, AMS-III.H. ver 16
Value applied:	Refer to CPA
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per methodology.
Any comment:	

Data / Parameter:	**$MCF_{s,treatment,BL,j}$**
Data unit:	fraction
Description:	Methane correction factor for the baseline sludge treatment system *j*
Source of data used:	Default value, AMS-III.H. ver 16
Value applied:	Refer to CPA and based on type of sludge treatment system
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per methodology.
Any comment:	

Data / Parameter:	**DOC_F**
Data unit:	fraction
Description:	Fraction of degradable organic content dissimilated to biogas
Source of data used:	Default value, AMS-III.H. ver 16

Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per methodology.
Any comment:	

Data / Parameter:	**F**
Data unit:	fraction
Description:	Fraction of CH4 in biogas
Source of data used:	Default value, AMS-III.H. ver 16
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per methodology.
Any comment:	

Data / Parameter:	$\mathbf{EF_{composting}}$
Data unit:	t CH4/t waste (sludge) treated
Description:	Emission factor for composting organic waste
Source of data used:	Default value, AMS-III.H. ver 16
Value applied:	0.01 (dry weight basis)
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per methodology.
Any comment:	Emission factors can be based on facility/site-specific measurements, country specific values or IPCC default values (Table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gas Inventories)

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

D.7.1. Data and parameters to be monitored by each SSC-CPA:

Data / Parameter:	$\mathbf{Q_{ww,y}}$
Data unit:	m^3 / month
Description:	The flow of wastewater entering the wastewater treatment system
Source of data to be used:	Measurement by project participant by using a flowmeter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to	The flow is measured with an online flow meter or equivalent

be applied:	
QA/QC procedures to be applied:	• Data are monitored continuously and recorded periodically (monthly or at shorter interval) in a data log file (DLF). • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every three (3) years
Any comment:	

Data / Parameter:	**$COD_{ww,untreated,y}$**
Data unit:	tCOD / m^3
Description:	Raw COD of wastewater entering the wastewater treatment system
Source of data to be used:	Laboratory (internal and external)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	Measure of COD according to national or international standards. COD is measure through representative sampling.
QA/QC procedures to be applied:	• Minimum once a month COD sampling to ensure a 90/10 confidence/precision level • COD reports are recorded manually • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every three (3) years for internal laboratory equipment
Any comment:	

Data / Parameter:	**$COD_{ww,treated,y}$**
Data unit:	tCOD / m^3
Description:	COD of treated wastewater leaving the wastewater treatment system
Source of data to be used:	Laboratory (internal and external)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	Measure of COD according to national or international standards. COD is measure through representative sampling.
QA/QC procedures to be applied:	• Minimum once a month COD sampling to ensure a 90/10 confidence/precision level • COD reports are recorded manually • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every three (3) years for internal laboratory equipment
Any comment:	

Data / Parameter:	**$COD_{ww,discharge,y}$**
Data unit:	$tCOD / m^3$
Description:	COD of treated wastewater discharge by treatment system
Source of data to be used:	Laboratory (internal and external)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	Measure of COD according to national or international standards. COD is measure through representative sampling.
QA/QC procedures to be applied:	• Minimum once a month COD sampling to ensure a 90/10 confidence/precision level • COD reports are recorded manually • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every three (3) years for internal laboratory equipment
Any comment:	

Data / Parameter:	**$S_{j,PJ,y}$**
Data unit:	mt
Description:	Amount of dry matter in the sludge treated by the sludge treatment system in the project scenario
Source of data to be used:	Measured during the project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	Monitoring of 100% of the sludge amount through continuous or batch measurements and moisture content through representative sampling
QA/QC procedures to be applied:	• Sampling to ensure a 90/10 confidence/precision level • The volume (m^3) and density or direct weighing may be used to determine the sludge amount • Representative samples are taken to determine the moisture content to calculate the total sludge amount on dry basis • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every three (3) years for internal laboratory equipment
Any comment:	- If the methane emissions from anaerobic decay of the final sludge are to be neglected because the sludge is controlled, combusted, disposed of in a landfill with methane recovery, or used for soil application, then the end-use of the final sludge will be monitored during the crediting period

	- If the baseline emissions include the anaerobic decay of final sludge generated by the baseline treatment systems in a landfill without methane recovery, the baseline disposal site shall be clearly defined, and verified by the DOE

Data / Parameter:	$S_{final,PJ,y}$
Data unit:	mt
Description:	Amount of dry matter in the final sludge generated by the project activity
Source of data to be used:	Measured during the project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	Monitoring of 100% of the sludge amount through continuous or batch measurements and moisture content through representative sampling
QA/QC procedures to be applied:	• Sampling to ensure a 90/10 confidence/precision level • The volume (m^3) and density or direct weighing may be used to determine the sludge amount • Representative samples are taken to determine the moisture content to calculate the total sludge amount on dry basis • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every three (3) years for internal laboratory equipment
Any comment:	- If the methane emissions from anaerobic decay of the final sludge are to be neglected because the sludge is controlled, combusted, disposed of in a landfill with methane recovery, or used for soil application, then the end-use of the final sludge will be monitored during the crediting period - If the baseline emissions include the anaerobic decay of final sludge generated by the baseline treatment systems in a landfill without methane recovery, the baseline disposal site shall be clearly defined, and verified by the DOE

Data / Parameter:	**End-use of the final sludge**
Data unit:	–
Description:	The final sludge generated by the project activity will be sent to control landfill site, if any
Source of data to be used:	By project participant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	The final disposal of the sludge will be monitored during the crediting period, if any. For each disposal of the sludge, the following will be recorded; disposal site and date of disposal.

QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$FV_{flared,h}$
Data unit:	Nm^3 / hour
Description:	Volumetric flow of biogas recovered and flared at normal conditions in the hour *h*
Source of data to be used:	Measured during the project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	The volume of biogas will be measured with a normalised flow meter or calculated from the volumetric flow, pressure, temperature. Biogas volume and methane content measurements shall be on the same basis (wet or dry).
QA/QC procedures to be applied:	• The biogas flow is monitored continuously, recorded and stored electronically in a data log file (DLF) (monthly or at shorter interval). • Uncertainty level of data: low • Maintenance and calibration as per manufacturer’s specifications or at least once every 3 years
Any comment:	

Data / Parameter:	$FV_{fuelled,h}$
Data unit:	Nm^3 / hour
Description:	Volumetric flow of biogas recovered and fuelled at normal conditions in the hour *h*
Source of data to be used:	Measured during the project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	The volume of biogas will be measured with a normalised flow meter or calculated from the volumetric flow of biogas, pressure, temperature. Biogas volume and methane content measurements shall be on the same basis (wet or dry).
QA/QC procedures to be applied:	• The biogas flow is monitored continuously, recorded and stored electronically in a data log file (DLF) (monthly or at shorter interval). • Uncertainty level of data: low • Maintenance and calibration as per manufacturer’s specifications or at least once every 3 years
Any comment:	

Data / Parameter:	$\mathbf{w_{CH4,h}}$
Data unit:	%
Description:	Methane content in biogas in same basis (wet/dry) as the biogas flows in year *y*
Source of data to be used:	By project participant using a gas analyzer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	Using calibrated gas analyzer either continuous or periodical measurement at confidence/precision level of 90/10.
QA/QC procedures to be applied:	• In case a continuous gas analyser is used, data will be recorded and stored electronically in a data log file (DLF) every hour or at shorter interval. • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every 3 years.
Any comment:	• See also clarification by EB Meth Panel, 30/10/2009 – SSC_360. http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QS83SX5B7WM6UGZE31JYQEQ4F65F6V • The biogas flow and the methane content measurements shall be carried out close to each others

Data / Parameter:	$\mathbf{T_{biogas}}$
Data unit:	ºC
Description:	Temperature of biogas
Source of data to be used:	Temperature probe
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	By project participant
QA/QC procedures to be applied:	• Shall be measured and recorded at the same time when methane content in biogas is measured. • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every 3 years.
Any comment:	Pressure and temperature are required to determine the density of the methane. If the biogas flow meter employed measures flow, pressure and temperature and displays/outputs normalised flow of biogas, there is no need to separate monitoring of pressure and temperature of the biogas.

Data / Parameter:	$\mathbf{P_{biogas}}$
Data unit:	Bar(g)

Description:	Pressure of biogas
Source of data to be used:	Measured during the project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	Pressure measurement device
QA/QC procedures to be applied:	• Shall be measured and recorded at the same time when methane content in biogas (ID8) is measured. • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every three (3) years
Any comment:	• Pressure and temperature are required to determine the density of the methane. If the biogas flow meter employed measures flow, pressure and temperature and displays/outputs normalised flow of biogas, there is no need to separate monitoring of pressure and temperature of the biogas. • Shall be measured at the same time when methane content in biogas is measured

Data / Parameter:	$\eta_{flare,h}$
Data unit:	%
Description:	Flare efficiency in the hour *h*
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	This yearly efficiency will be based on hourly flare efficiencies calculated as per the provisions in the "Tool to determine project emissions from flaring gases containing methane".
QA/QC procedures to be applied:	• Data are logged hourly in a data log file (DLF). • Uncertainty level of data: low
Any comment:	

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh
Description:	Quantity of net electricity generated and send to grid in year
Source of data to be used:	Measured during the project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to	The electricity generated or send to 3rd party is measured continuously with an energy meter (cumulative readings).

be applied:	Measurement results shall be cross-checked with records of sold / purchased electricity (e.g. invoices/receipts)
QA/QC procedures to be applied:	• Data are monitored continuously and recorded periodically (yearly or at shorter interval) in a data log file (DLF). • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every 3 years.
Any comment:	

Data / Parameter:	**$EC_{PJ,y}$**
Data unit:	MWh
Description:	The yearly grid electricity consumption of the project activity for the year '*y*'
Source of data to be used:	Measured during the project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	The electricity consumed is measured continuously with an energy meter (cumulative readings).
QA/QC procedures to be applied:	• Data are monitored continuously and recorded periodically (yearly or at shorter interval) in a data log file (DLF). • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every 3 years.
Any comment:	

Data / Parameter:	**Displacement of Biomass**
Data unit:	mt
Description:	Total amount of biomass (PKS and mesocarp fibre) displaced due to the project activity
Source of data to be used:	Weighing bridge or equivalent
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	All biomass (PKS and mesocarp fibre) displaced due to the project activity will be weighed
QA/QC procedures to be applied:	• Monthly calculation based on every single trip of trucks recorded • Data is recorded manually in a data log file based on the weighing records • Maintenance and calibration as per manufacturer's specifications • Uncertainty level of data: low
Any comment:	Will determine the storage conditions in both baseline and project

	activity.

Data / Parameter:	**$EG_{mill,y}$**
Data unit:	MWh
Description:	Quantity of annual output of renewable energy sent to the mill in year *y*
Source of data to be used:	By project participant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	The electricity generated and sent to mill to displace diesel use in diesel gensets is measured continuously with an energy meter (cumulative readings).
QA/QC procedures to be applied:	• Data are monitored continuously and recorded periodically (yearly or at shorter interval) in a data log file (DLF). • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once every 3 years.
Any comment:	As per AMS-I.A

Data / Parameter:	**$FC_{FF,y}$**
Data unit:	liter
Description:	Fossil fuel usage due to the project activity
Source of data to be used:	Measured during the project activity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined in each CPA
Description of measurement methods and procedures to be applied:	The fossil fuel usage for project activity is monitored and recorded based on fuel meter reading / direct measurement into log book. Counter check with purchasing invoice of fossil fuel.
QA/QC procedures to be applied:	• Data are recorded manually and stored electronically in a data log file (DLF). • Data are aggregated monthly or at shorter interval • Uncertainty level of data: low • Maintenance and calibration as per manufacturer's specifications
Any comment:	As per "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"

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

The monitoring plan details the necessary actions to monitor and record all the data parameters required by the applied methodology for each CPA. Monitoring will be carried out by the site operators at each individual site. The purpose of the monitoring plan is to determine the emission reductions achieved by each CPA. Details of the CPA monitoring plans will be described in each CPA-DD.

MONITORING EQUIPMENT

The flare unit is equipped with the following instruments to capture the required data:

Instrument	**Data monitored**	
Flowmeter	$F_{CH4,sent\_flare,y}$ $F_{CH4,EL,y}$ $F_{CH4,PJ,y}$	Amount of methane in the biogas which is sent to the flare Amount of methane in the biogas which is used for electricity generation Amount of methane in the biogas which is flared and/or used in the project activity
Pressure sensor	P_t	Pressure of the biogas (not monitored when using flowmeter that automatically measures temperature and pressure, expressing biogas volumes in normalised cubic meters)
Temperature sensor	T_t	Temperature of the biogas
Gas analyser	$v_{CH4,t,db}$	Fraction of methane in biogas
Exhaust gas analyzer	$fv_{CH4,FG,h}$ $t_{O2,h}$	Concentration of methane in the exhaust gas Volumetric fraction of O_2 in the exhaust gas
Thermocouple	T_{flare}	Temperature of in the exhaust gas of the flare
Electricity meter	$EC_{PJ,y}$	Electricity consumed by the equipment
Electricity meter	$EC_{BL,k,y}$	Net amount of electricity generated using biogas
Counter		Operating hours of the power plant

DATA LOGGING, TRANSMISSION AND STORAGE

- ✓ The data measured by the instruments will be collected and stored in a data logging system. The data will be retrieved remotely by modem or directly on site.
- ✓ If automatic data logging failed, the data will be recorded manually, if possible.
- ✓ If data cannot be retrieved, no emissions reductions will be claimed for the period of data failure.
- ✓ The data collected will be stored in a central data base. Access to production data will be restricted.
- ✓ Copies of the files will be stored up to two years after the end of the crediting period or the last issuance of CERs for this project activity whichever occurs later.

CALIBRATION AND MAINTENANCE PROCEDURES, MALFUNCTION OF EQUIPMENT

Maintenance includes all preventive and corrective actions necessary for the good functioning of the equipment, such as:

- ✓ Visual control of the equipment state and real-time check of displayed parameters,
- ✓ Cleaning up the equipment and the sensors,
- ✓ Adding lubricant,
- ✓ Replacement and change of defective parts.

Calibration of equipment consists in verifying, by comparison with a standard, the accuracy of a measuring instrument. Measuring instruments will be periodically and appropriately calibrated according to the procedures, timing and methods recommended by the manufacturer or national/international standards, as available.

General malfunction of equipment:
If the equipment fails, the supplier will be notified and repairs will be carried out. If the damaged equipment cannot be repaired, it will be replaced at the earliest by the same or an equivalent unit. In some cases, portable tools will be used in order to carry out daily monitoring of the missing parameter(s). This data will be recorded manually.

Discrepancies:
To avoid discrepancies between projected data in the DDs and actual data (e.g. due to deferred starting date, malfunction of equipment), cross-checks between internal meter readings and external sources (e.g. electricity invoices) will be carried out. Any source of inconsistencies will be clarified.

Case of emergency:
For the case of emergency (earthquakes, explosions, fires etc.), an emergency preparedness plan will be adapted to the project activity. All employees involved in the project on-site will be trained in the code of conduct and required actions at time of commissioning of the plant.

MANAGERIAL RESPONSIBILITIES

The CME will be responsible for the CDM aspects of the project. The CME may outsource some CDM tasks.

The CPA implementer will be responsible for the operation of the project.
See more details in section A.4.4.1 and A.4.4.2 above.

QUALITY ASSURANCE & QUALITY CONTROL

- ✓ The Monitoring Department will be responsible for the monitoring report. As such, it will be empowered to control consistency of monitored data by any means, such as on-site audit, visual control of data on the server, cross-checking of data on the server with data provided by the field technician and/or the maintenance director and/or the monitoring director.

- ✓ Proper management processes and systems records will be kept by the monitoring director. The auditors can require copies of such records to judge compliance with the required management processes.

TRAINING OF MONITORING PERSONNEL

Employees involved in the monitoring will be trained internally and/or externally. Training will include:
a) Review of equipment and sensors
b) Calibration requirement

c) Configuration of monitoring equipment
d) Maintenance requirement

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)

The baseline study was completed on 12/03/2012 by Ably Carbon.

Annex 1

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

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The PoA has not received any public funding. Any public funding that may be provided to individual CPA will be described in the corresponding CPA-DD. In case public funding is received for a CPA, an affirmation will be provided that such funding does not result in a diversion of ODA.

Annex 3

BASELINE INFORMATION

Year	2008	2009	2010	2011	1 2012	2 2013	3 2014
FFB (mt/yr)							
POME Volume (cu.m/yr)							
Mill Operating hour (hr/yr)							

4 2015	5 2016	6 2017	7 2018	8 2019	9 2020	10 2021

10 days measurement campaign (One year historical data) for baseline wastewater treatment system (*example*)

Day	ETP		
	Inlet Anaerobic system (mg/l)	Outlet Anaerobic system (mg/l)	Final Discharge to River (mg/l)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Average			

	ETP
COD removal efficiency (anaerobic system)	
COD removal efficiency (aerobic system)	
Total COD removal efficiency of the treatment system	

*The COD of the raw effluent during ex-post may vary from the one year historical records depending on the improvement of the production process (outside of project boundary), thus $ER_{ex\text{-}post}$ may vary from the estimated $ER_{ex\text{-}ante}$.

Annex 4

MONITORING INFORMATION

Please refer to section E.7.2. - Description of the monitoring plan for a CPA