Monitoring report form for CDM project activity
(Version 07.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT		
Title of the project activity	Methane Capture and Utilization Project at Melewar Palm Oil Mill, Malaysia	
UNFCCC reference number of the project activity	6488	
Version number of the PDD applicable to this monitoring report	03.1	
Version number of this monitoring report	01	
Completion date of this monitoring report	30/09/2020	
Monitoring period number	01	
Duration of this monitoring period	24/06/2016 to 31/12/2019 (first and last days included)	
Monitoring report number for this monitoring period	01	
Project participants	1. Melewar Properties Sdn Bhd (Host; Project owner) 2. Perenia Pty Ltd (Australia)	
Host Party	Malaysia	
Applied methodologies and standardized baselines	AMS-III.H Methane recovery in wastewater treatment version16.0	
Sectoral scopes	Sectoral Scope 13: Waste handling and disposal	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	85,262 tCO_2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	187,552 tCO_2e	

SECTION A. Description of project activity

A.1. General description of project activity

>> The “Methane Capture and Utilization Project at Melewar Palm Oil Mill”, Malaysia (“the project activity”) is implemented at the Melewar Palm Oil Mill (“the mill”) located at 1.6 km off the 45 km Lahad Datu Sandakan Highway, Sabah. The proposed project activity is implemented by Melewar Properties Sdn Bhd (“the project owner[1]”).

The aim of the project activity is to capture anthropogenic methane emissions from the Palm Oil Mill anaerobic effluent treatment system and utilize the methane gas to generate renewable energy. The project entails the installation of a new covered anaerobic digester tank system equipped with methane capture and collection system to replace existing open anaerobic ponds “Watermech WM Closed Tank Anaerobic Digester System”. The biogas recovered is supplied to biogas engine system. Any excess biogas would be flared in an enclosed flare and/or biomass boiler system. The project activity results in GHG emission reduction due to methane avoidance from anaerobic open lagoons.

It is estimated that the project activity would reduce 53,232 tCO_2e annually. This is the first monitoring period of the project activity which starts from 24/06/2016 to 31/12/2019. The total emission reduction project during the monitoring period is 85,262 tCO_2e.

A.2. Location of project activity

>> The project activity site is located within the Melewar Palm Oil Mill located at 1.6 km off the 45 km Lahad Datu – Sandakan Highway, Lahad Datu, Sabah in East Malaysia.

The project activity GPS coordinates are: 5° 16’ 17” N, 118° 3’ 7” E.

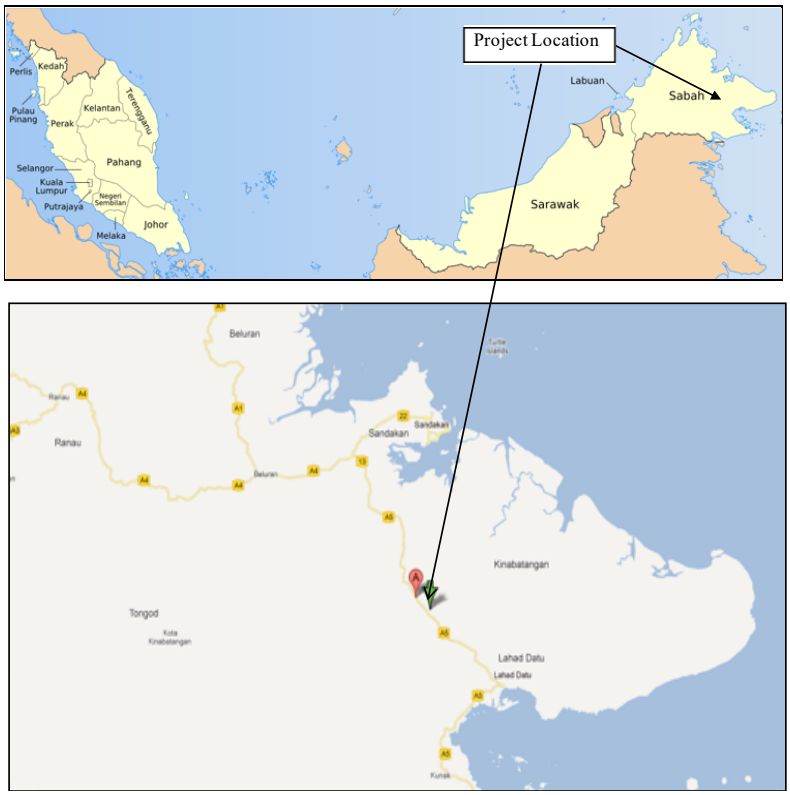


Figure 1: Map of Malaysia, Indicating the Location of Sabah State and Location of Mill

[1] Business Registration Form

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Malaysia (host Party)	Melewar Properties Sdn Bhd	No
Australia	Perenia Pty Ltd (Private)	No

A.4. References to applied methodologies and standardized baselines

>> The applied methodology is AMS-III.H. "Methane Recovery in Wastewater Treatment" (Version 16.0)

Reference to the methodology applied in the project activity;
https://cdm.unfccc.int/methodologies/DB/K7FDTJ4FL3432I1UKRNKLDCUFAMBX7

In accordance with the provisions of AMS-III.H. (Version 16), the following methodological tools are used:

- "Project emissions from flaring" (Version 3.0, EB 102 annex 6)
- "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version3.0, EB 96 annex 5)"

Reference to the tools applied in the project activity:
https://cdm.unfccc.int/Reference/tools/index.html

A.5. Crediting period type and duration

>> Type of crediting period: Fixed crediting period
Duration of the crediting period: 24/06/2016[2] to 23/06/2026
Length of crediting period: 10 years

Current monitoring period: 24/06/2016 to 31/12/2019
Length of current monitoring period: 3 years 6 months

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

>> Methane Capture and Utilization Project at Melewar Palm Oil, Malaysia has been implemented at the Melewar palm oil mill in Lahad Datu, Sabah in East Malaysia. The processing of crude palm oil from fresh palm fruit bunches (FFB) produces large amounts of Palm Oil Mill Effluent (POME) with high organic matter. The mill has a processing capacity of 384,000 tons[3] of FFB. Each tonne of FFB processed results in approximately 0.65 m^3 of POME produced[4].

In the baseline scenario, POME would have been treated via a series of open anaerobic ponds, while electricity would have been generated primarily from biomass-based boilers. The project activity involves the installation of a new covered anaerobic digester tank system equipped with methane capture and collection system to replace existing open anaerobic ponds. Methane

[2] Successful commissioning and handing over of Biogas capture and anaerobic digester as per commissioning report from Watermech Engineer Sdn. Bhd. (technology provider)
[3] Palm Oil Mill Board (MPOB) Processing Capacity License_ Melewar
[4] LudinN, Bakri MM, HashimM, SawillaB, MenonN, MokhtarH. "Palm Oil Biomass for Electricity Generation in Malaysia"; 2004.p.1–6. Pusat Tenaga Malaysia, Malaysia Palm Oil Board, SIRIM Berhad

captured from the anaerobic digester system is transferred to a biogas engine system for electricity generation.

An enclosed flare system and biogas burner were installed in order to combust excess biogas generated from project activity. However, the scope of biogas utilisation has been excluded from the project activity.

Technology of the small-scale project activity

Project activity implements Watermech WM Closed Tank Anaerobic Digester System. Raw POME undergoes hydrolysis and acidification process at the buffering ponds. The larger materials in POME are screened off prior to being pumped and distributed to the first stage digester system. The discharge from the first stage digester system overflows to the second stage digester system, while the effluent from the second digester tanks would be recycled and returned to the first stage digester system for better mixing and to maintain optimum percentage total solid. Treated effluent from the second stage digester system overflows to the existing aerobic pond, settling pond and subsequently to an existing effluent polishing plant, prior to discharge to land irrigation. Digested sludge from the project activity is used for land application in the plantation. The sludge is not stored for longer periods, no anaerobic conditions develop.

The generated biogas is channelled through a desulphurisation plant before being transferred to biogas engine system[5]. The auxiliary power consumption of the project activity is sourced from the renewable energy generated from the biogas engine. The net electricity generated from the gas engine is supplied back to mill and for other uses e.g. to staff quarters, plantation offices and other down-stream plants. Any excess biogas would be flared in an enclosed flare and/or biomass boiler system. Figure 2 illustrates the overall treatment process in detail.

Implementation status of the project activity during the monitoring period;
The details of implementation and actual operation of project activity, which conducted in this monitoring period, is provided in the following table. The data monitoring of the project activity was carried out as described in the registered PDD.

Table 1: The operation status of the project activity

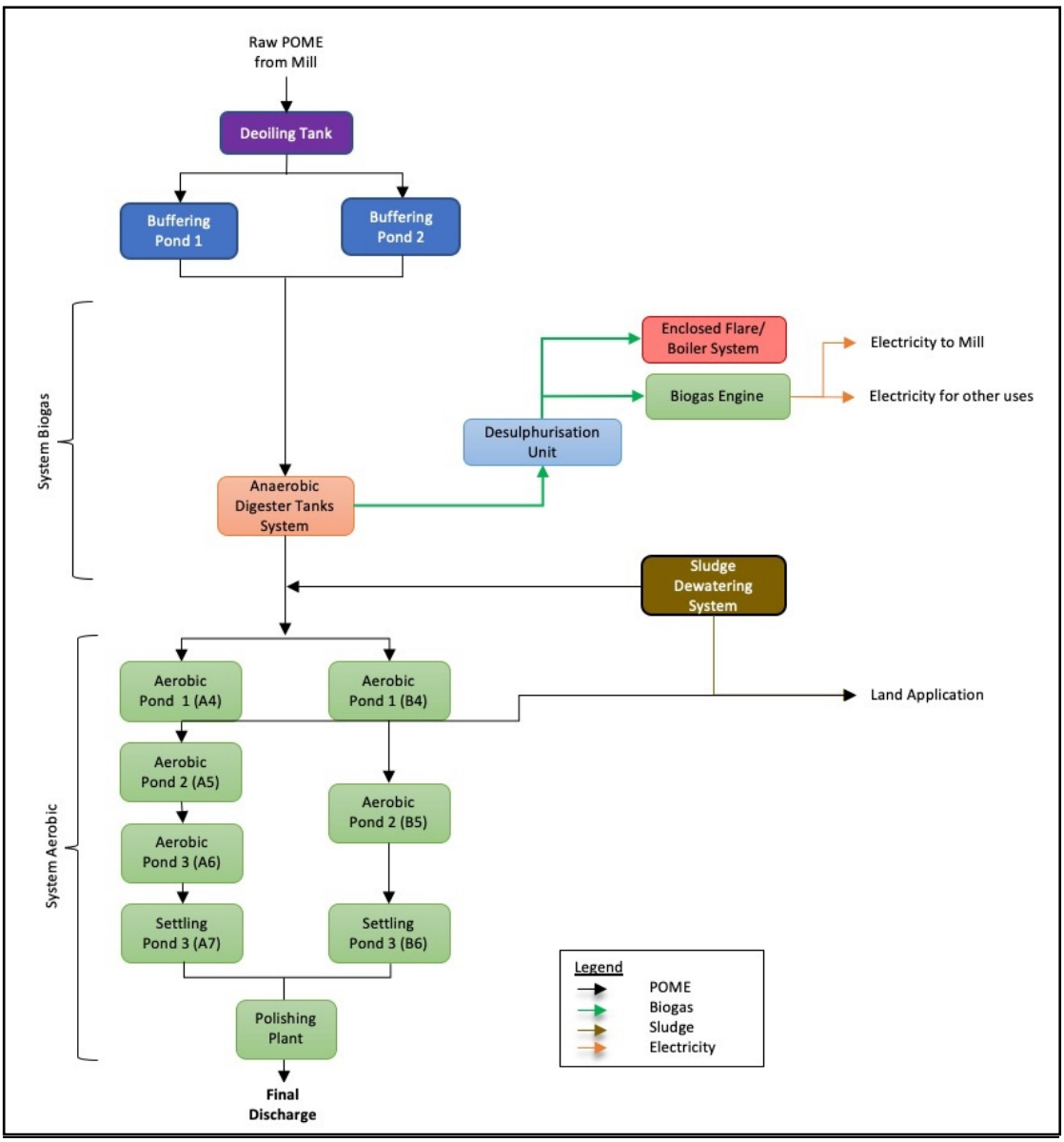
Event	Date	References
The project owner signed "Letter of Acceptance of Offer" with the Watermech Engineering Sdn.Bhd.	05/08/2011	Contract between Melewar Properties Sdn. Bhd. and Watermech
Construction start date (start of surveying works)	October, 2012	Melewar Biogas plant project work timeline
Registration under CDM scheme	02/10/2012	UNFCCC website
Commissioning of project activity (COD – commercial operation date)	24/06/2016	Commissioning report by Watermech; Successful commission and Handover
PRC approval date (refer to section B.2) - Change on project crediting period start date - Permanent changes to the registered PDD on GWP values - Change in project design	28/09/2020	Reference: PRC-6488-001[6]
First Monitoring period	24/06/2016 to 31/12/2019	Refer to this report

Further information in this period, the calibration of the equipment was conducted as per the registered monitoring plan. In case of calibration delay, the measured values during the delay period were adjusted by applying the maximum value between an identified error or maximum

[5] General Specification of System & Project Process Flow by Watermech
[6] https://cdm.unfccc.int/PRCContainer/DB/prcp501737554/view

permissible error as per equipment specification for a conservative manner, which is in line with the latest version of clean development mechanism validation and verification standard (VVS).

Figure 2 Process Flow Diagram of Project Activity



B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

>> No temporary deviations from registered monitoring plan or applied methodology during the monitoring period.

B.2.2. Corrections

>> There was no correction to the project information or parameters fixed at registration of the CDM project activity as described in the registered PDD. Thus, this section is not applicable.

B.2.3. Changes to the start date of the crediting period

>> The start date of crediting period was changed from “01/01/2013 – 31/12/2022” to “24/06/2016 – 23/06/2026”. The change of the start date is the change that has been approved by the Board

and that affects the start of this monitoring period. The changed start date is the start of this monitoring period.

PRC status: Approved
The approval date: 28/09/2020
Reference: PRC-6488-001
Link: https://cdm.unfccc.int/PRCContainer/DB/prcp501737554/view

B.2.4. Inclusion of monitoring plan

>> None of inclusion of a monitoring plan to registered PDD is considered during this current monitoring period.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

>> There was a change to project information or parameters fixed at the registration of the project activity. Project participant has updated the Global Warming Potential for methane - CH_4 (from 21 to 25) corresponding to the Ex-ante parameter "GWP_{CH4}" fixed at registration of the CDM project activity. The ex-ante emission reductions were changed from 44,715 tCO_2e to 53,232 tCO_2e.

This change has been approved by the Board as applicable from this monitoring period.

PRC status: Approved
The approval date: 28/09/2020
Reference: PRC-6488-001
Link: https://cdm.unfccc.int/PRCContainer/DB/prcp501737554/view

B.2.6. Changes to project design

>> The composting plant and biogas utilization have been excluded from the project boundary. The reason for change is to avoid complexity and future confusion. Since the end use sludge has been utilized for soil application. The emission from the final sludge are to be neglected.

This change has been approved by the Board as applicable from this monitoring period.

PRC status: Approved
The approval date: 28/09/2020
Reference: PRC-6488-001
Link: https://cdm.unfccc.int/PRCContainer/DB/prcp501737554/view

B.2.7. Changes specific to afforestation or reforestation project activity

>> This project activity is not afforestation nor reforestation project activity. Thus, this section is not applicable.

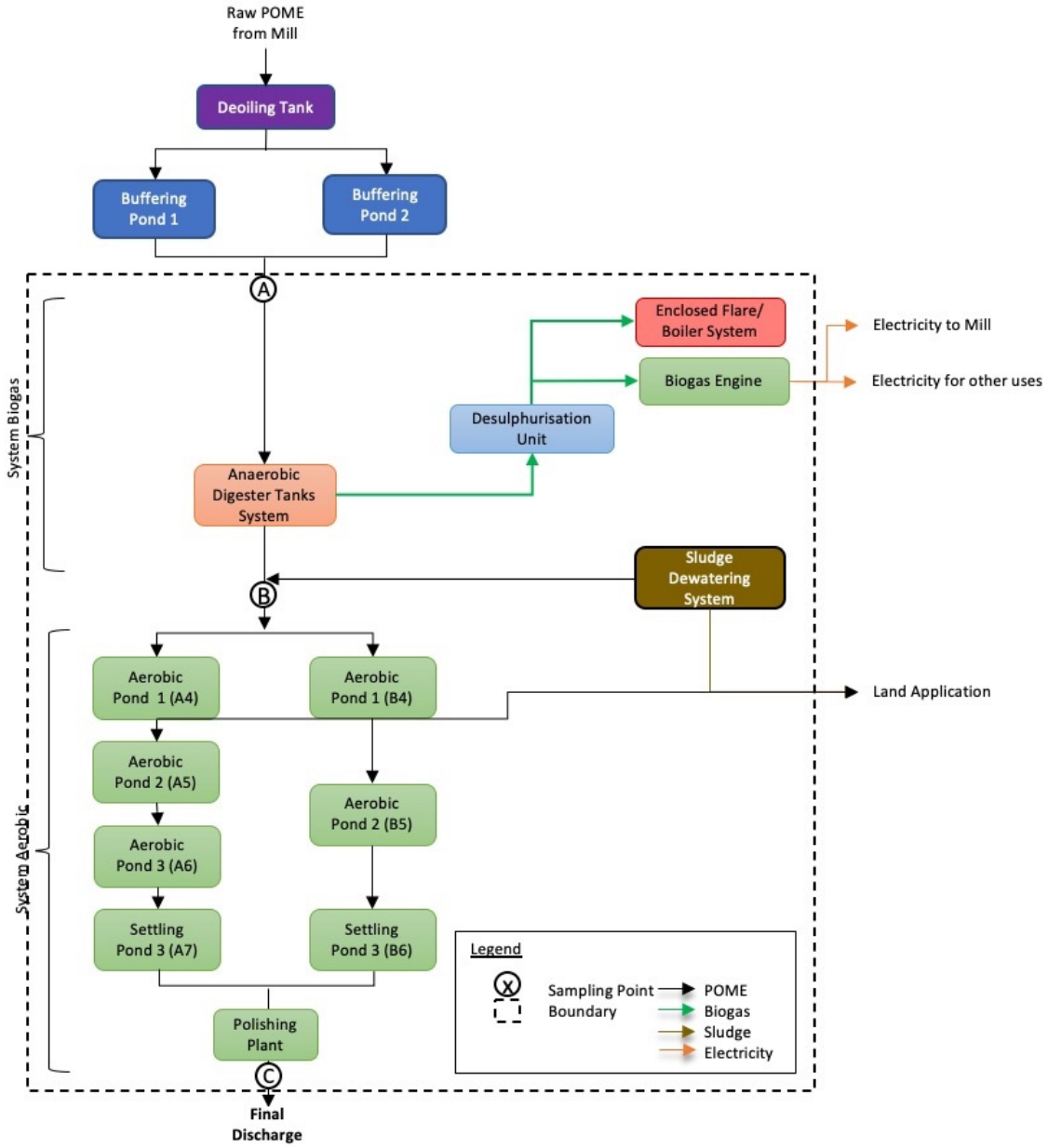
SECTION C. Description of monitoring system

>> Monitoring data was recorded/downloaded monthly and stored electronically in a database. Any problem with the monitoring equipment was noted/commented which has been included into the database. A monitoring data report was produced containing the monthly monitoring data files and details of any equipment faults and/or loss of data. The monitoring data report was submitted to the plant manager to review and acceptance.

Monitoring

The proposed measurement and sampling points for the project activity is illustrated in Figure 3;

Figure 3 Diagram showing all monitoring points for Project Activity



Quality Assurance and Quality Control

The CDM Monitoring and Management team ensured proper and timely calibration as scheduled for applicable monitoring instrumentation in accordance with the manufacturer's specification of system, data acquisition and storage. The responsible person also undertook regular follow up to ensure data measured is consistent.

Emergency Preparedness

The project activity is not expected to result in any emergency that can result in substantial emissions. The proposed project activity has the necessary provisions for emergency preparedness to deal with any unforeseen events such as fire or an electrical blackout.

An emergency management procedure has been developed which explains outlines steps to be followed to quantify emission reductions in the event of equipment or meter failures

Uncertainty in Data and Data Management

Some uncertainties may result due to malfunction of meters, calibration issues and wrong data collection (gaps in manual log sheets, human errors by plant operators, electronic recording system failure, etc.). The operator has put best efforts to prevent such errors, however regular internal checks rectify any such uncertainty in the monitored data.

The management of data records was kept both in soft copy and hard copy format with proper archive system by the CDM management team. All data would be electronically archived for a period of two years from the end of the crediting period.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	$MCF_{ww,treatment,BL}$
Data unit	Factor
Description	Methane correction factor for the baseline anaerobic wastewater treatment system
Source of data	IPCC default value for anaerobic decay of the untreated wastewater
Value(s) applied	0.8
Choice of data or measurement methods and procedures	MCF values as per table III.H.1, AMS III.H (Anaerobic deep lagoon depth more than 2 m).
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$MCF_{ww,treatment, aerobic}$
Data unit	Factor
Description	Methane correction factor for the baseline aerobic wastewater treatment system
Source of data	IPCC default value for aerobic treatment, well managed pond
Value(s) applied	0
Choice of data or measurement methods and procedures	MCF values as per table III.H.1, AMS III.H (Aerobic treatment, well managed pond).
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$\eta_{COD,BL}$
Data unit	%
Description	COD removal efficiency of the baseline anaerobic treatment system, determined as per the paragraphs 26, 27 or 28 in AMS III.H
Source of data	Measurement campaign
Value(s) applied	97
Choice of data or measurement methods and procedures	Measurement campaign was undertaken in the baseline wastewater treatment system for 10 normal operation days from 12th August – 21st August 2011.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$\eta_{COD,aerobic}$
Data unit	%
Description	COD removal efficiency of the baseline aerobic treatment system, determined as per the paragraphs 26, 27 or 28 in AMS III.H
Source of data	Measurement campaign
Value(s) applied	72

Choice of data or measurement methods and procedures	Measurement campaign was undertaken in the baseline wastewater treatment system for 10 normal operation days from 12th August – 21st August 2011.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	**$B_{o,ww}$**
Data unit	t CH_4 /t COD
Description	Methane producing capacity of wastewater
Source of data	AMS-III.H. Default value
Value(s) applied	0.25
Choice of data or measurement methods and procedures	The default value as specified in AMS-III.H (Version 16.0).
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	-

Data/Parameter	**UF_{BL}**
Data unit	-
Description	Model correction factor to account for model uncertainties
Source of data	AMS-III.H. default value
Value(s) applied	0.89
Choice of data or measurement methods and procedures	The default value as specified in AMS-III.H (Version 16.0) for the calculation of baseline emissions.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	**$MCF_{ww,treatment,PJ}$**
Data unit	Factor
Description	Methane correction factor for project activity equipped with biogas recovery in the year,y
Source of data	IPCC default value
Value(s) applied	0.8
Choice of data or measurement methods and procedures	MCF values per table III.H.1, AMS III.H for equipped with biogas recovery system digester
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	**$MCF_{ww,treatment,PJ,aerobic}$**
Data unit	Factor
Description	Methane correction factor for project activity not equipped with biogas recovery in the year, y
Source of data	IPCC default value for aerobic treatment, well managed

Value(s) applied	0.0
Choice of data or measurement methods and procedures	MCF values per table III.H.1, AMS III.H (Aerobic treatment, well managed pond).
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	**$MCF_{ww,BL,discharge}$, $MCF_{ww,PJ,discharge}$**
Data unit	Factor
Description	Methane correction factor of baseline wastewater treatment system sent for plantation irrigation purpose in the year,y
Source of data	IPCC default value for aerobic treatment, well managed
Value(s) applied	0.0
Choice of data or measurement methods and procedures	MCF values per table III.H.1, AMS III.H version 16.0
Purpose of data	Calculation of baseline emissions
Additional comment	Methane correction factor of baseline wastewater treatment system sent for plantation irrigation purpose

Data/Parameter	**GWP_{CH4}**
Data unit	tCO_2/ t CH_4
Description	Global warming potential of methane
Source of data	IPCC default value
Value(s) applied	21 - for the first commitment period 25* - for the second commitment period
Choice of data or measurement methods and procedures	The default value as specified in AMS-III.H (Version 16; EB58)
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	*According to EB69 - Annex3, the second commitment period GWP of 25 tCO_2/ tCH_4 is effective from 01/01/2013.

Data/Parameter	**UF_{PJ}**
Data unit	-
Description	Model correction factor to account for model uncertainties
Source of data	AMS-III.H. Default value
Value(s) applied	1.12
Choice of data or measurement methods and procedures	The default value as specified in AMS-III.H (Version 16; EB58)
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	**CEF_{ww}**
Data unit	Factor

Description	Capture efficiency of the biogas recovery equipment in wastewater treatment system
Source of data	AMS-III.H. Default value
Value(s) applied	0.9
Choice of data or measurement methods and procedures	The default value as specified in AMS-III.H (Version 16; EB58)
Purpose of data	Calculation of baseline emissions
Additional comment	-

D.2. Data and parameters monitored

Data/Parameter	**$Q_{ww,i,y}$**
Unit	m^3
Description	The flow of wastewater entering the project anaerobic digester system
Measured/calculated/ default	Measured
Source of data	Flow meter
Value(s) of monitored parameter	**Monitoring period** / **Monitored Value** 24/06/2016 to 31/12/2016 — 59,431 01/01/2017 to 31/12/2017 — 163,227 01/01/2018 to 31/12/2018 — 139,041 01/01/2019 to 31/12/2019 — 142,211
Monitoring equipment	Manufacturer: Endress+Hauser Model: Promag 10W Serial Number: JA028C2000 Period of utilisation: commissioning to present Accuracy: +/- 0.5% Calibration frequency: Once in three years Latest Calibration: 07/11/2014, 10/10/2016, 19/01/2018 Validity of calibration: 18/01/2021
Measuring/reading/recording frequency	Flow of wastewater was measured continuously using calibrated cumulative flow meters; data was recorded monthly. Data was kept electronically in a systematic and transparent manner during crediting period and two years after crediting period.
Calculation method (if applicable)	N/A
QA/QC procedures	Equipment was calibrated according to manufacturer specifications, and at least once in three years.
Purpose of data/parameter	Calculation of baseline emissions and project emissions
Additional comments	-

Data/Parameter	**$COD_{ww,untreated,y}$**
Unit	$tCOD/m^3$
Description	COD of wastewater entering the anaerobic digester system
Measured/calculated/ default	Measured
Source of data	Laboratory testing

Value(s) of monitored parameter	<table><tr><th>Monitoring period</th><th colspan="2">Monitored Value</th></tr><tr><th></th><th>Lower</th><th>Higher</th></tr><tr><td>24/06/2016 to 31/12/2016</td><td>0.0451</td><td>0.0544</td></tr><tr><td>01/01/2017 to 31/12/2017</td><td>0.0512</td><td>0.0574</td></tr><tr><td>01/01/2018 to 31/12/2018</td><td>0.0502</td><td>0.0580</td></tr><tr><td>01/01/2019 to 31/12/2019</td><td>0.0511</td><td>0.0610</td></tr></table>
Monitoring equipment	This section is not applicable as the COD testing has been done by the accredited lab; "Dynakey Laboratories SDN. BHD."
Measuring/reading/recording frequency	COD sample was tested once every two weeks according to national or international standards. The average of the COD measurement readings was used. Samples and measurements were ensured with a 90/10 confidence/precision level.
Calculation method (if applicable)	N/A
QA/QC procedures	The COD testing was carried out by an accredited laboratory[7]. Data was kept electronically in a systematic and transparent manner during the crediting period and two years after the crediting period.
Purpose of data/parameter	Calculation of baseline emissions and project emissions
Additional comments	Standard Test Methods for COD was done through the In-House Method, DL-LAB-TM02 (based on MN Method[8] 0-26, 0-28, 0-29).

Data/Parameter	**$COD_{ww,treated,y}$**
Unit	$tCOD/m^3$
Description	COD of wastewater exiting the anaerobic digester system
Measured/calculated/ default	Measured
Source of data	Laboratory testing
Value(s) of monitored parameter	<table><tr><th>Monitoring period</th><th colspan="2">Monitored Value</th></tr><tr><th></th><th>Lower</th><th>Higher</th></tr><tr><td>24/06/2016 to 31/12/2016</td><td>0.0055</td><td>0.0094</td></tr><tr><td>01/01/2017 to 31/12/2017</td><td>0.0022</td><td>0.0041</td></tr><tr><td>01/01/2018 to 31/12/2018</td><td>0.0022</td><td>0.0046</td></tr><tr><td>01/01/2019 to 31/12/2019</td><td>0.0015</td><td>0.0027</td></tr></table>
Monitoring equipment	Please see "**$COD_{ww,untreated,y}$**"
Measuring/reading/recording frequency	COD sample was tested once every two weeks according to national or international standards. The average of the COD measurement readings was used. Samples and measurements were ensured with a 90/10 confidence/precision level.
Calculation method (if applicable)	N/A
QA/QC procedures	The COD testing was carried out by an accredited laboratory. Data was kept electronically in a systematic and transparent manner during the crediting period and two years after the crediting period.
Purpose of data/parameter	Calculation of baseline emissions and project emissions
Additional comments	Please see "**$COD_{ww,untreated,y}$**"

Data/Parameter	**$COD_{ww,discharge,PJ,y}$**
Unit	$tCOD/m^3$
Description	COD of wastewater leaving the final discharge point

[7] http://www.jsm.gov.my/documents/11396/300433/SAMM0576
[8] MN Method means Test Method of Macherey-Nagel Manual for NANOCOLOR Spectrophotometers, 2010

Measured/calculated/ default	Measured
Source of data	Laboratory testing
Value(s) of monitored parameter	Monitoring period: 24/06/2016 to 31/12/2016; Monitored Value Lower: 0.0012; Higher: 0.0023 Monitoring period: 01/01/2017 to 31/12/2017; Monitored Value Lower: 0.0006; Higher: 0.0008 Monitoring period: 01/01/2018 to 31/12/2018; Monitored Value Lower: 0.0007; Higher: 0.0008 Monitoring period: 01/01/2019 to 31/12/2019; Monitored Value Lower: 0.0005; Higher: 0.0006
Monitoring equipment	Please see "**$COD_{ww,untreated,y}$**"
Measuring/reading/recording frequency	COD sample was tested once every two weeks according to national or international standards. The average of the COD measurement readings was used. Samples and measurements were ensured with a 90/10 confidence/precision level.
Calculation method (if applicable)	N/A
QA/QC procedures	The COD testing was carried out by an accredited laboratory. Data was kept electronically in a systematic and transparent manner during the crediting period and two years after the crediting period.
Purpose of data/parameter	Calculation of baseline emissions and project emissions
Additional comments	Please see "**$COD_{ww,untreated,y}$**"

Data/Parameter	**$BG_{burnt,y}$**
Unit	Nm^3
Description	Amount of biogas fuelled or flared in year, *y*
Measured/calculated/ default	Calculated
Source of data	Calculated as the summation of **$BG_{fuelled,y}$** and **$BG_{flared,y}$** data from Gas flow meter
Value(s) of monitored parameter	Monitoring period: 24/06/2016 to 31/12/2016; Calculation: 1,438,169 Monitoring period: 01/01/2017 to 31/12/2017; Calculation: 3,477,023 Monitoring period: 01/01/2018 to 31/12/2018; Calculation: 3,824,047 Monitoring period: 01/01/2019 to 31/12/2019; Calculation: 3,640,969
Monitoring equipment	Please see **$BG_{fuelled,y}$** and **$BG_{flared,y}$**
Measuring/reading/recording frequency	Please see **$BG_{fuelled,y}$** and **$BG_{flared,y}$**
Calculation method (if applicable)	Calculated as the summation of **$BG_{fuelled,y}$** and **$BG_{flared,y}$**
QA/QC procedures	Please see **$BG_{fuelled,y}$** and **$BG_{flared,y}$**
Purpose of data/parameter	Please see **$BG_{fuelled,y}$** and **$BG_{flared,y}$**
Additional comments	Please see **$BG_{fuelled,y}$** and **$BG_{flared,y}$**

Data/Parameter	**$BG_{fuelled,y}$**
Unit	Nm^3
Description	Amount of biogas fuelled in the gas engine and/or boiler in year, *y*
Measured/calculated/ default	Measured
Source of data	Gas flow meter

Value(s) of monitored parameter

Monitoring period	Calculation
24/06/2016 to 31/12/2016	1,058,778
01/01/2017 to 31/12/2017	2,925,306
01/01/2018 to 31/12/2018	3,824,047
01/01/2019 to 31/12/2019	3,640,969

Biogas fuelled

Monitoring period	Monitored Value	
	BG to gas engine	BG to boiler
24/06/2016 to 31/12/2016	1,058,778	0
01/01/2017 to 31/12/2017	2,925,306	0
01/01/2018 to 31/12/2018	3,824,047	0
01/01/2019 to 31/12/2019	3,640,969	0

Monitoring equipment

Gas meter at the gas engine

Manufacturer	Mercoid
Model	N/A
Serial Number	N/A
Period of utilisation	N/A
Accuracy	N/A
Calibration frequency	N/A
Latest Calibration	N/A
Validity of calibration	N/A

Gas meter at the boiler

Manufacturer	Mercoid
Model	N/A
Serial Number	N/A
Period of utilisation	N/A
Accuracy	N/A
Calibration frequency	N/A
Latest Calibration	N/A
Validity of calibration	N/A

Measuring/reading/recording frequency	The biogas flow, temperature and pressure were measured continuously using calibrated volumetric flow meters, and a cumulative normalised flow (Nm^3) of the biogas was calculated continuously by a flow meter or flow calculator.
Calculation method (if applicable)	Summation amount of biogas sending to the gas engine and/or boiler
QA/QC procedures	The meters were maintenance/calibration as per the manufacturer's specifications, or at least once every three years.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**$BG_{flared,y}$**
Unit	Nm^3
Description	Amount of biogas flared in year,*y*
Measured/calculated/ default	Measured
Source of data	Gas flow meter

Value(s) of monitored parameter

Monitoring period	Monitored Value
24/06/2016 to 31/12/2016	382,256
01/01/2017 to 31/12/2017	178,715
01/01/2018 to 31/12/2018	0
01/01/2019 to 31/12/2019	0

Monitoring equipment	<table><tr><td>Manufacturer</td><td>Yokogawa</td></tr><tr><td>Model</td><td>EJA110E</td></tr><tr><td>Serial Number</td><td>91V418947915</td></tr><tr><td>Period of utilisation</td><td>Commissioning to present</td></tr><tr><td>Accuracy</td><td>0.055%[9]</td></tr><tr><td>Calibration frequency</td><td>Once in three years</td></tr><tr><td>Latest Calibration</td><td>15/11/2019</td></tr><tr><td>Validity of calibration</td><td>14/11/2022</td></tr></table>
Measuring/reading/recording frequency	The biogas flow, temperature and pressure were measured continuously using calibrated volumetric flow meters, and a cumulative normalised flow (Nm^3) of the biogas was calculated continuously by a flow meter or flow calculator.
Calculation method (if applicable)	N/A
QA/QC procedures	The meters underwent maintenance/calibration as per the manufacturer's specifications, or at least once every three years.
Purpose of data/parameter	Calculation of baseline emissions and project emissions
Additional comments	-

Data/Parameter	$w_{CH4,y}$
Unit	%
Description	Methane content in biogas in the year y
Measured/calculated/ default	Measured
Source of data	Continuous analyzer
Value(s) of monitored parameter	<table><tr><th>Monitoring period</th><th>Monitored Value</th></tr><tr><td>24/06/2016 to 31/12/2016</td><td>75%</td></tr><tr><td>01/01/2017 to 31/12/2017</td><td>80%</td></tr><tr><td>01/01/2018 to 31/12/2018</td><td>74%</td></tr><tr><td>01/01/2019 to 31/12/2019</td><td>74%</td></tr></table>
Monitoring equipment	<table><tr><td>Manufacturer</td><td>Edinburg Sensor</td></tr><tr><td>Model</td><td>200950</td></tr><tr><td>Serial Number</td><td>6736</td></tr><tr><td>Equipment type (if applicable)</td><td>Continuous analyzer</td></tr><tr><td>Period of utilisation</td><td>Commissioning to present</td></tr><tr><td>Accuracy</td><td>+/- 2%[10]</td></tr><tr><td>Calibration frequency</td><td>Once in three years</td></tr><tr><td>Latest Calibration</td><td>25/11/2016 19/01/2018</td></tr><tr><td>Validity of calibration</td><td>18/01/2021</td></tr></table>
Measuring/reading/recording frequency	Measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level. The methane content measurement will be carried out close to a location in the system where a biogas flow measurement takes place
Calculation method (if applicable)	N/A
QA/QC procedures	The analyzer was maintained/calibrated as per the manufacturer's specifications, but at least once every three years.
Purpose of data/parameter	Calculation of baseline emissions and project emissions
Additional comments	-

[9] https://www.yokogawa.com/th/solutions/solutions/oprex/oprex-measurement/oprex-field-instruments/level-meters/level-transmitters/eja110e/
[10] https://edinburghsensors.com/products/gas-monitors/guardian-ng/

Data/Parameter	T_{flare}
Unit	°Celsius
Description	Temperature in the exhaust gas of the flare
Measured/calculated/ default	Measured
Source of data	Thermocouple in the enclosed flare; Type N
Value(s) of monitored parameter	<table><tr><th>Monitoring period</th><th>Monitored Value</th></tr><tr><td>24/06/2016 to 31/12/2016</td><td>No data recorded</td></tr><tr><td>01/01/2017 to 31/12/2017</td><td>No data recorded</td></tr><tr><td>01/01/2018 to 31/12/2018</td><td>No data recorded</td></tr><tr><td>01/01/2019 to 31/12/2019</td><td>No data recorded</td></tr></table>
Monitoring equipment	Upper <table><tr><td>Equipment type (if applicable)</td><td>Type N</td></tr><tr><td>Period of utilisation</td><td>Commissioning to present</td></tr><tr><td>Accuracy</td><td>0.75%[11]</td></tr></table> Lower <table><tr><td>Equipment type (if applicable)</td><td>Type N</td></tr><tr><td>Period of utilisation</td><td>Commissioning to present</td></tr><tr><td>Accuracy</td><td>0.75%[12]</td></tr></table>
Measuring/reading/recording frequency	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. A temperature above 500 ºC indicates that a significant amount of gas is still being burnt and that the flare is operating.
Calculation method (if applicable)	N/A
QA/QC procedures	Thermocouples should be replaced or calibrated every year.
Purpose of data/parameter	N/A
Additional comments	Temperature in the exhaust gas of the flare will be monitored according to "Tool to determine project emissions from flaring gases containing methane"

Data/Parameter	$\eta_{flare,h}$
Unit	%
Description	Flare efficiency in hour h
Measured/calculated/ default	Default
Source of data	N/A
Value(s) of monitored parameter	<table><tr><th>Monitoring period</th><th>Monitored Value</th></tr><tr><td>24/06/2016 to 31/12/2016</td><td>0%</td></tr><tr><td>01/01/2017 to 31/12/2017</td><td>0%</td></tr><tr><td>01/01/2018 to 31/12/2018</td><td>0%</td></tr><tr><td>01/01/2019 to 31/12/2019</td><td>0%</td></tr></table>

[11] https://www.thermocoupleinfo.com/type-n-thermocouple.htm
[12] https://www.thermocoupleinfo.com/type-n-thermocouple.htm

Monitoring equipment	N/A
Measuring/reading/recording frequency	Default flare efficiency for enclosed flare is estimated based on hourly flaring efficiency: • 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour h. • 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h, but the manufacturer specifications on proper operation of the flare are not met at any point in time during the hour h. • 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h and the manufacturer specifications on proper operation of the flare are met continuously during the hour h.
Calculation method (if applicable)	N/A
QA/QC procedures	N/A
Purpose of data/parameter	Calculation of baseline emissions and project emissions
Additional comments	Since there is no monitoring data of temperature in minute the selected data is 0%

Data/Parameter	**$S_{final,PJ,y}$**
Unit	ton
Description	End use of final sludge from the digester system
Measured/calculated/ default	Measured
Source of data	Records/ Log sheet
Value(s) of monitored parameter	**Monitoring period** / **Monitored Value** 24/06/2016 to 31/12/2016 — 161 01/01/2017 to 31/12/2017 — 1,036 01/01/2018 to 31/12/2018 — 1,865 01/01/2019 to 31/12/2019 — 4,313
Monitoring equipment	Manufacturer: N/A Model: N/A Serial Number: N/A Period of utilisation: Commissioning to present Accuracy: N/A Calibration frequency: N/A Latest Calibration: N/A Validity of calibration: N/A
Measuring/reading/recording frequency	The sludge removed periodically from the digester was sent to the palm plantation as soil application and applied in a thin layer under aerobic conditions and was not stored for longer periods to ensure that it is under aerobic conditions. Records of when sludge is removed and where the sludge is applied has been kept.
Calculation method (if applicable)	N/A
QA/QC procedures	-
Purpose of data/parameter	-
Additional comments	In any event of removal of sludge and soil application, the process was monitored to ensure the conditions are aerobic.

D.3. Implementation of sampling plan

>> There is no sampling plan. This is not applicable for the project activity.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

>> Baseline emissions were calculated as follows;

$BE_y = \{BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,discharge,y} + BE_{s,final,y}\}$		
Parameter	**Description**	**Unit**
BE_y	Baseline emissions in 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 to plantation for land irrigation in year *y*	tCO_2e
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year y. The sludge was used for soil application in the baseline scenario, this term has been neglected.	tCO_2e

(a) Baseline emissions from electricity consumption ($BE_{power,y}$)

The treatment systems (anaerobic ponds, aerobic ponds, settling ponds, polishing plant) affected by project activity biogas recovery would continue to operate with the same operational characteristics as in the baseline scenario. Furthermore, power supply to the baseline wastewater treatment system is from The Mill biomass boiler. Thus, the baseline electricity consumption, $BE_{power,y} = 0$.

(b) Baseline emissions of the wastewater treatment systems affected by the proposed project activity ($BE_{ww,treatment,y}$)

The baseline treatment systems consist of anaerobic ponds and aerobic ponds.

The MCF for baseline aerobic wastewater treatment is zero, for well managed aerobic ponds (table III.H.1. of AMS-III.H version 16.0). Therefore, the baseline emissions from the aerobic wastewater treatment = 0.

The baseline emissions of the anaerobic wastewater treatment systems are determined as:

$BE_{ww,treatment,y} = (Q_{ww,,y} * COD_{inflow,y} * \eta_{COD,BL} * MCF_{ww,treatment,BL,}) * B_{o,ww} * UF_{BL} * GWP_{CH4}$		
Parameter	**Description**	**Unit**
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year y	tCO_2e
$Q_{ww,y}$	Volume of wastewater treated in baseline wastewater treatment system i in year y.	m^3
$COD_{inflow,y}$	Chemical oxygen demand of the wastewater inflow to the baseline anaerobic treatment system (System- anaerobic) in year y. Average value has been used through sampling with the confidence/ precision level 90/10.	t/m^3
$\eta_{COD,BL}$	COD removal efficiency of the baseline anaerobic treatment system (System-anaerobic – 96.64%), determined as per the paragraphs 26, 27 or 28 in AMS III.H (Version 16)	%
$MCF_{ww,treatment,BL}$	Methane correction factor for baseline wastewater treatment systems (System-anaerobic – 0.8)	
$B_{o,ww}$	Methane producing capacity of the wastewater (0.25)	tCH_4/ tCOD
UF_{BL}	Model correction factor to account for model uncertainties (0.89)	
GWP_{CH4}	Global Warming Potential of methane (25)	tCO_2/ tCH_4

(c) Baseline emissions of the sludge treatment systems affected by the project activity ($BE_{treatment,s,y}$)

The baseline scenario does not involve sludge treatment. Therefore, on this basis $BE_{treatment,s,y} = 0$.

(d) Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year y ($BE_{ww,discharge,y}$)

The baseline scenario, the final treated wastewater is used for land irrigation which indicates well managed aerobic treatment. Therefore, on this basis $BE_{ww,\ discharge,y} = 0$.

(e) Baseline methane emissions from anaerobic decay of the final sludge produced ($BE_{s,final.y}$)

In the baseline scenario, sludge would have been periodically removed from the anaerobic open ponds and sent to the plantation for soil application. All sludge removed is used for soil application under aerobic conditions. Therefore, on this basis $BE_{s,final,y} = 0$.

As per equation 16 as in AMS III.H. version 16.0, in case of flaring/combustion, MD_y was measured using the conditions of the flaring process:

$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4,} * FE * GWP_{CH4}$		
Parameter	**Description**	**Unit**
MD_y	Methane captured and destroyed /gainfully used by the project activity in year y	tCO_2e
$BG_{burnt,y}$	Biogas flared/combusted in year y	m^3
$w_{CH4,y}$	Methane content in the biogas in the year y	%
D_{CH4}	Density of methane at the temperature and pressure of the biogas in the year y (0.00072)	ton/m^3
FE	Flare efficiency in year y (fraction). In the case that biogas is destructed for gainful purpose, e.g., fed to the engine, an efficiency of 100% is to be applied. $DE_{\text{gas engine/ boiler}} = 100\%$ $FE_{\text{flare}} = 0\%$	%
GWP_{CH4}	Global Warming Potential of methane (25)	tCO_2/tCH_4

Table of calculation of baseline emissions (tCO_2e)

Baseline emissions	**2016**	**2017**	**2018**	**2020**
	24/06 to 31/12	**01/01 to 31/12**	**01/01 to 31/12**	**01/01 to 31/12**
$BE_{power,y}$	0	0	0	0
$BE_{ww,treatment,y}$	11,538	35,907	29,992	31,269
$BE_{s,treatment,y}$	0	0	0	0
$BE_{ww,discharge,y}$	0	0	0	0
$BE_{s,final,y}$	0	0	0	0
BE_y (round down)	**11,538**	**35,907**	**29,992**	**31,269**
MD_y	**14,158**	**42,013**	**50,858**	**48,355**

E.2. Calculation of project emissions or actual net removals

>> As per AMS-III.H. (Version 16) project emissions are calculated using the following formula.

$PE_y = \{PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y}\}$		
Parameter	**Description**	**Unit**
PE_y	Project activity emissions in the year y	tCO_2e
$PE_{power,y}$	Emissions from electricity or fuel consumption in the year y	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	tCO_2e
$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year y as per the "Tool to determine project emissions from flaring gases containing methane" These emissions are accounted for when the flare was in use.	tCO_2e

Project activity emission from fuel consumption ($PE_{power,y}$)

The auxiliary power consumption for project activity is sourced from electricity generated from biogas engine. In the event the biogas engine generated electricity is lesser than auxiliary power consumption, the remaining electricity would be supplied by the mill.

The mill's primary electricity supply is from biomass turbines. During this monitoring period, the amount of electricity generated by the project activity is more than the electricity consumption.

Therefore, $PE_{power,y} = 0$.

Methane emissions from wastewater treatment systems affected by the proposed project activity, and not equipped with biogas recovery in the project situation ($PE_{ww,treatment,y}$)

Wastewater treatment systems (aerobic ponds) affected by the project activity that are not equipped with biogas recovery, has continued to be the same as in the baseline scenario and the *MCF* values as per Table III.H.1 is '0', for aerobic treatment well managed ponds. The implementation of the project activity does not change the operational characteristics of the aerobic ponds.

Therefore, $PE_{ww,treatment,y} = 0$.

Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery ($PE_{s,treatment,y}$)

In the proposed project activity sludge from the wastewater ponds has been used for land application which is an aerobic process. Therefore on this basis $PE_{s,treatment,y} = 0$.

Methane emissions from degradable organic carbon in treated wastewater ($PE_{ww, discharge, y}$)

In the project activity, the final treated effluent has been sent for land irrigation. The implementation of the project activity does not change the operational characteristics of treated wastewater discharged to plantation as in the baseline and the MCF values as per Table III.H.1 is = 0.

Therefore, on this basis; $PE_{ww, discharge,y} = 0$.

Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$)

The sludge removed periodically from the digester applied to the palm plantation as soil application and applied in a thin layer under aerobic conditions. Therefore on this basis $PE_{s,final,y} = 0$.

Methane emissions from biogas release in capture systems ($PE_{fugitive,y}$)

$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$		
Parameter	**Description**	**Unit**
$PE_{fugitive,ww,y}$	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 In the project activity, there is no sludge treatment as sludge was used as fertilizer. Therefore, on this basis $PE_{fugitive,s,y} = 0$.	tCO_2e
$PE_{fugitive,y} = PE_{fugitive,ww,y}$ **$PE_{fugitive,ww,y} = (1-CFE_{ww}) * MEP_{ww,treatment,y} * GWP_{CH4}$**		
CFE_{ww}	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems (0.9)	
$MEP_{ww,treatment,y}$	Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year y	tonnes
$MEP_{ww,treatment,y} = Q_{ww,y} * B_{o,ww} * UF_{PJ} * \Sigma_k COD_{removed,PJ,k,y} * MCF_{ww,treatment,PJ,k}$		
$Q_{ww,y}$	Volume of wastewater treated in baseline wastewater treatment system i in year y.	m^3
$COD_{removed,PJ,k,y}$	The chemical oxygen demand removed by the treatment system k of the project activity equipped with biogas recovery in the year y. Average value was used through sampling with the confidence/ precision level 90/10.	t/m^3
$MCF_{ww,treatment,BL}$	Methane correction factor for the project wastewater treatment system *k* equipped with biogas recovery equipment (MCF values as per table III.H.1 – 0.8)	
$B_{o,ww}$	Methane producing capacity of the wastewater (0.25)	tCH_4 /tCOD
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)	

Methane emissions from biomass stored under anaerobic conditions ($PE_{biomass}$)

Storage of biomass under anaerobic conditions would not take place due to the proposed project activity, therefore on this basis $PE_{Biomass} = 0$.

Methane emissions due to incomplete flaring ($PE_{flare,y}$)

The main purpose of generated biogas is to be used in the biogas engines for electricity generation. Excess biogas was combusted at biomass boiler system and/or flared using enclosed flare system. In this situation, any methane emissions that occur due to incomplete flaring would be calculated as per the "Tool to determine project emissions from flaring gases containing methane" (Version 1, EB 28).

The flare installed in the project activity is an enclosed flare. In accordance with section II, step 6 of the "Tool to determine project emissions from flaring gases containing methane" (Version 1, EB28), a default value of 0% efficiency was applied during this monitoring period because temperature of flare has not been recorded and this approach is conservative.

Calculation of annual project emission from flaring

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

$PE_{flare} = \sum_{h=1}^{8760} TM_{RG,h} * (1-\eta_{flare,h}) * (GWP_{CH4}/1000)$		
Parameter	**Description**	**Unit**
PE_{flare}	Project emission from flaring of methane in the residual gas in year y	tCO_2e
$TM_{RG,h}$	Mass flow rate of methane in hour h	kg/h
$\eta_{flare,h}$	Flare efficiency in hour h (The flame and temperature of flare have not been detected in minute m – 0%)	%
GWP_{CH4}	Global Warming Potential of methane (25)	tCO_2/ tCH_4
$TM_{RG,h} = FV_{RG,h} * fv_{CH4,RG,h} * \rho_{CH4,n}$		

$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h	m^3/h
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the residual gas on dry basis in hour h	%
$\rho_{CH4,n}$	Density of methane at normal conditions (0.716)	Kg/m^3

Table of calculation of project emissions (tCO_2e)

Project emissions	**2016**	**2017**	**2018**	**2020**
	24/06 to 31/12	**01/01 to 31/12**	**01/01 to 31/12**	**01/01 to 31/12**
$PE_{power,y}$	0	0	0	0
$PE_{ww,treatment,y}$	0	0	0	0
$PE_{s,treatment,y}$	0	0	0	0
$PE_{ww,discharge,y}$	0	0	0	0
$PE_{s,final,y}$	0	0	0	0
$PE_{fugitive,y}$	1,629	5,050	4,342	4,744
$PE_{biomass,y}$	0	0	0	0
$PE_{flaring,y}$	5,112	2,567	0	0
PE_y (round up)	**6,741**	**7,617**	**4,342**	**4,744**

E.3. Calculation of leakage emissions

>> As per AMS-III.H.(Version 16), paragraph 31, there is no leakage expected from proposed project activity as the technology and equipment used is not transferred from another activity.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals ($t CO_2e$)	**Project GHG emissions or actual net GHG removals ($t CO_2e$)**	**Leakage GHG emissions ($t CO_2e$)**	**GHG emission reductions or net anthropogenic GHG removals ($t CO_2e$)**		
				Before 01/01/2013	**From 01/01/2013**	**Total amount**
Total	108,706	23,444	0	0	85,262	85,262

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period ($t CO_2e$)	**Amount estimated ex ante for this monitoring period in the PDD ($t CO_2e$)**
85,262	187,552

E.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the PDD"

>> This first monitoring period starts from 24/06/2016 to 31/12/2019. The calculation of the ex-ante is based on maximum processing capacity of the palm oil mill. The key parameters are the estimated wastewater generation and value of COD, in which has been expected to generate during this monitoring period. The other assumption follows the same calculation approach described in the registered PDD. The amount estimated ex ante for this monitoring period is calculated by ex-ante amount multiplied with the length of 3 years and 191 days (53,232*3) + (53,232*191/365); thus, estimated ex-ante for this monitoring period is 187,552 tCO_2e

E.6. Remarks on increase in achieved emission reductions

>> The actual GHG emission reductions achieved during this monitoring period is lower than the amount based on the ex-ante estimation in the registered PDD. Thus, this section is not applicable.

E.7. Remarks on scale of small-scale project activity

>> The monitoring period starts from 24/06/2016 to 31/12/2019. The emission reduction that the project activity has achieved during this period is 85,262 tCO_2e. The actual emission reduction achieved yearly under this monitoring period remains under the limit of Type III small-scale project activity (60,000 tCO_2e). The following table demonstrates the emission reduction the project has achieved in yearly basis.

Parameter	Description	Monitoring Period	Value
$ER_{y,expost}$	Minimum between amount of biogas recovered and fuelled or flared and Ex post calculated baseline, project and leakage emissions based on actual monitored data (tCO_2e)	01/01/2016 to 31/12/2016	**4,797**
		01/01/2017 to 31/12/2017	**28,290**
		01/01/2018 to 31/12/2018	**25,650**
		01/01/2019 to 31/12/2019	**26,525**
		TOTAL	**85,262**

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Document information

Version	*Date*	*Description*
07.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).

Version	*Date*	*Description*
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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