CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAM ACTIVITY DESIGN DOCUMENT FORM (CDM-SSC-CPA-DD)
Version 01

CONTENTS

Annexes

NOTE:

(i) This form is for submission of CPAs that apply a small-scale approved methodology using the provision of the proposed small scale CDM PoA.

(ii) The coordinating/managing entity shall prepare a CDM Small Scale Programme Activity Design Document (CDM-SSC-CPA-DD)[1,2] that is specified to the proposed PoA by using the provisions stated in the SSC PoA DD. At the time of requesting registration the SSC PoA DD must be accompanied by a CDM-SSC CPA-DD form that has been specified for the proposed SSC PoA, as well as by one completed CDM-SSC CPA-DD (using a real case). After the first CPA, every CPA that is added over time to the SSC PoA must submit a completed CDM-SSC CPA-DD.

[1] The latest version of the template form CDM-CPA-DD is available on the UNFCCC CDM web site in the reference/document section.

[2] At the time of requesting validation/registration, the coordinating managing entity is required to submit a completed CDM-POA-DD, the PoA specific CDM-CPA-DD, as well as one of such CDM-CPA-DD completed (using a real case).

SECTION A. General description of small scale CDM programme activity (CPA)

A.1. Title of the small-scale CPA:

[CPA name] – Under PoA Composting and Co-composting Programme of Activities (PoA) in Indonesia

Version []
Date: [date]

A.2. Description of the small-scale CPA:

The CPA developed by [XXX] (hereafter referred to as the "project developer") is a composting project in the province of [XXX], on the island of [XXX] in Indonesia (hereafter referred to as the "host country"). The project will be located at [XXX] palm oil mill.

[brief project description]

A.3. Entity/individual responsible for the small-scale CPA:

[company] is the responsible project implementer of the CPA.

A.4. Technical description of the small-scale CPA:

[Technical description of the CPA]

A.4.1. Identification of the small-scale CPA:

A.4.1.1. Host Party:

The host party of this CPA is Republic of Indonesia.

A.4.1.2. Geographic reference or other means of identification allowing the unique identification of the small-scale CPA (maximum one page):

The project will be located adjacent [location].

The geographical coordinates of the project activity are: [coordinates … latitude, … longitude]

The location of the project site is shown in the following map:

[map]
Figure 1 – Location map of the project site

A.4.2. Duration of the small-scale CPA:

A.4.2.1. Starting date of the small-scale CPA:

The starting date of the CPA is [starting date].

Explanation on the choice of the project start date is being provided in section B.3.

A.4.2.2. Expected operational lifetime of the small-scale CPA:

The expected operational lifetime of this CPA is [lifetime] years.

A.4.3. Choice of the crediting period and related information:

Renewable crediting period.

A.4.3.1. Starting date of the crediting period:

The starting date of the crediting period is the registration date of the related CPA.

A.4.3.2. Length of the crediting period, first crediting period if the choice is renewable CP:

The length of the crediting period for this CPA is 7 years, and can be renewed for three periods of seven years.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

The estimated amount of emission reduction was calculated for the CPA from the equations described in the PoA-DD for the Composting and Co-composting Programme of Activities (PoA) in Indonesia. The table below demonstrates the total emission reduction estimated for the first crediting period for this proposed CPA.

Table 1- Estimated amount of emission reductions over the chosen crediting period

Years	Annual estimation of emission reductions in tonnes of $tCO_2.eq$
1	
2	
3	
4	
5	
6	
7	
Total emission reductions (tonnes of CO_2-eq)	

Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2-eq)	

A.4.5. Public funding of the CPA:

The proposed CDM Programme Activities (CPA) does [yes/no] receive any public funding.

A.4.6. Information to confirm that the proposed small-scale CPA is not a de-bundled component

The "Guidance for determining the occurrence of de-bundling under a programme of activities (PoA)" (EB54 annex 13) is used to demonstrate that the CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

There is no other registered small-scale CPA of a PoA, an application to register another small-scale CPA of a PoA or another registered CDM project activity which:
a) has the [project implementer] as an activity implementer.
b) the boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point.

Moreover, PT. Composting Program International does not manage another PoA of the same sectoral scope within Indonesia and palm oil mills are typically spread far apart to not camped in receiving Fresh Fruit Bunches (FFB).

However, in order to avoid registering a CPA that is in fact a de-bundled component of another CPA or CDM project activity, the coordinating entity will ensure that each CPA followed the aforementioned guidance as defined by the Executive Board and as discussed in the SSC-PoA-DD.

A.4.7. Confirmation that small-scale CPA is neither registered as an individual CDM project activity or is part of another Registered PoA:

The proposed CPA is not registered as an individual CDM project and is not part of another PoA.

SECTION B. Eligibility of small-scale CPA and Estimation of emissions reductions

B.1. Title and reference of the Registered PoA to which small-scale CPA is added:

Composting and Co-composting Programme of Activities (PoA) in Indonesia

B.2. Justification of the why the small-scale CPA is eligible to be included in the Registered PoA:

[CPA name] is eligible to be included to the Composting and Co-composting Programme of Activities (PoA) in Indonesia because it fulfils all eligibility requirement of the PoA:

i. consist of only one composting or co-composting plant producing compost from palm oil mill waste, situated in Indonesia. Project shall be implemented at Palm Oil Mill site where no composting or co-composting activity was taking place before.	[XXX]
ii. The requirements including applicability criteria of AMS-III.F version 8 will be met by CPA.	[XXX]
iii. An agreement shall be in place between the co-composting project owner (CPA operator) and the Coordinating and Managing Entity (CME), authorizing the CME to include the CPA into the PoA and therefore ceding the carbon rights to the CME.	[XXX]
iv. prior to CPA implementation; where the EFB is disposed in dumping site. The dumping site must have the capacity to accommodate EFB for the whole crediting period. Where the EFB is burnt or land applied, no baseline emission from solid waste will be claimed.	[XXX]
v. prior to CPA implementation; POME must be treated in anaerobic ponds without biogas recovery systems.	[XXX]
vi. only EFB & POME will be composted out of all the palm oil mill residues.	[XXX]
vii. at the time of inclusion of the CPA in the PoA, there is no enforced regulation in Indonesia that prohibits the current disposal of EFB in an unmanaged solid waste disposal site/landfilling and (for co-composting CPAs) there is no regulation to require the recovery of methane from anaerobic ponds treating POME.	[XXX]
viii. residual waste or compost produced shall not be stored under anaerobic conditions.	[XXX]
ix. the maximum distance for transporting POME and EFB for the composting process by the CPA is 200 km.	[XXX]
x. must be in compliance with all laws and regulations of Indonesia.	[XXX]
xi. The CPA Operator shall demonstrate that this project activity shall not lead to double counting of Emission Reduction by confirming that this project activity shall not be a part of any of the below mentioned category post approval of the project activity under CDM: (1) Standalone CDM project activity, (2) Bundled CDM project activity, (3) Another registered PoA.	[XXX]

xii. The Proposed CPA Project activity shall demonstrate the compliance with the EB 54 Annex 13 "Guidelines on assessment of de-bundling for SSC project activities". The CPA is considered as debundled if both conditions (a) and (b) below are satisfied: a. Has the same activity implementer as the proposed small scale CPA or has a coordinating or managing entity, which also manages a large scale PoA of the same technology/measure, and; b. The boundary is within 1 km of the boundary of the proposed small-scale CPA at the closest point.	[XXX]

[CPA name] meets all the applicability criteria of AMS III-F as follows:

The applicability criteria of AMS III.F.v8	**Methodology AMS III.F.v8 is applicable to a CPA because:**
1. This methodology comprises measures to avoid the emissions of methane to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site (SWDS), or in an animal waste management system (AWMS). In the project activity, controlled biological treatment of biomass is introduced through one, or a combination, of the following measures: (a) aerobic treatment by composting and proper soil application of the compost. (b) Anaerobic digestion in closed reactors equipped with biogas recovery and combustion/flaring system.	[XXX]
2. The project activity does not recover or combust landfill gas from the disposal site (unlike III G) and does not undertake controlled combustion of the waste that is not treated biologically in a first step (unlike AMS III.E). Project activities that recover biogas from wastewater treatment shall use methodology AMS-III.H.	[XXX]
3. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2e annually	[XXX]
4. This methodology is applicable to the treatment of the organic fraction of municipal solid waste and	[XXX]

biomass waste from agricultural or agro- industrial activities including manure. Project activities involving anaerobic digestion and biogas recovery from manure shall apply AMS-III.D or AMS-III.R.	
5. This methodology includes construction and expansion of treatment facilities as well as activities that increase capacity utilization at an existing facility. For project activities that increase capacity utilization at existing facilities, project participant(s) shall demonstrate that special efforts are made to increase the capacity utilization, that the existing facility meets all applicable laws and regulations and that the existing facility is not included in a separate CDM project activity. The special efforts should be identified and described.	[XXX]
6. This methodology is also applicable for co-treating wastewater and solid biomass waste, where wastewater would otherwise have been treated in an anaerobic wastewater treatment system without biogas recovery.	[XXX]
7. The location and characteristics of the disposal site of the biomass in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions. Guidance in paragraphs 4, 6 and 7 in AMS III.E shall be followed in this regard.	[XXX]
8. The following requirement shall be checked ex-ante at the beginning of each crediting period in the case of composting of solid waste: ▪ Establish that identified landfill(s) can be expected to accommodate the waste to be used for the project activity for the duration of the crediting period; or ▪ Establish that it is common practice in the region to dispose off the waste in solid waste disposal site (landfill).	[XXX]
9. The project participants shall clearly define the geographical boundary of the region and document it in the CDM-PDD. In defining the geographical boundary of the region, project participants should take the usual distances for transporting the waste utilized by the project activity into account, i.e., if waste is transported up to 50 km, the region may cover a radius of 50 km around the project activity. In any case, the region should cover a reasonable radius around the project activity that can be justified with reference to the project circumstances	[XXX]

but in no case it shall be more than 200 km. Once defined, the region should not be changed during the crediting period(s).	
10. In the case of stockpiles of wastes baseline emission calculations as described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" shall be adjusted. Stockpiles can be characterised as waste disposal sites that consist of wastes of a homogenous nature with similar origin (e.g., rice husk, empty fruit bunches of oil palm, sawmill waste, etc.). Paragraph 22 in AMS III.E vs.16 provides specific instructions for the calculation of baseline emissions where the baseline is stockpiling of the waste.	[XXX]
11. Where in the baseline usually there is a reduction in the amount of waste through regular open burning or removal for other applications, the use of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" shall be adjusted to take account of this burning or removal in order to estimate correctly the baseline emission.	[XXX]
12. The project activity does not recover or combust methane unlike AMS-III.G. Nevertheless, the location and characteristics of the disposal site in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions.	[XXX]
13 In case residual waste from the biological treatment (slurry, compost or products from those treatments) are handled aerobically and submitted to soil application, the proper conditions and procedures (not resulting in methane emissions) must be ensured.	13. Compost produced by the project activity will be used for agriculture purpose. This ensures no emission of methane.
14. In case residual wastes from the biological treatment (slurry, compost or products from those treatments) are treated thermally/mechanically, the provisions in AMS-III.E related to thermal/mechanical treatment shall be applied.	[XXX]
15. In case residual waste from the biological treatment (slurry, compost or products from those treatments) are stored under anaerobic conditions and/or delivered to a landfill, emissions from the residual waste shall to be taken into account and calculated as per the latest version of the "Tool to determine methane emissions avoided from	[XXX]

disposal of waste at a solid waste disposal site".	
16. For project activities involving controlled anaerobic digestion and production of biogas, technical measures shall be used (e.g., flared, combusted) to ensure that all biogas produced by the digester is captured and gainfully used or combusted/flared.	[XXX]
17. The recovered biogas from anaerobic digestion may also be utilised for the following applications instead of flaring or combustion: (a) Thermal or electrical energy generation directly; or (b) Thermal or electrical energy generation after bottling of upgraded biogas; or (c) Thermal or electrical energy generation after upgrading and distribution using one of the following options: (i) Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; or (ii) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or Hydrogen production.	[XXX]
18. If the recovered biogas is used for project activities covered under paragraph 12 (a), that component of the project activity shall use a corresponding category under Type I.	[XXX]
19. If the recovered biogas is used for project activities covered under paragraph 12 (b) or 12 (c) relevant provisions in AMS-III.H related to upgrading of biogas, bottling of biogas, injection of biogas into a natural gas distribution grid and transportation of biogas via a dedicated piped network shall be used.	[XXX]
20. If the recovered biogas is used for project activities covered under paragraph 12 (d) that component of the project activity shall use corresponding methodology AMS-III.O.	[XXX]
21. In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a	[XXX]

check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.	

B.3. Assessment and demonstration of additionality of the small-scale CPA , as per eligibility criteria listed in the Registered PoA:

As per attachment A to appendix B to the simplified Modalities & Procedures for small-scale CDM project activities, at least one barrier listed shall be identified due to which the project would not have occurred anyway.

Prior consideration of the CDM:

CPAs with starting date between 22 June 2007 and the commencement of validation of the PoA, listed and sent to the validating DOE and UNFCCC secretariat prior to 31 January 2010 (as per EB report 47):

As per "Guidelines for the Demonstration and Assessment of Prior Consideration of the CDM"[3]:

- For project activities with a start date before 02 August 2008, for which the start date is prior to the date of publication of the PDD for global stakeholder consultation, are required to demonstrate that the CDM was seriously considered in the decision to implement the project activity.
- For project activities with a starting date on or after 02 August 2008, the project participant must inform a host party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date.

[any explanation, if required]

In the case of the present project activity, the starting date is set as the [definition starting date].

The complete CDM-related chronological timeline is outlined below:

Table 2 - Schedule of the project implementation

Description	Date

[3] EB 49, Annex 22 was the most recent version of this guidance, which could be applied for CPAs falling under this category (only CPAs with project start date up to commencement of the validation of the PoA, 22, December 2009)

As shown above, the project implementer has [activities that demonstrate prior consideration] The project implementer has always shown its best and continuous effort to secure CDM services, the proposed project activity is in-line with the requirements defined in EB 49 Annex 22 regarding prior consideration of CDM.

CPAs with starting date after commencement of validation of the PoA:

CPAs with start date after the publication of the global stakeholder consultation of the PoA do not have to follow the "Guidelines for the Demonstration and Assessment of Prior Consideration of the CDM" as per EB 60 Annex 26. However the start date shall be clearly defined as per CDM Glossary of Terms.

Pre-tax Project IRR calculation

The proposed CPA would not have occurred without CDM income due the investment barriers, which are in line with section E.5.2 of the Co-Composting PoA DD:

Pursuant to the PoA-DD, the Project IRR calculations will be based on a list of economic parameters provided by the CPA owner that were available at the date of the investment decision. This list of parameters includes:

Table 3 - Parameters for IRR calculation

PROJECT DATA	**Unit**	**Value**	**References**
Investment decision date	DD/MM/YY		
Technical lifetime	Year		
Investment decision date	DD/MM/YY		
Construction start date	Year		
Date project starts operating	Year		
Annual compost production	t/year		
FINANCIAL PARAMETERS	**Unit**	**Value**	**References**
Price of compost	IDR/t		
Inflation rate	% per year		
Exchange Rate	IDR/[]		
COSTS AND EQUIPMENT	**Unit**	**Value**	**References**
Total investments	IDR		

Operation & Maintenance cost	IDR /year	
Insurance	% of Capex p.a.	

Assets in a co-composting facility are considered as shredder, truck, turning machine. According to Indonesian accounting standards such assets are depreciated within 8 years. IRR analysis is performed over the period of the technical lifetime or 10 years, whichever is higher. As a consequence, the book value of any project activity assets at the end of the assessment will be considered as zero[4]. After 8 years, the lifetime of the equipment is accounting wise expected to be over. Hence, the realization of the asset is calculated by the value of the asset material (i.e. mainly steel) and the cost of transportation as it is assumed to not function anymore. Due to the remote locations of palm oil mills, transportation costs are considered as fairly high, equalizing or even exceeding the potential revenues from selling the asset (i.e. steel). If small profits or losses would be generated with the realization of the assets, such would affect the overall IRR on a minimal base as it is added in the last year of the IRR analysis period. Hence, the profit on the realization of the assets can be considered as zero.

[description of key IRR parameters].

Inserting these values yields a pre-tax project **IRR of [XXX]%**.

Benchmark calculation
The benchmark used to compare the return of the project shall be either the "local commercial lending rate", the Weighted Average Cost of Capital. Benchmarks or any other suitable benchmark shall be determined as per the investment decision date. In order to determine the WACC the CAPM can be used to estimate the cost-of-equity.

[description of the benchmark determination and its underlying refereneces].

As per the date of investment the **benchmark has been found as [XXX]%**.

The results of the financial analysis show that [results].

Sensitivity analysis

A sensitivity analysis was undertaken by varying the most sensitive parameters by +/-10%, as summarized in the table below. The results in the table below show that [results sensitivity analysis].

[4] As per paragraph 4 of Guidance on the Assessment of Investment Analysis (Version 05).

Table 4 - Sensitivity analysis

	IRR	Variation that hits the benchmark	Likelihood of hitting the benchmark
Total investment -10%			
O&M -10%			
Compost price increase +10%			
Compost production increase +10%			

The analysis shows that [XXX].

B.4. Description of the sources and gases included in the project boundary and proof that the small-scale CPA is located within the geographical boundary of the registered PoA.

As referred to the stipulated project boundary for Type III activities in Appendix B for small-scale project activities, the project activity boundary encompasses the physical, geographical site of the composting plant, as well as the following sites:

(a) Where the solid waste would have been disposed and the methane emission occurs in the absence of the project activity
(b) Where the co-composting waste water would have been treated anaerobically in the absence of the project activity;
(c) Where the treatment of biomass through composting takes place;
(d) Where the soil application of the produced compost takes place;

And the itineraries between (a), (b), (c) and (d), where the transportation of the waste, wastewater or compost occurs.

The project boundary is graphically summarized in the figure below. The dashed arrows express the GHG-relevant mass flow of the baseline scenario and the drawn-through arrows express the GHG-relevant mass flow of the project activity:

[figure of project boundary]

The gases and sources relevant to the Project are listed below based on the AMS III F version 8 methodology:

Table 5 - Summary of Gases and Sources included in project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Biomass disposed in unmanaged landfill/dumpsite	CO_2	No	CO_2 emissions from biomass decay in solid waste disposal sites are considered GHG neutral
		CH_4	[Yes/No]	[XXX]
		N_2O	No	Excluded for simplification and conservativeness. Expected to be minimal
	POME treatment in Open Lagoons	CO_2	No	CO_2 emissions from anaerobic digestion are considered GHG neutral
		CH_4	[Yes/No]	[XXX]
		N_2O	No	Excluded for simplification and conservativeness. Expected to be minimal
Project Activity	Composting process	CO_2	No	CO_2 emissions from composting process are considered GHG neutral. Excluded for simplification and conservativeness. Expected to be minimal
		CH_4	[Yes/No]	[XXX]
		N_2O	No	N_2O emissions from loss of N2O-N during composting process and during application of the compost. Excluded for simplification and conservativeness. Expected to be minimal
	Run-off water	CO_2	No	Excluded for simplification and conservativeness. Expected to be minimal
		CH_4	[Yes/No]	[XXX]
		N_2O	No	Not significant, excluded for simplification. Excluded for simplification and conservativeness. Expected to be minimal
	Incremental use of fossil fuel for transportation and auxiliary equipments or machineries due to project activity	CO_2	[Yes/No]	[XXX]
		CH_4	No	Excluded for simplification and conservativeness. Expected to be minimal
		N_2O	No	Excluded for simplification and conservativeness. Expected to be minimal
	Electricity	CO_2	[Yes/No]	[XXX]
		CH_4	No	Excluded for simplification and conservativeness. Expected to be minimal
		N_2O	No	Excluded for simplification and conservativeness. Expected to be minimal

[CPA name] is located within the boundaries of Republic of Indonesia as specified in A.4.1.2.

B.5. Emission reductions:

B.5.1. Data and parameters that are available at validation:

Data / Parameter:	**Bo_{ww}**
Data unit:	$tCH_4/tCOD$
Description:	The methane generation capacity of the wastewater
Source of data used:	AMS-III.F version 8
Value applied:	0.21
Justification of the choice of data or description of measurement methods and procedures actually applied:	Corrected IPCC (2006) default value.
Any comment:	-

Data / Parameter:	**$MCF_{ww,treatment}$**
Data unit:	
Description:	The methane correction factor for the anaerobic decay of untreated wastewater
Source of data used:	AMS-III.F, version 8, Table III.F.1.
Value applied:	[To be determined based on characteristics of the baseline wastewater]
Justification of the choice of data or description of measurement methods and procedures actually applied:	Values for MCF according to table AMS-III.F version 8: Table III.F.1.
Any comment:	-

Data / Parameter:	**φ**
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	-
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" version 5.1
Any comment:	Oonk et al. (1994) have validated several landfill gas models based on 17 realized landfill gas projects. The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results.

Data / Parameter:	OX
Data unit:	-
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories Volume 3 – Chapter 3.2.3
Value applied:	[To be determined of each CPA: - Use 0.1 for managed solid waste disposal sites that are covered with oxidizing material such as soil or compost. - Use 0 for other types of solid waste disposal sites.]
Justification of the choice of data or description of measurement methods and procedures actually applied:	Managed or uncategorized SWDS
Any comment:	As per the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" version 5.1

Data / Parameter:	F
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories Volume 3 – Chapter 3.2.3
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" version 5.1
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by the IPCC.

Data / Parameter:	DOC_f
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories Volume 3 – Chapter 3.2.3
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually	As per the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" version 5.1

applied:	
Any comment:	-

Data / Parameter:	**MCF**
Data unit:	-
Description:	Methane correction factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories Volume 3 – Table 3.1
Value applied:	[]
Justification of the choice of data or description of measurement methods and procedures actually applied:	Use the following values for MCF: • 1.0 for **anaerobic managed solid waste disposal sites**. These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) leveling of the waste; • 0.5 for **semi-aerobic managed solid waste disposal sites**. These must have controlled placement of waste and will include all of the following structures for introducing air to waste layer: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation system; • 0.8 for **unmanaged solid waste disposal sites – deep and/or with high water table**. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste; • 0.4 for **unmanaged-shallow solid waste disposal sites.** This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres.
Any comment:	The methane correction factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.

Data / Parameter:	**DOC_j**
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in the waste type j
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories Volume 5 – Tables 2.4 and 2.5
Value applied:	20 %
Justification of the choice of data or description of measurement methods and procedures actually applied:	The figure represents the percentage of wet waste. Processed EFB falls under the category of 'garden, yard and park waste'. As per the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" version 5.1
Any comment:	See Annex 3 – Baseline Information

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential (GWP) of methane, valid for the relevant commitment period
Source of data used:	Decisions under UNFCCC and the Kyoto Protocol (a value of 21 is to be applied for the first commitment period of the Kyoto Protocol)
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied:	As required by IPCC.
Any comment:	-

Data / Parameter:	k_j
Data unit:	-
Description:	Decay rate for the waste type j
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories Volume 5 – Tables 3.3
Value applied:	0.17
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" version 5.1, EFB characteristics are similar to garden waste. Hence correspondent values for garden waste shall be used. Palm oil mills are situated within palm oil plantations. Palm oil plantations are grown within the tropical belt with MAT > 20°C and MAP > 1000 mm[5]. Indonesia is situated within the tropical belt.

Waste type *j*		Boreal and Temperate (MAT≤20°C)		Tropical (MAT>20°C)	
		Dry (MAP/PET <1)	Wet (MAP/PET >1)	Dry (MAP< 1000mm)	Wet (MAP> 1000mm)
Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07
Slowly degrading	Wood, wood products and straw	0.02	0.03	0.025	0.035
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17
Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.06	0.185	0.085	0.40

[5] Indonesia faces climatic conditions with all-year-round temperatures ranging 25 °C to 32 °C and evenly distributed rainfall of 2000 mm: Basiron Yusof, "Palm oil production through sustainable plantations" (2007), European Journal of Lipid Science Technology, 109:289

Any comment:	-

Data / Parameter:	**EF_{fuel}**
Data unit:	$t.CO_2/t.fuel$
Description:	CO_2 emission factor from diesel use
Source of data used:	IPCC 2006 value.
Value applied:	3.185
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated by multiplying the following two values: i) Emission factor for Gas/Diesel oil: 74.10 tCO2/TJ (Source: IPCC 2006, vol2, 2006 - Table 2.2 page 2.16cited at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf) ii) NCV for Gas/Diesel oil: 43.33 $TJ/10^3$ tonnes (Source: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook cited at http://www.ipcc- nggip.iges.or.jp/public/gl/guidelin/ch1wb1.pdf)
Any comment:	-

Data / Parameter:	**EF_{CO2}**
Data unit:	$t.CO_2/km$
Description:	CO_2 emission factor from diesel fuel use due to transportation
Source of data used:	Calculated based on the following inputs: i) Vehicle Fuel Consumption (volume): 0.175 litres/km ii) Fuel Density: 0.85 kg/litre iii) CO_2 emission factor from fuel use due to transportation: 3.185 $t.CO_2$ / t.fuel EF_{CO2} can be calculated as: (0.175 * 0.85) * 3.185 / 1000 = 0.00047
Value applied:	0.00047
Justification of the choice of data or description of measurement methods and procedures actually applied:	i) Vehicle Fuel Consumption (volume): 17.5 litres for 100km used. Source: www.ipcc-nggip.iges.or.jp/public/gp/bgp/2_3_Road_Transport.pdf (table 1-31 page 70) ii) Fuel Density: 0.8425 kg/litre. Source: Pertamina National Oil Company http://www.pertamina.com /index.php?option=com_content&task=view&id=3194&Itemid=667 iii) CO2 emission factor from fuel use due to transportation: IPCC 2006, vol2, 2006 - Table 2.2 page 2.16
Any comment:	-

Data / Parameter:	$\eta_{machine,skidloader}$
Data unit:	t.fuel / hour
Description:	Composting machine efficiency, loader / skidloader (diesel fuel consumption rate per hour)
Source of data used:	Values to be used (unit converted into tonnes using fuel density = 0.8425) : 1. Fuel consumption as defined by manufacturer; or 2. 13.6 liter/hour, defined as maximum fuel consumption of loader / skidloader in composting facilities. $\eta_{machine,skidloader}$ can be calculated as:

	13.6 x 0.8425 / 1000 = 0.01146
Value applied:	[]
Justification of the choice of data or description of measurement methods and procedures actually applied:	i) Highest value for loader / skidloader diesel fuel consumption rate (e.g. model GEHL 5240E = 13.6 litres / hour) Source : www.mwesales.com/Gehl-Specs/3640-4240-4640-5240.pdf ii) Fuel Density: 0.8425 kg/litre. Source: Pertamina National Oil Company http://www.pertamina.com /index.php?option=com_content&task=view&id=3194&Itemid=667
Any comment:	-

Data / Parameter:	$\eta_{machine,turning}$
Data unit:	t.fuel / hour
Description:	Composting machine efficiency, turning machine (diesel fuel consumption rate per hour)
Source of data used:	Values to be used (unit converted into tonnes using fuel density = 0.8425) : 1. Fuel consumption as defined by manufacturer; or 2. Values from below table for different size of turning machine :

Turning machine	Fuel consumption, highest	Remarks
Small size	13 liter/hour	Compost width <=4 meter
Medium size	25 liter/hour	Compost width <4-5 meter
Large size	37 liter/hour	Compost width <5-6 meter
Very large size	45 liter/hour	Compost width >6 meter

$\eta_{machine,turning}$ can be calculated as:
37 x 0.8425 / 1000 = 0.03117 *(large size)*

Value applied:	[]
Justification of the choice of data or description of measurement methods and procedures actually applied:	i) Typical model Backhus 17.50 turning machine fuel consumption (volume): 37 litres / hour Source : http://www.organics-recycling.org.uk/uploads/article1762 /Materials%20Handling%20Equipment%20Guide.pdf ii) Fuel Density: 0.8425 kg/litre. Source: Pertamina National Oil Company http://www.pertamina.com /index.php?option=com_content&task=view&id=3194&Itemid=667
Any comment:	-

Data / Parameter:	$\mathbf{CEF}_{gen,y}$
Data unit:	tCO2e/MWh
Description:	Carbon emissions factor of electricity supplied to the project by the palm oil mill in year 'y'
Source of data used:	Higher of the following four sources: 1. Technical specifications on fossil fuel use per energy produced multiplied by IPCC 2006 default emission factor 2. Default IPCC 2006 default emission factor on diesel fuelled stationary combustion applying a conservative generator efficiency of 30% (IPCC chapter 2, page 2.16 ff.) 3. Emission factor listed in Table I.D.1 of the methodology AMS I.D

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

Data / Parameter:	**$EF_{composting}$**
Data unit:	$g.CH_4/kg.waste$
Description:	Emission factor for composting of organic waste
Source of data used:	IPCC default values
Value applied:	4 $kg.CH_4$/tonne wet waste
Justification of the choice of data or description of measurement methods and procedures actually applied:	The figure was based on wet waste, as per methodology
Any comment:	-

Data / Parameter:	***$UF_{b,baseline}$***
Data unit:	-
Description:	Model correction factor to account for model uncertainties of co-composted wastewater
Source of data used:	AMS III.F version 8, reference: FCCC/SBSTA/2003/10/Add.2, page 25
Value applied:	0.94
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per methodology
Any comment:	-

Data / Parameter:	**$UF_{b,project}$**
Data unit:	-
Description:	Model correction factor to account for model uncertainties of runoff water
Source of data used:	AMS III.F version 8, reference: FCCC/SBSTA/2003/10/Add.2, page 25
Value applied:	1.06
Justification of the choice of data or description of measurement methods and procedures actually	As per methodology

applied:	
Any comment:	-

B.5.2. Ex-ante calculation of emission reductions:

The total emissions reduction of the CPA is calculated on the basis of the equations and parameters presented and explained in the section E.6.1 of the PoA DD and B.5.1 of this document.

Baseline Emissions
The baseline emissions are [baseline emissions]

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

$BE_y = BE_{CH4,SWDS,y} - (MD_{y,reg} * GWP_{CH4}) + (MEP_{y,ww} * GWP_{CH4}) + BE_{CH4,manure,y}$

Where:

$BE_{CH4,SWDS,y}$	Yearly methane generation potential of the solid waste composted by the project during the years "x" from the beginning of the project activity (x=1) up to the year 'y' estimated as described in AMS III.G (t CO2e)
$MD_{y,reg}$	Amount of methane that would have to be captured and combusted in the year 'y' to comply with the prevailing regulations
$MEP_{y,ww}$	Methane emission potential in the year 'y' of the wastewater. The value of this term is zero if co-composting of wastewater is not included in the project activity
$BE_{CH4,manure,y}$	Where applicable, baseline emissions from manure composted by the project activities, as per the procedures of AMS-III.D. The value of this term is zero, since the project does not include treatment of manure.
GWP_{CH4}	GWP for CH_4 (value of 21 is used)

The above baseline emissions will be calculated as follows:

(a) The estimation of the methane emission potential of a solid waste disposal site ($BE_{CH4,SWDS,y}$, in tCO_2e) shall be undertaken using the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" version 5.1.

$$BE_{CH4,SWDS,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j (y-x)} \cdot \left(1 - e^{-k_j}\right)$$

where:

$BE_{CH4,SWDS,y}$	Methane emissions avoided during the year *y* from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year y (tCO2e)
φ	Model correction factor to account for model uncertainties (0.9)
f	Fraction of methane captured at the SWDS and flared, combusted or used in

	another manner
GWP_{CH4}	Global warming potential (GWP) of methane, valid for the relevant commitment period (21)
OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste) [xx]:
F	Fraction of methane in the SWDS gas (volume fraction) (0.5)
DOC_f	Fraction of degradable organic carbon (DOC) that can decompose (0.5)
MCF	Methane correction factor [xx]:
$W_{j,x}$	Amount of organic waste type *j* prevented from disposal in the SWDS in the year *x* (tons)
DOC_j	Fraction of degradable organic carbon (by weight) in the waste type *j* (20%)
k_j	Decay rate for the waste type *j* (0.17)
j	Waste type category (index)
x	Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are calculated (x = y)
y	Year for which methane emissions are calculated

The following table shows the amount of organic waste composted from the palm-oil mill operation that would have been [baseline treatment of waste]:

Waste type	**Amount composted per year**	**Proportion of total**
Wood and wood products		
Pulp, paper and cardboard (other than sludge)		
Food, food waste, beverages and tobacco (other than sludge)		
Textiles		
Garden, yard and park waste		
Glass, plastic, metal, other inert waste		
TOTAL		

Baseline Emissions for EFB

Year	EFB (tonnes)	$BE_{CH4,SWDS}$ (tCO_2e)
1		
2		
3		
4		
5		
6		
7		

Methane emission potential of co-composted wastewater is estimated as follows:

$$MEP_{y,ww} = Q_{y,ww,in} * COD_{y,ww,untreated} * B_{o,ww} * MCF_{ww,treatment} * UF_{b,wastewater}$$

Where:

$Q_{y,ww,in}$	Volume of wastewater entering the co-composting facility in the year "y" (m^3)
$COD_{y,ww,untreated}$	Chemical oxygen demand of the wastewater entering the co-composting facility in the year "y" (tonnes/m^3)
$B_{o,ww}$	Methane producing capacity for the wastewater (IPCC default value of 0.21 kg CH_4 / kg COD)
$MCF_{ww,treatment}$	Methane correction factor for the wastewater treatment system in the baseline scenario (MCF value as per table III.F.1)
$UF_{b,wastewater}$	Model correction factor to account for model uncertainties of co-composted wastewater (0.94)

Baseline Emissions for POME

YEAR	Qww (m3/year)	COD_{ww} (kg COD/m^3)	$B_{O,ww}$ (default value)	$MCF_{ww,treatment}$	GWP_{CH4}	UF_b (default value)	$BE_{CH4,WW}$ (tCO_2e)
1							
2							
3							
4							
5							
6							
7							

(c) There are no regulations in Indonesia requiring the capture and utilisation or destruction of methane from EFB disposal sites. There are no regulations in Indonesia that prohibits the EFB disposal in unmanaged solid waste disposal site/landfilling. In addition, there is no regulation to require the recovery of methane from anaerobic lagoons treating POME.

Project Activity Emissions

Project activity emissions consist of:

(a) CO_2 emissions due to incremental transport distances;
(b) CO2 emissions from electricity and/or fossil fuel consumption by the project activity facilities;
(c) In case of anaerobic digestion: methane emissions from physical leakages of the anaerobic digester;
(d) In case of composting: methane emissions during composting process;
(e) In case of composting (including co-composting of wastewater): methane emissions from runoff water;
(f) In case the residual waste from the biological treatment (slurry, compost or products from those treatments) are stored under anaerobic conditions and/or delivered to a landfill: the methane emissions from the disposal/storage of these residual waste/products.

$PE = PE_{y,transp} + PE_{y,power} + PE_{y,\ phy\ leakage} + PE_{y,comp} + PE_{y,runoff} + PE_{y,res\ waste}$

Where:

PE_y	Project activity emissions in the year
$PE_{y,transp}$	Emissions from incremental transportation in the year y (tCO_2e)
$PE_{y,power}$	Emissions from electricity or fossil fuel consumption in the year y (tCO_2e)
$PE_{y,\ phy\ leakage}$	In case of anaerobic digestion: methane emissions from physical leakages of the anaerobic digester in the year y (tCO_2e)
$PE_{y,comp}$	In case of composting: methane emissions during composting process in the year y (tCO_2e)
$PE_{y,runoff}$	In case of composting (including co-composting of wastewater): methane emissions from runoff water in the year y (tCO_2e)
$PE_{y,res\ waste}$	In case the residual waste/slurry/products are subjected to anaerobic storage or disposed in a landfill: methane emissions from the anaerobic decay of the residual waste/products (tCO_2e)

(a) CO_2 emissions due to incremental transport distances between:

(i) The collection points of biomass and the composting site as compared to the baseline solid waste disposal site,
(ii) The collection points of wastewater and composting site as compared to the baseline wastewater treatment site,
(iii) The composting site and the soil application sites.

$PE_{y,transp} = (Q_y / CT_y) * DAF_w * EF_{CO2} + (Q_{y,comp} / CT_{y,comp}) * DAF_{comp} * EF_{CO2}$

Where:

Q_y	Quantity of waste composted and/or wastewater in the year "y" (t)
CT_y	Average truck capacity for waste transportation (t/truck)
DAF_w	Average incremental distance for waste transportation (km/truck)
EF_{CO2}	CO_2 emission factor from fuel use due to transportation ($t.CO_2$/km, IPCC default values or local values can be used) (0.00047)
$Q_{y,comp}$	Quantity of final compost product produced in the year "y" (t)
$CT_{y,\ comp}$	Average truck capacity for final compost product transportation (t/truck)
DAF_{comp}	Average distance for final compost product transportation (km/truck)

$DAF_w = 0$; as the composting facilities are within the boundaries of the composting mills, therefore project emissions due to transportation of EFB to the composting sites is considered as '0'. Therefore the average truck capacity for EFB transportation CT_y is not needed to be monitored.

Hence:

$PE_{y,transp} = (Q_{y,comp} / CT_{y,comp}) * DAF_{comp} * EF_{CO2}$

Project Emissions from transportation

YEAR	$Q_{y,comp}$ (tonnes)	$CT_{y,comp}$ (tonnes/truck)	DAF_{comp} (km/truck)	EF_{CO2} (tCO_2e/km)	$PE_{y,trans}$ (tCO_2e)
1					
2					
3					
4					
5					
6					
7					

(b) CO_2 emissions on account of fossil fuel based energy used by the project activity facilities, which includes energy used for [use of power at CPA site].

$$PE_{y,power} = PE_{gen,y} + \sum PE_{fuel,i,y}$$

$$PE_{gen,y} = P_{gen,y} \times OT_{gen\_comp,y} \times 110\% \times CEF_{gen,y}$$

$$PE_{fuel,i,y} = OT_{machine,i,y} \times \eta_{machine,i} \times EF_{fuel}$$

Where:

$PE_{y,power}$	Project emissions from electricity and/or fossil fuel consumption by the project activity facilities ($t.CO_2$/year)
$PE_{gen,y}$	Project emissions from electricity consumption by the project activity facilities ($t.CO_2$/year)
$PE_{fuel,y}$	Project emissions from fossil fuel consumption by the project activity facilities ($t.CO_2$/year)
$P_{gen,y}$	Total capacity of auxiliary equipment installed in the project activity (MW).
$OT_{gen\_comp,y}$	Operating hours of composting plant when biomass power plant is out of operation (hour/year).
$CEF_{gen,y}$	Carbon emissions factor of electricity supplied to the project by the palm-oil mill in year 'y' ($t.CO_2e$/MWh).
$PE_{fuel,i,y}$	Project emissions from fossil fuel consumption by the project activity facilities ($t.CO_2$/year)
$OT_{machine,i,y}$	Operating hours of hours of composting machine type 'i' in year 'y' (hour/year) (*see values below*)
EF_{fuel}	Emissions factor for the diesel fuel used ($t.CO_2e$/t.fuel) (IPCC 2006)
$\eta_{machine,i}$	Efficiency factor of composting machine type 'i', (t.fuel / hour) (*see values below*)
i	type of composting machines with diesel fuel consumption (loader / skidloader or turning machine)

$CEF_{gen,y}$ is determined using the highest applicable value of the following four sources:

1. Technical specifications on fossil fuel use per energy produced multiplied by IPCC 2006 default emission factor
2. Default IPCC 2006 default emission factor on diesel fuelled stationary combustion applying a conservative generator efficiency of 30% (IPCC chapter 2, page 2.16 ff.)

3. Emission factor listed in Table I.D.1 of the methodology AMS I.D
4. Grid emissions factor relevant to the palm oil mill operation (if grid connection is available)

In case of renewable energy sources, $CEF_{gen,y}$ is set zero.

Default values listed, section B.5.1, can be used for the composting machine efficiency or can be taken from machine specification datasheet. There are two types of composting machine, the loader / skidloader and the turning machine, with each diesel fuel consumption rate per hour as follows:

$OT_{machine,loader,y}$ Operating hours of composting machine, loader, in year 'y' (hour/year)
$OT_{machine,turning,y}$ Operating hours of composting machine, turning, in year 'y' (hour/year)
$\eta_{machine,skidloader}$ Efficiency factor of the loader / skidloader machine (t.fuel / hour)
$\eta_{machine,turning}$ Efficiency factor of the turning machine used (t.fuel / hour)

Project Emissions from electricity consumption

YEAR	$P_{gen,y}$ (MW)	$OT_{gen,comp.,y}$ (hours)	$CEF_{gen,y}$ (t CO_2/MWh)	$PE_{gen,y}$ (t.CO_2e)
1				
2				
3				
4				
5				
6				
7				

Project Emissions from fossil fuel consumption, skidloader

YEAR	$OT_{machine,skidloader,y}$ (hours)	$\eta_{machine,skidloader}$ (t.fuel / hours)	EF_{fuel} (t.CO_2e/t.fuel)	$PE_{fuel,skidloader,y}$ (t.CO_2e)
1				
2				
3				
4				
5				
6				
7				

Project Emissions from fossil fuel consumption, turning machine

YEAR	$OT_{machine,turning,y}$ (hours)	$\eta_{machine,turning}$ (t.fuel / hours)	EF_{fuel} (t.CO_2e/t.fuel)	$PE_{fuel,turning,y}$ (t.CO_2e)
1				
2				
3				

4				
5				
6				
7				

(c) CH_4 emissions from physical leakages of the anaerobic digester.

$PE_{y,phy\ leakage} = Q_y * EF_{anaerobic} * GWP_{CH4}$

Where:

$EF_{anaerobic}$ Emission factor for anaerobic digestion of organic waste (t CH_4/ton waste treated)
Emission factor can be based on facility/site-specific measurements, country specific values (table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gases Inventories). IPCC default values are 2 g CH_4/kg waste treated on a dry weight basis and 1 g CH_4/kg waste treated on a wet weight basis

Methane emission from physical leakages in the project emission is negligible, since the project activity is composting.

Hence this project emission calculation is zero.

(d) CH_4 emissions during composting.

$PE_{y,comp} = Q_y * EF_{composting} * GWP_{CH4}$

Where:

$EF_{composting}$ Emission factor for composting of organic waste (t CH_4/ton waste treated)
Emission factor can be based on facility/site-specific measurements, country specific values (table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gases Inventories). IPCC default values are 10 g CH_4/kg waste treated on a dry weight basis and 4 g CH_4/kg waste treated on a wet weight basis. In this case, the waste treated (EFB) is categorized as wet weight basis[6].

In case oxygen content of the composting process is monitored and above 8%, value of $EF_{composting}$ can be set to zero. This will be done via sampling with maximum margin of error of 10% at a 95% confidence level. For this purpose a portable oxygen meter can be used with lancets of at least 1 m length.

Hence this project emission calculation is [XXX].

(e) CH_4 emissions from run-off water from the composting facilities.

[6] Astimar Abdul Aziz, Mohamad Deraman, Ropandi Mamat, Anis Mokhtar, Wan Hasamudin Wan Hasan, Ridzuan Ramli and Ismadi Ismail; High Porosity Carbon Powder from Oil Palm Empty Fruit Bunches for Adsorbent Products, Jurnal MPOB TT No. 332

[treatment of run-off water] Project emissions from runoff water will take into account [XXX]

$PE_{y,runoff} = Q_{y,ww,runoff} * COD_{y,ww,runoff} * B_{o,ww} * MCF_{ww,treatment} * UF_{b,project} * GWP_{CH4}$

Where:

$Q_{y,ww,runoff}$	Volume of run-off water in the year "y" (m^3)
$COD_{y,ww,runoff}$	Chemical oxygen demand of the runoff water leaving the composting facility in the year "y" (t/m^3)
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC default value for domestic wastewater of 0.21 kg CH_4/kg. COD)
$MCF_{ww, treatment}$	Methane correction factor for the wastewater treatment system where the runoff water is treated (MCF value as per table III.F.1)
GWP_{CH4}	Global Warming Potential (GWP) of methane, valid for the relevant commitment period (21)
$UF_{b,project}$	Model correction factor to account for model uncertainties (1.06)

Project Emissions from runoff water

YEAR	$Q_{y,runoff}$ (m^3/year)	$COD_{y,runoff}$ (kg COD/m^3)	$B_{O,ww}$ (default)	$MCF_{ww,treatment}$	GWP_{CH4}	$UF_{b,project}$ (default)	$PE_{y,runoff}$ (tCO_2e)
1							
2							
3							
4							
5							
6							
7							

(f) CH_4 emissions from anaerobic storage and/or disposal in a landfill of the compost

Methane emission from anaerobic storage and/or disposal in a landfill of the compost is [XXX].

Hence this project emission calculation is [XXX].

Hence: [equation for project emissions]

Leakage

Project leakage is [XXX]. Therefore, $\mathbf{Leakage_y}$ = [XXX].

B.5.3. Summary of the ex-ante estimation of emission reductions:

Table 8 - Summary of the ex-ante estimation of emission reductions

Years	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of emission reductions (tonnes of CO_2 e)
1				
2				
3				
4				
5				
6				
7				
Total (tonnes of CO_2)				
Total number of crediting years				
Annual average over the crediting period of estimated reductions (tonnes of CO2e)				

B.6.1. Description of the monitoring plan:

The monitoring plan details the actions necessary to record all the data parameters required by the methodology AMS III.F, version 8, as detailed in section E.7.1 of the PoA-DD. Details of the monitoring procedures and frequency of monitoring are described for each parameter in this section. All data will be recorded at the specified frequency.

The operator of the CPA will be responsible for collecting the monitoring data and will provide the coordinating entity with full data records and if applicable calibration certificates. The data will be archived electronically, backed up regularly, and be stored by the coordinating entity for 2 years after the end of the crediting period of each CPA or the last issuance of CERs of this project, whichever occurs last.

The installation of the monitoring equipment is detailed below for each parameter. The CPA operator will implement QA&QC measures to calibrate and guarantee the accuracy of metering and safety of the project operation. The metering devices will be calibrated and inspected properly and periodically as per standard industry norms and requirements.

Procedures to discount conservatively the emission reductions from the projects will be defined, in the event either the project owner or the coordinating entity detects any distortion or mal-function of the monitoring equipment. The readings from monitoring equipment will be readily accessible for the Designated Operational Entity (DOE) carrying out the verification of monitoring data.

The CPA operator has an operational and management structure in place to monitor emission reductions from the project activity. Specific personnel will be assigned to be responsible for project management as well as for all the different parameters to be monitored and reported.

The parameters to be monitored are:

Data / Parameter:	**Q_v**
Data unit:	t/year
Description:	Total amount of organic waste prevented from disposal in year 'x'
Source of data to be used:	Project owner
Value of data	[XXX]
Description of measurement methods and procedures to be applied:	EFB weighing by calibrated weighbridge. Recording frequency: each time a truck passes the weighbridge. The data will be measured and recorded daily in a log sheet and aggregated monthly for calculations
QA/QC procedures to be applied:	Calibration and maintenance are subject to procedures established by instrument manufacturer. The weighbridge will be calibrated annually.
Any comment:	Data monitored and required for verification and issuance will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this programme activity, whichever occurs later.

Data / Parameter:	**$Q_{y,ww,in}$**
Data unit:	m^3/year
Description:	Flow rate of organic wastewater into the composting facility
Source of data to be used:	Host facility: flow meter
Value of data	[XXX]
Description of measurement methods and procedures to be applied:	Measurement will be taken from an installed flowmeter that will be placed at the inlet of pond where POME will be pumped to the composting site. Data will be recorded daily in a log sheet and aggregated monthly.
QA/QC procedures to be applied:	Calibration and maintenance are subject to procedures established by instrument manufacturer. The flowmeter will be calibrated annually.
Any comment:	Data monitored and required for verification and issuance will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this programme activity, whichever occurs later.

Data / Parameter:	**$COD_{y,ww,untreated}$**
Data unit:	kg/m^3
Description:	Concentration of organic material in wastewater into the composting facility
Source of data to be used:	Project owner through COD sampling
Value of data	[XXX]
Description of measurement methods and procedures to be applied:	COD sampling will be conducted at the inlet to composting site. COD samples will be taken monthly and sent for testing at an independent third party laboratory.

QA/QC procedures to be applied:	Test equipment will be calibrated according to manufacturer's recommendations.
Any comment:	Data monitored and required for verification and issuance will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this programme activity, whichever occurs later. COD values of the wastewater in a mill won't vary over the year as palm oil production process doesn't change. Hence, one COD test a month by an independent third party laboratory is considered as representative and further in line with the government regulation of effluent COD measurement frequency

Data / Parameter:	$\mathbf{Q_{y,ww,runoff}}$
Data unit:	m^3
Description:	Volume of run-off water from the co-composting plant
Source of data to be used:	Project developer
Value of data:	[XXX]
Description of measurement methods and procedures to be applied:	Measurement will be taken from an installed flowmeter that will be placed at the inlet point to the environmental pond. Data will be recorded daily in a log sheet and aggregated monthly.
QA/QC procedures to be applied:	Calibration and maintenance are subject to procedures established by instrument manufacturer. The flowmeter will be calibrated annually.
Any comment:	Data monitored and required for verification and issuance will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this programme activity, whichever occurs later.

Data / Parameter:	$\mathbf{COD_{y,ww,runoff}}$
Data unit:	kg / m^3
Description:	Concentration of organic material in runoff water from the composting facility
Source of data to be used:	Project owner through COD sampling
Value of data:	[XXX]
Description of measurement methods and procedures to be applied:	Measurement will be taken from the pond where the runoff water is discharged. One COD sample will be taken monthly and sent for testing at an independent third party laboratory.
QA/QC procedures to be applied:	Test equipment will be calibrated according to manufacturer's recommendations.
Any comment:	Data monitored and required for verification and issuance will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this programme activity, whichever occurs later. COD values of the wastewater in a mill won't vary over the year as palm oil production process doesn't change. Hence, one COD test a month by an independent third party laboratory is considered as representative and further in line with the government regulation of effluent COD measurement frequency.

Data / Parameter:	$Q_{y,comp}$
Data unit:	t/year
Description:	Quantity of final compost produced in year 'y'
Source of data to be used:	Project owner
Value of data	[XXX]
Description of measurement methods and procedures to be applied:	The produced compost weighing by calibrated weighbridge. Recording frequency: each time a truck passes the weighbridge. The data will be measured and recorded daily in a log sheet but aggregated monthly for calculations
QA/QC procedures to be applied:	Calibration and maintenance are subject to procedures established by instrument manufacturer. The weighbridge will be calibrated annually.
Any comment:	Data monitored and required for verification and issuance will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this programme activity, whichever occurs later.

Data / Parameter:	$P_{gen,y}$
Data unit:	MW
Description:	Total capacity of auxiliary equipment installed in the project activity
Source of data to be used:	Project owner
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[XXX]
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$OT_{gen\_comp,y}$
Data unit:	hour/year
Description:	Operating hours of composting plant when biomass power plant is out of operation
Source of data to be used:	Project owner
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[XXX]
Description of	Data can be obtained from the palm oil mills and composting facilities logbooks.

measurement methods and procedures to be applied:	Any time when composting plant is operating during failure of biomass power plant shall be monitored.
QA/QC procedures to be applied:	Each failure or maintenance shut down of either the biomass power plant of composting facility is recorded in company's logbooks.
Any comment:	-

Data / Parameter:	**$OT_{machine,skidloader,y}$**
Data unit:	hour/year
Description:	Annual operating hours of loader / skidloader machine
Source of data to be used:	Project owner
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[XXX]
Description of measurement methods and procedures to be applied:	Data can be obtained from i) Device installed in machine measuring operating hours or ii) The palm oil mills and composting facilities logbooks.
QA/QC procedures to be applied:	Confirmation by supervisor, attendance logbook of machine operator.
Any comment:	-

Data / Parameter:	**$OT_{machine,turning,y}$**
Data unit:	hour/year
Description:	Annual operating hours of turning machine
Source of data to be used:	Project owner
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[XXX]
Description of measurement methods and procedures to be applied:	Data can be obtained from i) Device installed in machine measuring operating hours or ii) The palm oil mills and composting facilities logbooks.
QA/QC procedures to be applied:	Confirmation by supervisor, attendance logbook of machine operator.
Any comment:	-

Data / Parameter:	**DAF_{comp}**
Data unit:	km/truck
Description:	Average incremental distance for composting transportation
Source of data to be	Project owner/compost buyer

used:	
Value of data:	[XXX]
Description of measurement methods and procedures to be applied:	Records of all dispatches of compost from the composting site and the destination for the delivery of compost will be maintained at the plant. For each load/trip of compost taken out of the plant, the operator shall record the distance to destination by speaking to the carrier The total distance will be divided by the total number of trips to calculate the average distance.
QA/QC procedures to be applied:	Confirmation by supervisor & bills/invoices for compost delivery.
Any comment:	Data monitored and required for verification and issuance will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this programme activity, whichever occurs later. This will be calculated annually.

Data / Parameter:	**$CT_{y, comp}$**
Data unit:	t/truck
Description:	Average truck capacity for compost transportation
Source of data to be used:	Capacity specification of the truck fleet
Value of data:	[XXX]
Description of measurement methods and procedures to be applied:	Analysis of the composition of the truck fleet and respective load capacity of each truck. Keeping records (log sheets) of the trucks transporting compost that depart from the composting sites.
QA/QC procedures to be applied:	Data from weighbridge measurement will be used to cross check the recorded data
Any comment:	Data monitored and required for verification and issuance will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this programme activity, whichever occurs later. This will be calculated annually.

Data / Parameter:	**Oxygen Level in the compost**
Data unit:	% of dissolvent oxygen content
Description:	Percentage of dissolved oxygen content in the compost
Source of data to be used:	On-site measurements
Value of data:	[XXX]
Description of measurement methods and procedures to be applied:	The oxygen level will be recorded daily using a handheld oxygen meter with lancets of at least 1 m length and sampling with maximum margin of error of 10% at a 95% confidence level. The compost pile will be turned if the oxygen level drops to below 10% to ensure the compost pile is in aerobic condition at all times.
QA/QC procedures to be applied:	The oxygen meter will record data from at least 2 different points in the windrow to ensure homogeneity of reading taken. Average value of these data will be used to determine the oxygen level of the windrow. The handheld oxygen meter will be calibrated annually as per manufacturers

	specification.
Any comment:	In case oxygen content of the composting process is monitored and above 8%, the parameter $EF_{composting}$ can be set to zero for the portions of Q_y for which the monitored oxygen content of the composting process.

Data / Parameter:	**Soil application of the compost in the plantation**
Data unit:	N/A
Description:	Soil application of the compost in the plantation will be monitored
Source of data to be used:	Project owner / plantation [XXX]
Value of data:	N/A
Description of measurement methods and procedures to be applied:	The sale of compost to smallholders and plantations will be documented through invoices if such exist. In situ verification of the proper soil application of the compost in a representative sample of the sites in the nearby plantations will be performed. Photographic evidences will be provided to demonstrate that the compost is properly applied.
QA/QC procedures to be applied:	All bills/invoices of compost sale will include information about compost end-use destination.
Any comment:	Data monitored and required for verification and issuance will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this programme activity, whichever occurs later.

Data / Parameter:	**Quality Control Program to the Composting work**
Data unit:	N/A
Description:	monitoring the conditions and procedures that ensure the aerobic condition of the waste during the composting process
Source of data to be used:	Project owner (composting plant team work and Technical Advisor)
Value of data:	N/A
Description of measurement methods and procedures to be applied:	– Turning of the material every 2 days - Regular check of the compost quality leaving the composting facility (i.e. brown color and homogenous shows low C/N ratio: good quality; dark color and heterogeneous shows high C/N ratio: bad quality)
QA/QC procedures to be applied:	- Check of the operating hours of turning machine which equals a defined amount of compost during the period as turning machine operates at fixed speed. - Pictures will be taken of the final compost product on frequent basis. Quality is assured by regular turning anyhow.
Any comment:	-

Data / Parameter:	**$MD_{y,reg}$**
Data unit:	tonnes of CH_4 / year
Description:	Quantity of methane that would have to be captured and combusted to comply with the prevailing regulations
Source of data to be used:	Current regulations in the Host Country

Value of data:	[XXX]
Description of measurement methods and procedures to be applied:	Current regulations in the host country do not require the capture and combustion Of methane. Changes in the legislation requirements will be monitored.
QA/QC procedures to be applied:	-
Any comment:	To be updated according to the latest regulation for each CPA

Data / Parameter:	**f**
Data unit:	%
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data to be used:	Data available from palm oil mill site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	[XXX]
Justification of the choice of data or description of measurement methods and procedures actually applied:	No methane is captured and flared at the palm oil mill's facilities. The continuance of no capturing/flaring will be checked on-site during every verification site visit.
QA/QC procedures to be applied:	-
Any comment:	To be carried out on an annual basis.

Parameters to be **calculated** (not measured):

Data / Parameter:	**$BE_{CH4,SWDS,y}$**
Data unit:	tCO2/year
Description:	Yearly methane generation potential of the solid waste composted by the project during the years "x" from the beginning of the project activity (x=1) up to the year 'y'
Source of data to be used:	Calculated from other monitored parameters (as explained in section B.5.2, baseline a))
Value of data	[XXX] (calculation provided in the spreadsheet, this value is for the first year)
Description of measurement methods and procedures to be applied:	Calculated
QA/QC procedures to be applied:	N/A

Any comment:	This parameter is not measured directly.

Data / Parameter:	**$MEP_{y,ww}$**
Data unit:	tCO2/year
Description:	Methane emission potential in the year 'y' of the wastewater co-composted.
Source of data to be used:	Calculated from other monitored parameters (as explained in section B.5.2, baseline b))
Value of data	[XXX] (calculation provided in the spreadsheet, this value is for the first year)
Description of measurement methods and procedures to be applied:	Calculated
QA/QC procedures to be applied:	N/A
Any comment:	This parameter is not measured directly.

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:

☐ Please tick if this information is provided at the PoA level. In this case sections C.2. and C.3. need not be completed in this form.

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

[environmental impact]

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

[Apply latest rules. Currently no EIA is required]

SECTION D. Stakeholders' comments

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

☐ Please tick if this information is provided at the PoA level. In this case sections D.2. to D.4. need not be completed in this form.

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

A local stakeholder consultation was carried out on [date] in [location].

[description of stakeholder consultation and attendees]

D.3. Summary of the comments received:

The following are the main issues raised by the participants during the consultation:
1. [XXX]
2. [XXX]
[…..]

Below are the minutes of meeting of the Stakeholder Consultation:

[minutes]

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

[XXX]

Annex 1

CONTACT INFORMATION ON ENTITY/INDIVIDUAL RESPONSIBLE FOR THE SMALL-SCALE CPA

Organization:	
Street/P.O.Box:	
Building:	
City:	
State/Region:	
Postfix/ZIP:	
Country:	
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

[insert]

Annex 3

BASELINE INFORMATION

Baseline emission calculation is shown in section B.5.2

FFB Process

Total FFB Production (ton/year)					
Year	**20[XX]**				**Average**
Total					

[profile of lagoons]

Annex 4

MONITORING INFORMATION

The monitoring parameters and description of monitoring is shown in section B.6.1