CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	•The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. •As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	•The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Title : Myagri Bio-organic Plant at Pantai Remis, Perak
Version : 4.5
Date : 21/12/2012

A.2. Description of the small-scale project activity:

Malaysia is the largest palm oil exporter in the world with about 4.85 million hectares of palm oil plantation and around 420 palm oil mills spread over the country[1].

The palm oil mills process Fresh Fruit Bunches (FFB) into the main products Crude Palm Oil (CPO) and palm kernels. In the process a number of waste streams are produced including solid biomass waste (Empty Fruit Bunches (EFB), mesocarp fibre and Palm Kernel Shell (PKS) and wastewater or Palm Oil Mill Effluent (POME).

The bio-organic plant at Pantai Remis in Perak state in Malaysia (hereinafter the 'project activity') will implement a co-composting facility for EFB and some POME generated from Kilang Kelapa Sawit Pantai Remis (Pantai Remis Palm Oil Mill). The mill processing capacity is as described in Table 1[2] below. Currently, the mill does not intend to increase its operation capacity.

Pantai Remis Palm Oil Mill does not own an oil palm plantation, thus EFB mulching[3] could not be an option. The mill also does not own an incinerator to solve its EFB disposing problem. The EFB is currently deposited at a dump site (solid waste disposal site - SWDS) near the mill, where it is left to decompose. Daily unloading of EFB using truck at the SWDS leads to accumulation of EFB which causes anaerobic degradation and consequent release of methane emissions to the atmosphere. The project aims avoidance of methane release into the atmosphere by installation of an aerobic co-composting system for EFB recycling of composting leachate collected from the composting plant and for part of (5-10%) of POME. The project activity is designed to treat 66,000 tons[4] of EFB per annum.

[1] 2010 Malaysian Palm Oil Council's Annual Report (Page 13 – 18).

[2] Refer to "Monthly breakdown EFB & POME from PR POM 2008-2011 - verified by PRPOM 22May2012"

[3] Mulching involves EFB being utilized as a fertilizer substitute for the palms when distributed evenly in the field. Refer to N.Ravi Menon, Zulkifli Ab Rahman & Nasrin Abu Bakar from Malaysian Palm Oil Board (2003) '*Empty Fruit Bunches Evaluation : Mulch in Plantation Vs. Fuel for Electricity Generation*', for Oil Palm Industry Economic Journal (Vol.3 (2)/2003)

[4] Refer to "Mass balance calculation for Pantai Remis"

Table 1: Mill processing capacity[5] for 2008, 2009 and 2010

Item	2008	2009	2010
Fresh fruit bunches	338,214 tons	358,175 tons	327,470 tons
Empty fruit bunches	71,025 tons	75,217 tons	68,769 tons
POME	135,286 m^3	143,270 m^3	130,988 m^3

Data provided in the Table 1 above is based on historical records of raw material processed by the palm oil mill in the year 2008, 2009 and 2010. Further, the project proponent has assumed EFB to FFB ratio of 21% for the calculation purpose based on the historical data. It is also noticed that the POME generation rate of the mill is about 0.4m3/ton of FFB processed. This is mainly due to an efficient three phase decanter system employed by the mill[6]. Average palm oil mill's POME to FFB exchange rate is approximately 0.65[7]m3/tons FFB processed.

A.2.1. Brief project description

The proposed composting plant is located near to the palm oil mill Kilang Kelapa Sawit Pantai Remis. The project activity is a co-composting project, which is a process of controlled aerobic biological decomposition of organic materials.

The EFB shall be transported via trucks to the compost yard in the project activity and laid in rows. Palm oil mill effluent (POME) from the existing treatment plant from anaerobic ponds and leachate collected from leachate collection pond constructed near the composting plant shall be used as wetting agent for the composting material. Additional organic palm oil mill waste such as decanter residues and ash from boilers shall be added. Mesocarp fibre may also be added if required / available to be disposed. However, emission reductions are not claimed for treatment of these additional wastes such as decanter cake, ash and mesocarp fibre.

The windrows will be periodically turned for aeration using a wheel loader. The entire composting process would take between 10 to 12 weeks and the end product - the organic compost- is a dark brown porous substance with earthly smell. Subsequently, the compost will be used as organic compost in the plantation.

More detailed project description is given in section A.4.2

A.2.2. Reduction of Green House Gas (GHG) emissions by the project activity

The EFB to be consumed in the project activity is currently disposed in dumpsites near the mill and left to decay anaerobically causing huge methane emissions to the atmosphere. The project activity will utilize the EFB and subject to aerobic decomposition to produce organic compost; thus preventing methane emissions to the atmosphere. Thus, the project activity reduces GHG emissions.

A.2.3. Contribution of the project activity to sustainable development in project participant's view

[5] Refer to "Monthly breakdown EFB & POME from PR POM 2008-2011 - verified by PRPOM 22May2012"

[6] Technical Specifications for decanter centrifuge PANX 600 CS (Alfalaval)

[7] Page 6, Palm Oil Biomass for Electricity Generation in Malaysia

a. The sustainable development benefits of the project activity include:Previous study conducted by the Malaysian Palm Oil Board (MPOB) concluded that the usage of organic fertilizer improves the palm yield.[8] This contributes to the economical benefits.
b. The project activity contributes towards a decrease in chemical fertilizer consumption with the usage of organic compost[9];
c. It reduces GHG emissions caused by the anaerobic decay of EFB. The emissions to air prevented include methane, ammonia and hydrogen sulphide. As well known, these emissions contribute to global climate change, local acid rain and offensive smell in the local area.
d. It will act as a clean technology demonstration project, encouraging development of biomass facilities throughout Malaysia which could be replicated across the region;
e. It improves the environmental performance of the palm oil industries[10];
f. It creates job opportunities for the local people during construction and operation of the project activity;

Further, it is strongly believed that compost improves environmental performance in plantation sector such as the palm oil sector. Recent study[11] concluded that compost has numerous agronomic and horticultural uses such as a soil amendment, fertilizer supplement, top dressing for pastures and hay crops. In the examples stated above, the compost increases the water and nutrients retention of the soil, provides a porous medium for roots to grow in, increases the organic matter and decreases the bulk density or penetration resistance.

As the compost nutrient characteristic are in an organic form and not high in nitrogen, phosphorous, or potassium, these nutrients are released slowly in the soil. This will lead to efficient utilization of nitrogen and a decreased potential for nitrogen leaching compared to inorganic fertilizers.

A.3. Project participants:

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Malaysia (host)	Myagri Nutribio Sdn. Bhd. (Private entity)	No

[8] Refer to N.Ravi Menon, Zulkifli Ab Rahman & Nasrin Abu Bakar from Malaysian Palm Oil Board (2003) '*Empty Fruit Bunches Evaluation : Mulch in Plantation Vs. Fuel for Electricity Generation*', for Oil Palm Industry Economic Journal (Vol.3 (2)/2003)

[9] Refer to Tohiruddin L, Abner J. Silahi & H.L. Foster from Sumatra Bioscience (2011) 'Superior effect of compost derived from palm oil mill by-products as a replacement for inorganic fertilizers applied to oil palm', for PIPOC 2011 Int. P. O. Cong.-Agric., Biotech. & Sustainability Conf.

[10] Page 13, P. O. Oviasogie, N. O. Aisueni and G. E. Brown from Chemistry Division, Nigerian Institute for Oil Palm Research (NIFOR) (2010) 'Oil palm composted biomass: A review of the preparation, utilization, handling and storage'

[11] Page 13, P. O. Oviasogie, N. O. Aisueni and G. E. Brown from Chemistry Division, Nigerian Institute for Oil Palm Research (NIFOR) (2010) 'Oil palm composted biomass: A review of the preparation, utilization, handling and storage'

United Kingdom of Great Britain and Northern Ireland	Gazprom Marketing & Trading Limited (Private entity)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Malaysia

A.4.1.2. Region/State/Province etc.:

Perak

A.4.1.3. City/Town/Community etc:

Changkat Kruing

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project activity will be implemented near Kilang Kelapa Sawit Pantai Remis (Pantai Remis Palm Oil Mill) in the following address:
Lot 790, Jalan Ayer Tawar,
32500 Changkat Kruing,
Perak,
Malaysia
The coordinates of the project location are: 4.3666 N and 100.7680 E

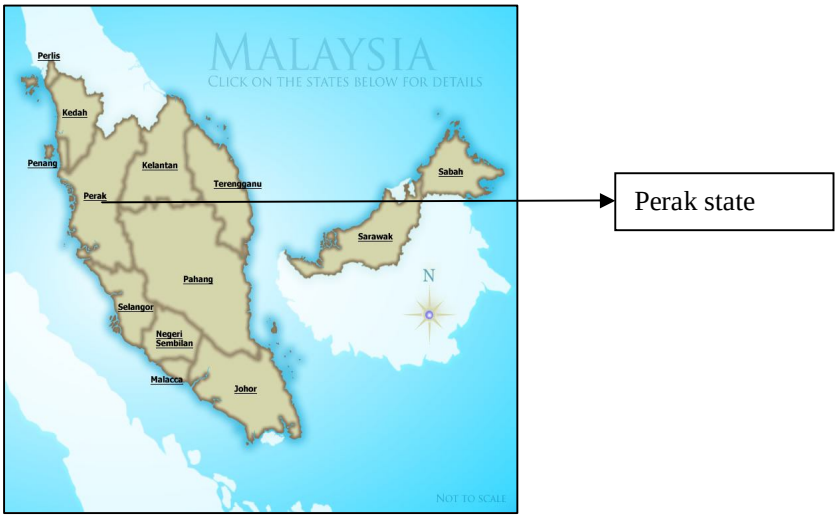


Fig 1 – Map showing Perak state in Malaysia Map

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

In accordance to Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities, the proposed CDM project is a small scale project and it falls under the following category:

Sectoral Scopes : 13-Waste handling and disposal
Main Category : Type III: Other Project Activities
Category : Methane Recovery

Approved small scale methodology AMS III.F / Version 10,"***Avoidance of methane emissions through composting***" is applied for the project activity.

A.4.2.1. Technology employed in the project activity

The EFB from the mill shall be transported via trucks to composting yard and laid in rows called "Windrows". If required, EFB may be subjected to further size reduction in the project activity.

Composting is a controlled, microbial process that converts organic matter into a stable, humus-like useful product called compost. This project activity will use mainly EFB. Palm oil mill effluent (POME) from the existing treatment plant from anaerobic ponds[12] and leachate collected from leachate collection pond constructed near the composting plant shall be used as wetting agent for the composting material. Other organic palm oil mill waste such as decanter residues and ash shall be added. Mesocarp fibre may also be added if required / available to be disposed.

The composting plant is organized into following sections:

[12] POME usage will be between 5-10%. A detailed calculation has been provided to the DOE.

i. Composting area for mixing and turning of compost material
ii. Post composting area for maturation and conditioning of composted material

The composting process will take place on a concrete floor with a perimeter drainage system to collect leachate. Each row will be covered by specially designed windrow cover permeable to air to facilitate natural aeration. The cover prevents rainwater getting in contact with composting material and allows the rain water to runoff smoothly without causing leachate and waste water production. The windrows will be periodically turned for aeration using a wheel loader. Forced aeration will also be supplied, if required, during the process by injecting air from a blower / compressor.

During the active phase of composting, the mixture of composting microorganisms will help to accelerate the process and the substrate will undergo a series of reactions to convert the organics in the windrows material into substances that are essential for the growth of plant such as nitrogen (N), phosphorus (P), carbon dioxide (CO_2), energy and water.

A leachate collection pond will be constructed near the composting area to collect any leachate produced and the same will be recycled back as a wetting agent for the composting process. All the leachate will be recycled and used as wetting agent. Only when sufficient leachate is not available, POME from existing POME treatment plant shall be applied to water the composting heaps in order to balance the high water evaporation due to the aggressive decomposition process and to maintain the temperature for optimum function of composting microorganisms. The important process parameters such as temperature, moisture content and percentage of dissolved oxygen, etc., will be monitored to ensure optimum aerobic conditions of the composting process.

After 8 to 9 weeks, the pre-matured compost is produced. The pre-matured compost is transferred to the roofed area for curing. The pre-matured compost will undergo the curing process for 3 weeks and after the temperature of the pile core reaches ambient temperature, the matured compost is produced. The matured compost is sieved and the rejected materials will be recycled for further composting.

The composting process for palm oil mill organic wastes is developed within the country and was installed in few mills on a pilot plant basis. Since the compost plants were not financially viable, as illustrated in subsequent sections, these projects were not widely implemented by the industry. Since CDM incentives now make the project financially attractive, many composting projects are developed as CDM projects in Malaysia. The project activity is an environmentally friendly project converting decaying organic wastes into valuable organic composting returning organics to the earth. The project activity is absolutely safe and environmentally friendly. Thus, a safe and sound technology is implemented in the project activity.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

A fixed crediting period of 10 years is chosen for the proposed project activity. The total emission reductions resulting from the project activity are estimated to be approximately 315,654 tCO_2e over the 10 years crediting period. An annual average of 31,565 tCO_2e will be reduced as a consequence of the project activity.

Table 2: Estimated amount of annual emission reductions

Year	Estimation of annual emission reductions in tonnes of CO_2e
Year 2013	8,424
Year 2014	15,883
Year 2015	22,175
Year 2016	27,484
Year 2017	31,963
Year 2018	35,741
Year 2019	38,929
Year 2020	41,619
Year 2021	43,888
Year 2022	45,802
Total estimated reductions (tonnes of CO_2e)	**315,654**
Total numbers of crediting years	10
Annual average of the estimated reductions over the crediting period (tCO_2e)	**31,565**

Note (1) Crediting period starts from the date of registration of the project activity as a CDM project activity.

A.4.4. Public funding of the small-scale project activity:

No public funding is involved in the project activity

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

Debundling is defined as the fragmentation of a large project activity into smaller parts, according to Appendix C (paragraph 2) of the Simplified M&P for Small-Scale CDM project activities. The current project cannot be deemed to be a debundled component of a larger project activity because, at the moment of registration of this project, there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity with the same project participants; in the same project category and technology/measure; registered within the previous 2 years; and whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

The following approved methodology is applied to the project activity:

Title of the methodology: AMS III.F / Version 10 - Avoidance of methane emissions through composting

This methodology is used in conjunction with the following tool:

- Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1 / EB66.
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". Version 2 / EB 41.
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" Version 1 / EB39. However, this tool is not applicable to the project activity, as all the electricity used in the project activity is renewable energy based.
- AMS III.H / Version 16 - Methane recovery in wastewater treatment. However, this methodology has only been referred for Methane Correction Factor (MCF) for the wastewater treatment system where the runoff water is treated.

B.2 Justification of the choice of the project category:

The project activity qualifies as small scale project as the emissions reductions from the project activity will be less than 60,000 tCO_2e/ year over its crediting period. The approved small scale methodology 'AMS-III.F / Version 10 - Avoidance of methane emissions through composting' is applicable to the project activity.

The table below shows that the proposed project activity meets each of the applicability conditions of the methodology:

Table 3: Justification of the choice of the project category

Applicability criteria set by AMS III.F/ Version 10	Compliance by the proposed project activity
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), or in a wastewater treatment system (WWTS). In the project activity, controlled aerobic treatment by composting of biomass is introduced.	Without the project activity, the EFB would be left to decay naturally at an unmanaged dumpsite without any methane recovery. The project activity proposes to implement controlled aerobic treatment by composting of biomass (EFB) and some POME. *Hence, meets the criteria*
2. The project activity does not recover or combust landfill gas from the disposal site (unlike AMS III.G "Landfill methane recovery"), and does not undertake controlled combustion of the waste that is not treated biologically in a first step (unlike AMS III.E "Avoidance of methane production from decay of biomass through combustion, gasification or mechanical treatment"). Project activities that recover biogas from wastewater treatment shall use methodology AMS-III.H "Methane recovery in wastewater treatment". Project activities involving co-digestion of organic matters shall apply	The project activity does not recover or combust landfill gas or biogas. The project activity does not recover any biogas from the wastewater treatment.

methodology AMS-III.AO "Methane recovery through controlled anaerobic digestion".	*Hence, meets the criteria.*
3. Measures are limited to those that result in emission reductions of less than or equal to 60kt CO_2e annually.	The expected annual average emission reductions is 31.565kt CO_2e and the highest emission reductions during the crediting period is expected to be 45.802kt CO_2e / year which less than the threshold value of 60 kt CO_2e. *Hence, meets the criteria.*
4. This methodology is applicable to the composting of the organic fraction of municipal solid waste and biomass waste from agricultural or agro- industrial activities including manure.	The project activity utilizes biomass waste from oil palm industry such as EFB, POME etc which is an agro- industrial activity. *Hence, meets the criteria.*
5. This methodology includes construction and expansion of treatment facilities as well as activities that increase capacity utilization at an existing composting production 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.	The project activity involves construction of a new co-composting plant. The project activity displaces disposal of EFBs at unmanaged solid waste disposal site thereby reducing GHG emissions. The project activity does not include any construction or expansion of compost production facilities as well as activities that increase capacity utilization at an existing composting production facility. The wastewater will be only used as wetting agent for the composting process. Also, there is no increase in capacity utilization of the existing POME treatment facilities either. Further more, the existing modes of treatment were sufficient enough to discharge treated effluent meeting the applicable laws and regulations and are not a part of any other CDM project activity. *This clause is not applicable to the project activity.*
6. This methodology is also applicable for co-composting wastewater and solid biomass waste, where wastewater would otherwise have been treated in an anaerobic wastewater treatment system without biogas recovery. The wastewater in the project scenario is used as a source of moisture and/or nutrients to the biological treatment process e.g. composting of empty fruit bunches (EFB), a residue from palm oil production, with the addition of palm oil mill effluent (POME) which is the wastewater co- produced from palm oil production.	The project activity utilises EFB and some POME wherein POME is used only as a source of moisture to the co-composting process. *Hence, meets the criteria*

7. In case of co-composting, if it can not be demonstrated that the organic matter would otherwise been left to decay anaerobically, baseline emissions related to such organic matter shall be accounted for zero, whereas project emissions shall be calculated according to the procedures presented in this methodology for all co-composted substrates.	The wastewater will be only used as wetting agent for the composting process. No emission reductions will be claimed from the composting of wastewater. *This clause is not applicable for the project activity.*
8. The location and characteristics of the disposal site of the biomass, animal manure and co-composting wastewater in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions, using the provision of AMS-III.G, AMS-III.E (concerning stockpile), AMS-III.D "Methane recovery in animal manure management systems" or AMS-III.H respectively. Project activities for composting of animal manure shall meet the requirements under paragraphs 1, and 2 (c) of AMS-III.D. Further no bedding material is used in the animal barns or intentionally added to the animal manure stream in the baseline. Blending materials may be added in the project scenario to increase the efficiency of the composting process (e.g. to achieve a desirable C/N ratio or free air space value), however, only monitored quality of solid waste or manure or wastewater diverted from the baseline treatment system is used for emission reduction calculation. The following requirement shall be checked *ex ante* at the beginning of each crediting period: (a) Establish that identified landfill(s)/stockpile(s) can be expected to accommodate the waste to be used for the project activity for the duration of the crediting period; or (b) Establish that it is a common practice in the region to dispose off waste in solid waste disposal site (landfill)/stockpile(s).	The location and characteristics of the dumpsite where EFB are currently being dumped is well defined. In the absence of project activity, EFBs would be disposed to a solid waste disposal site; located at a distance of approximately 0.4km (round trip) from the solid waste disposal site. Also, the distance travelled to transport the finished product (after composting) shall be approximately 120km (round trip). Hence, the distance in either case is less than 200 km. The project does not involve any disposal of animal manure or co-composting of wastewater. The wastewater will be used only as wetting agent (5-10%) for composting process and no emission reduction will be claimed from the composting of wastewater. *Hence, meets the criteria*
9. The project participant shall clearly define the geographical boundary of the region referred in paragraph 8 (b), and document it in CDM-PDD. In defining the geographical boundary of the region, project participants should take into account the source of the waste i.e. if waste is transported up to 50km, the region may cover a radius of 50 km around the project activity. In addition, it should	The geographical boundary of the project activity is the district of Manjung in Perak state, Malaysia. The clients to whom the compost will be sold to are well identified. The round trip between the project activity and the clients' location are less

also consider the distance to which the final product after composting will be transported. In either case, the region should cover a reasonable radius around the project activity that can be justified with reference to the project circumstances but in no case it shall be more than 200 km. Once defined, the region should not be changed during the crediting period(s).	than 10 km. However, a round trip distance of about 120 km is considered for ex-ante estimate purpose; which is well below 200 km[13]. *Hence, meets the criteria*
10. In case produced compost is handled anaerobically and submitted to soil application, the proper conditions and procedures (not resulting in methane emissions) must be ensured.	The compost produced in the project activity shall be used as soil conditioner in the nearby plantation through soil application and would not result in methane emissions. *Hence, meets the criteria*
11. In case produced compost is treated thermally/ mechanically, the provisions in AMS-III.E related to thermal/mechanical treatment shall be applied.	The compost is not thermally/mechanically treated under the project activity. *Hence this condition is not applicable for the project activity.*
12. In case produced compost is stored under anaerobic conditions and /or delivered to a landfill, emissions from the residual organic content shall be taken into account and calculated as per the latest version of the "Tool to determine methane emissions avoided fro the disposal of waste at solid waste disposal site".	The compost produced shall be used as soil conditioner in the nearby plantations. No compost will be stored under anaerobic conditions and/or delivered to a landfill. *Hence this condition is not applicable for the project activity.*

[13] Distance between the project activity and external buyers (end user of compost) have been plotted using Google Map application.

B.3. Description of the project boundary:

The project boundary is the physical, geographical site:

- Where the solid waste would have been disposed of and the methane emission occurs in the absence of the proposed project activity - dumping site for EFB;
- The co-composting wastewater would have been treated anaerobically in the absence of the project activity (the anaerobic pond);
- The treatment of biomass through composting takes place – composting plant;
- The organic compost is handled, disposed and submitted to soil application;
- The transportation of waste, wastewater, compost occur (itineraries between all locations mentioned above).

The co-composting plant is located next to the existing palm oil mill. The EFB will be shredded and loaded into windrows. The compost produced will be applied in the oil palm plantation. Therefore, the project boundary includes the oil palm plantation in which the compost is applied.

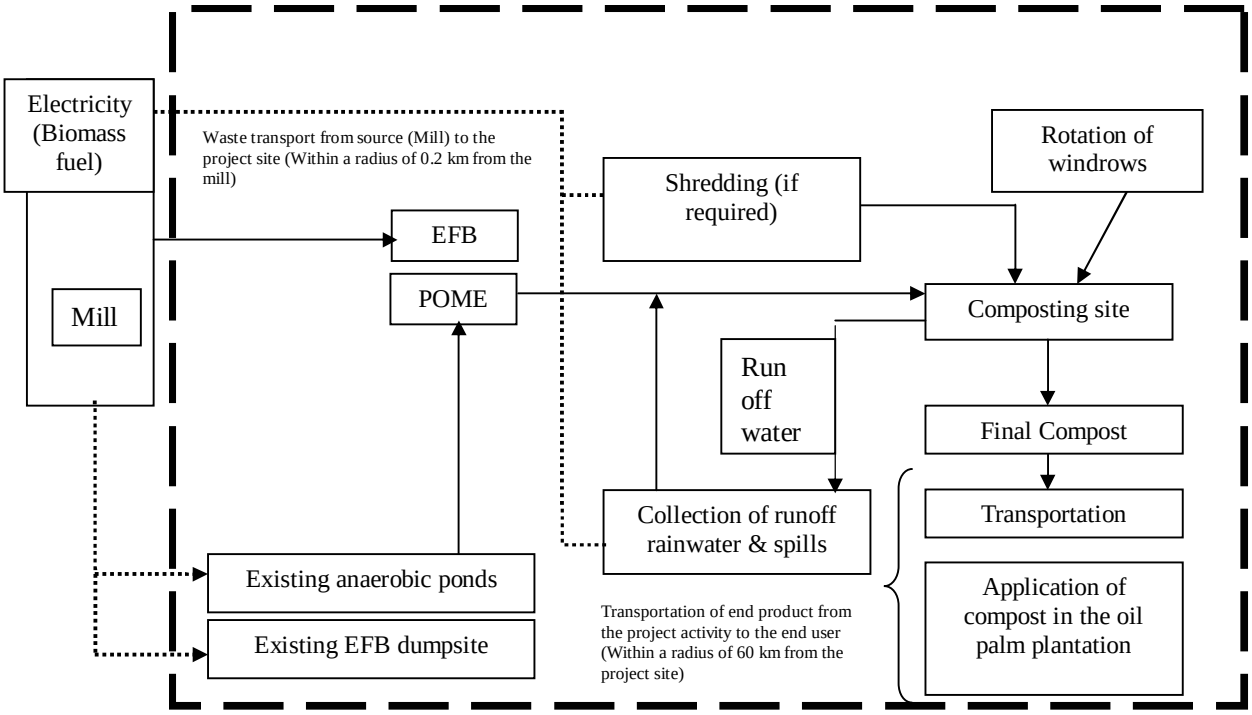


Figure 3: Project boundary

The sources and GHGs included in the project boundary are given in Table 4 below:

Table 4 – Sources of GHG emissions

Emissions	Sources	Gas	Included	Comment
Baseline emissions	Dumping of EFB in the dumping site	CH_4	Yes	Main baseline emissions from anaerobic decay of EFB in unmanaged dumpsite
		CO_2	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Transportation	CO_2	No	In the baseline scenario, the EFB was transported to a dumpsite which is located within the palm oil mill. The project activity also located within the mill's perimeter as well; which is not incremental in terms of carbon emissions. Hence, there are no incremental emissions for transportation of raw EFB is considered.
		N_2O	No	Excluded for simplification. This is conservative.
		CH_4	No	Excluded for simplification. This is conservative.
	Auxiliary fuel consumption	CO_2	No	Similar project activity was not implemented in the baseline scenario. Thus, emission due to auxiliary equipment has been excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
		CH_4	No	Excluded for simplification. This is conservative.
	POME from anaerobic lagoon	CH_4	No	Methane generated from the open ponds will not be considered in the CER calculation as the project activity will consume only 5- 10 % of the POME discharged by the mill. POME would be taken from second or third anaerobic lagoon / pond where the organic levels are expected to be low. This is conservative.
		CO_2	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project emissions	Transportation	CO_2	Yes	The project emissions due to EFB and organic compost transportation by trucks need to be considered. In the baseline scenario, the EFB was transported to a dumpsite which is located within the palm oil mill. The project activity also located within the mill's perimeter as well; which is not incremental in terms of carbon emissions. Hence, no emission for transportation of raw EFB is considered. However, emissions due to transportation of finished organic compost have been accounted.
	Electricity	CO_2	No	No project emissions are considered from the electricity used for the additional machineries in the project activity as the electricity consumed is generated using biomass fuel in the palm oil mill, a carbon neutral renewable source of energy.

	Fossil fuel	CO_2	Yes	Emissions are expected from fossil fuel consumption by vehicles (such as turners, wheel loader and etc used for waste management at the site) and auxiliary equipment at the composting sites.
	Composting process	CH_4	Yes	The methane emissions from the composting process are considered
	Runoff water	CH_4	No	All runoff water will be collected and recycled to the composting materials as moisture and/or nutrient. Thus, the project emission from this source is not considered.
	Residual waste	CH_4	No	There will be no methane emisisons from the compost due to anaerobic storage or disposal in landfill as the final compost will be evenly applied in the palm oil plantation.

B.4. Description of baseline and its development:

According to paragraph 14 of AMS-III.F / Version 10, 'the baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter are left to decay within the project boundary and methane is emitted to the atmosphere. The baseline emissions are the amount of methane emitted from the decay of degradable organic carbon in the biomass solid waste or manure. When wastewater is co-composted, the baseline emissions include emissions from wastewater co-composted in the project activity. The yearly Methane Generation Potential for the solid waste is calculated using the first order decay model as described in the latest version of the methodological tool "Emissions from solid waste disposal sites" /Version 06.0.1/ EB66.

In the absence of the project activity, the solid waste biomass (EFB) would be dumped in an unmanaged solid waste disposal site close to the mill and left to decay in anaerobic conditions. Also, the wastewater produced during the processing of the FFB would be treated anaerobically in an open pond system to reduce its COD before being discharged in the local waterways, with consequent release of methane to the atmosphere.

Baseline emissions exclude emissions of methane that would have to be captured to comply with national regulations. In the case of Malaysia there are no legal requirements to collect and destroy or utilize methane gas from landfill, therefore all methane emissions are included in the baseline.

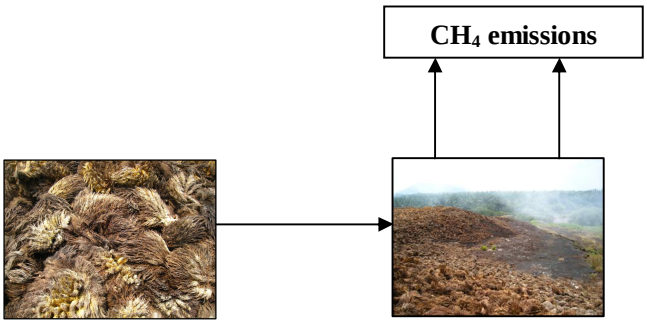


Figure 4: Baseline for the project activity

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

B.5.1. CDM consideration for the project activity

Paragraph 2 of "Guidelines on the demonstration and assessment of prior consideration of the CDM", version 04 / EB 62 indicates that notification must be made to Host Party Designated National Authority (DNA) and the UNFCCC within six months of the project activity start date. The notification to UNFCCC was made on 10th August 2011and to DNA of Malaysia on 2nd August 2011. The expected start date of the project activity is 30th January 2013, which shall be the date when the first work order or purchase order shall be raised for the project. Thus, the notification was made even before the start date of the project activity.

Early consideration of CDM must be demonstrated in accordance with the latest "Guidance on the demonstration and assessment of prior consideration of the CDM[14]". CDM has been seriously considered by the project owner prior to the commencement of the construction. The key actions and the timeline of the CDM consideration of the project activity are outlined in Table 5 below.

Table 5: Timeline of the project activity

Event	Date	Evidence
Memorandum of Understanding with CER Buyer	03/11/2010	MoU with Gazprom Marketing and Trading Ltd (GMT)
Proposal from CDM consultant	14/01/2011	E-mail from YTL-SV Carbon Sdn. Bhd. dated 14/01/2011
Decision to develop project as a CDM project *(Investment decision date)*	02/02/2011	Extract of Board resolution (decision made as per date on the resolution)

[14] EB 62 Report, Annex 13.

Conclusion of ERPA with CER buyer	04/07/2011	ERPA signed with GMT
Local stakeholders consultation meeting	26/07/2011	Newspaper advertisement and invitation letter
Appointment of CDM consultant	28/07/2011	CDM consultancy agreement
Notification of Prior consideration to UNFCCC	10/08/2011	E-mail to UNFCCC
Notification of Prior consideration to DNA, Malaysia	02/08/2011	Letter to DNA Malaysia dated 02/08/2011
Acknowledgement from DNA, Malaysia	05/08/2011	Letter Ref: NRE (S) 602-2/11
Acknowledgement from UNFCCC	02/09/2011	E-mail from UNFCCC
Received host country approval from DNA, Malaysia	16/04/2012	Letter Ref: NRE(S)602-2/11 Jld 15(36)
Received Annex 1 approval from DNA, UK	30/05/2012	Letter Ref: EA/GAZPROM/10/2012
Project start date	30/01/2013	Expected date of contract award for earthwork

The Memorandum of Understanding (MoU) that was signed with GMT - CER Buyer as early as 3rd November 2010 clearly demonstrates that CDM incentives were very seriously considered right from early stages of planning the project activity. The MoU gave strong confidence to project proponent to move further in this project. Nevertheless, the project proponent worked on the cash flow, received quotes from the contractors and did other market studies. Proposal from CDM consultant was received on 14th January 2011. The board made the decision to invest in the project on 2nd February 2011 and ERPA with CER buyer was then signed on 4th July 2011.

B.5.2. Additionality of the proposed project activity

As per the "Guidelines on the demonstration of additionality of small-scale project activities", version 09.0 / EB68, proof that the project is additional is required. This is done by identifying the barriers that would have prevented the project from occurring at least one of the following barriers is required:

- Investment barriers
- Technological barriers
- Barrier due to prevailing practice
- Other barriers

The main barrier faced by the project activity is discussed below:

B.5.2.1 Investment barrier

The current practice of disposal of EFB in the unmanaged dumpsite only involves transportation costs. The treatment of POME is conducted using anaerobic and aerobic lagoons already established at the mill. Therefore the continuation of current practice will not require additional capital investment.

On the other hand the construction of a new composting plant will require apportion of land, new equipment and staff which will incur huge investment. It is estimated that about 3 acres of land will be taken away

from the mill area for the establishment of the composting plant. Table 6 below details the project capital investment and annual operational costs. All values are in Ringgit Malaysia (RM), the official currency of Malaysia.

Table 6: Capital investment

Description	Evidence	Project Investment (Pre-Operational) (RM)	Operation cost (for the first year) (RM)
Composting plant 1.Capital cost i.Cost of Engineering, Procurement, Construction & Commissioning (EPCC)	Quotation from suppliers with details provided in the financial cash flow sheet	8,375,950	
ii.Quality control (QC) production training, installation and commissioning Project engineering, Department of Environment (DOE) application procedure, Preliminary Survey, Design, Engineering	Agreement between FELCRA Bukit Kepong & Myagri Nutribio	180,000 500,000	
2.Annual operational cost i. Annual O& M cost	Assumed 3% of total machinery cost		118,680
ii. Raw material cost (EFB and microbes)	Rental agreement between project proponent & participating mill / Biotech Alliance		1,032,900
iii. Electricity iv. water	Refer “Electricity & Water Pantai Remis”		24,785 783
v. Contract bagging, mixing & loading	Refer “bagging mixing loading (Wamosas Enterprise) quotation”		673,200
vi. Annual labour cost	Refer breakdown of manpower		444,600

vii. Annual diesel cost	Refer list of equipment & diesel consumption		304,416
viii. Fees to owner for land rental	Refer to Pantai Remis Tenancy Agreement 6Apr2011		84,000
ix. Project management fee	Refer "Service Level Agreement (Schedule 1)-MEB vs MAN"		240,000
Total		**9,055,950**	**2,923,364**
Compost sale price @ 140 RM/ton		RM 140/ ton	
CER price		€10 / CER	

The implementation of the project activity demands an investment of RM 9.056 million for the composting equipment, civil works, project management and training fees. The sale price of the organic compost has been assumed as RM 140/ton based on invoice from other plant managed by the project proponent. It is expected that about 22,440 tons[15] of compost would be produced per year which is expected to generate an income of RM 3,141,600. However, even if the mill generates more EFB during the crediting period, the project capacity will not process more than 66,000 tons of EFB per annum.

A nominal residual value of the assets after the end of the crediting period was also calculated and included in the financial model as required in the "Guidelines on the Assessment of Investment Analysis" Version 5.

The project internal rate of return (IRR) has been calculated for the project activity using the above capital and operational cost estimates to evaluate the financial viability of the project. A period of 15 years has been considered for investment analysis as raw material supply is contracted for 15 years only. **The Project IRR for the project activity has been calculated as -4.25%.** This return is certainly not viable for an entrepreneur to establish a new project. The benchmark of 8.8% is chosen as supported by the commercial bank lending rate available in Malaysia[16]; a base lending rate of 6.30% plus effective cost rate of 2.5% is considered for the benchmark calculation. Since the Project IRR without CDM is much lower than the chosen benchmark, it is clearly demonstrated that the investment in the project activity is not financially viable to the investors.

[15] Based on project proponent's plant operating experience at LCSB plant; EFB to compost ratio has been derived at 34%.

[16] Brochure from Bank Pembangunan Malaysia for high technology industry

B.5.2.2 Sensitivity Analysis

Latest "Guidelines on the assessment of investment analysis" require the project developer to subject critical assumption to reasonable variations to ascertain the robustness of conclusion drawn, that is, the project is additional. As required, a sensitivity analysis was undertaken using variations for various project variables. The Project IRRs for various variations on capital expenditure, operational expenses and revenue are given in Table 7 below:

Table 7: Results of sensitivity analysis for the project activity

Variation	Project IRR (without CDM revenues)	Comment
Compost price + 10%	1.33%	Lower than the benchmark
Compost price - 10%	-11.11%	Lower than the benchmark
O&M cost + 10%	-10.57%	Lower than the benchmark
O&M cost - 10%	0.97%	Lower than the benchmark
CAPEX + 10%	-4.64%	Lower than the benchmark
CAPEX - 10%	-3.78%	Lower than the benchmark

Through the sensitivity analysis we could derive that the financial analysis is quite robust against ±10% variations to the input parameters. The IRRs of the project activity with variations of investment cost, revenue and O&M costs without CER revenue is shown in the graph below in Figure 5. Further to the analysis, we also could establish that the project will cross the benchmark of 8.8% IRR as shown below:

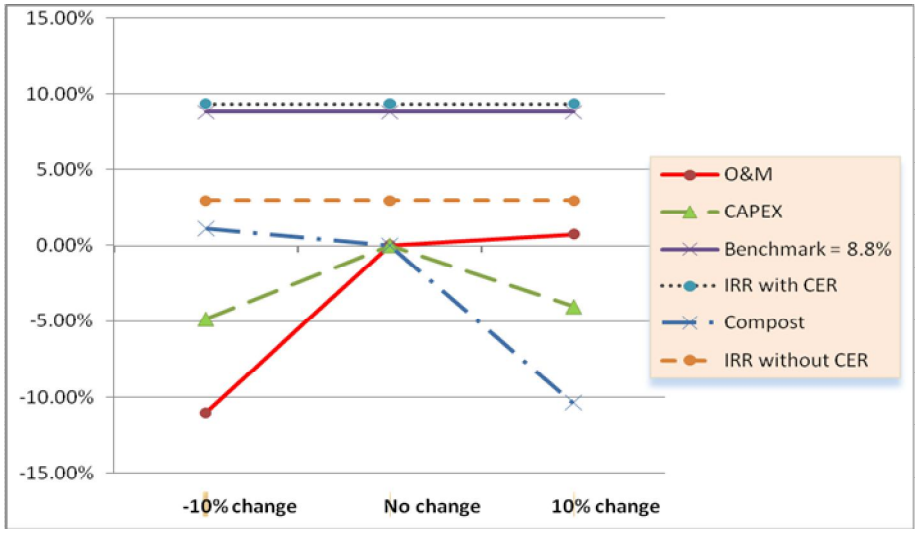


Figure 5 – Graph showing IRRs with & without CDM revenue with variations of project variables

Table 8: Variation of variables for IRR without CDM to cross benchmark

Variation	Comment
Compost price + 27%	Crossed the benchmark
CAPEX - 80%	Crossed the benchmark
O&M cost -29%	Crossed the benchmark

Currently, there are 28 composting projects from Malaysia registered with UNFCCC. Out of these, 26 projects are registered under methodology AMS-III.F[17] and two other registered under methodology AM0039. Further, there are another 16 under methodology AM-III.F, 7 under AM0025 and 13 under AM0039 projects from Malaysia that are listed in the UNFCCC under projects undergoing validation[18]. Considering large numbers of similar projects in Malaysia, there is a possibility of supply exceeding the demand of compost in the local market. Therefore an increase of 27% in the price of compost is highly unlikely.

In the case of CAPEX, the assumption is based on the actual quotation received for a similar project (Perak SADC). Therefore, a decrease of 80% in the price of CAPEX is highly unlikely.

It is a practice in the manufacturing industry that the maintenance cost to be taken as 5% of the total cost of plant and machineries. For conservative purposes, the project proponent has assumed 3% of the total plant and machineries. Therefore, a decrease of 29% in the price of O&M is highly unlikely.

The IRRs of the project activity with variations of investment cost, revenue and O&M costs without CER revenue is shown in the graph below in Figure 5.

The results of the sensitivity analysis conducted confirm that the internal rate of return of the project activity without CDM revenues is much lower than the benchmark even with variations of 10% on either side of main factors affecting the cost and revenues of the project.

IRR with CDM revenues

The registration of the project activity as CDM project activity would provide the project activity additional source of revenue. The IRR of the project activity increases **to 10.91%** with expected sale of CERs generated from the project activity. This would make the project commercially attractive to the investors.

The above facts and figures clarifies that the 'project activity is financially a non-viable activity without CDM revenues' and is robust to reasonable variations in the critical assumptions. The CDM revenue, the project activity would obtain through sale of the emission reductions, is very crucial to sustain the operations of the project activity to make it financially attractive.

[17] http://cdm.unfccc.int/Projects/projsearch.html

[18] http://cdm.unfccc.int/Projects/Validation/index.html

The investment analysis clearly shows that the project is viable only if the incomes from the sale of carbon credits are included. The project activity is not economically and financially viable without the revenue from the sale of certified emission reductions.

Based on the investment analysis above, the project activity is considered to be additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As per AMS.III.F, version 10, the emission reductions achieved by the project activity will be measured as difference between the baseline emission (BE_y) and the sum of the project emission (PE_y) and leakage (LE_y).

$$ER_y = BE_y - (PE_y + LE_y) \quad \textbf{(1)}$$

Where:

ER_y Emission reduction in the year y (tCO_2e)
BE_y Baseline emissions in the year y (tCO_2e)
PE_y Project activity emissions in the year y (tCO_2e)
LE_y Leakage emissions in the year y (tCO_2e)

B.6.1.Baseline Emissions

The baseline emissions (BE_y) of the project activity are calculated as:

$$BE_y = BE_{CH4,SWDS,y} + BE_{ww,y} + BE_{CH4,manure,y} - MD_{y,reg} * GWP\_CH_4 \quad \textbf{(2)}$$

Where:

$BE_{CH4,SWDS,y}$ Yearly methane generation potential of the solid waste composted by the project activity during the years x from the beginning of the project activity (x=1) up to the year y estimated as per the latest version of the 'Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal sites[19]' (tCO_2e/year). The tool may be used with the factor "f=0.0" assuming that no biogas is captured and flared. With the definition of year x as 'the year since the project activity started diverting wastes from landfill disposal, x runs from the first year of crediting period (x=1) to the year which emissions are calculated (x=y)'

$BE_{ww,y}$ where applicable, baseline emissions from the wastewater co-composted, calculated as per procedures AMS III.H

$BE_{CH4,manure,y}$ where applicable, baseline emissions from manure composted by the project activity as per procedures AMS III.D

[19] The methodology refers to the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal sites" for determining methane potential of SWDS, the name of the tool has been changed as "Emissions from solid waste disposal sites" /Version 06.0.1 in EB 66.

$MD_{y,reg}$	Amount of methane that would have to be captured and combusted in the year *y* to comply with the prevailing regulations (tonne)
GWP_CH_4	GWP for CH4 (value of 21 is used)

In Malaysia there is no regulation to capture and/or combust methane resulting from the anaerobic degradation of EFB and POME; thus $MD_{y,reg} = 0$ and hence, not considered further.

Only little quantity of POME is used basically as a wetting agent and therefore the baseline emissions from this quantity are expected to be small. Hence $BE_{ww,y}$ is not considered. Thus, this is conservative.

$BE_{CH4,manure,y}$ is not applicable for the project activity.

Hence, equation 2 becomes, $BE_y = BE_{CH4,SWDS,y}$ **(2a)**

B.6.1.1. Baseline emissions from methane potential of SWDS

The 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 (tCO_2 e) are calculated according to the Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1 as reported in equation 3 below:

$$\left.\begin{matrix} BE_{CH4,SWDS,y} \\ PE_{CH4,SWDS,y} \\ LE_{CH4,SWDS,y} \end{matrix}\right\} = \varphi_y \cdot (1-f_y) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_{f,y} \cdot MCF_y \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j (y-x)} \cdot \left(1-e^{-k_j}\right) \quad \textbf{(3)}$$

$BE_{CH4,SWDS,y}$ $PE_{CH4,SWDS,y}$ $LE_{CH4,SWDS,y}$	Baseline, project or leakage methane emissions occurring in the year *y* generated from waste disposal at a SWDS during a time period ending in year *y* (t CO_{2e} / yr)
x	Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (*x*=1) to year *y* (*x*=*y*).
y	Year of the crediting period for which methane emissions are calculated (*y* is a consecutive period of 12 months)
$DOC_{f,y}$	Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year *y* (weight fraction)
$W_{j,x}$	Amount of organic waste type *j* disposed/prevented from disposal in the SWDS in the year *x*
φ_y	Model correction factor to account for model uncertainties for year *y*
f_y	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to atmosphere in the *y*
GWP_{CH4}	Global Warming Potential of methane
OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
F	Fraction of methane in the SWDS gas (volume fraction)
MCF_y	Methane correction factor for the year *y*

DOC_j	Fraction of degradable organic carbon in the waste type *j* (weight fraction)*;*
k_j	Decay rate for the waste type *j* (l/yr)
j	Type of residual waste or types of waste in the MSW

The project activity is a composting project which involves avoidance of disposal of waste at SWDS. Hence, project falls under application B as per tool "Emissions from solid waste disposal sites", version 06.0.1.

B.6.1.2 Project activity emissions

According to AMS-III.F / Version 10 project emissions arise from incremental transportation distances, electricity and/or fossil fuel consumption by the project activity facilities, methane emissions during composting process as well as methane emissions from runoff water and methane emissions from from disposal or storage of compost.

The total project emissions in (tCO_2e) can be calculated using equation 4 below:

$$PE_y = PE_{y,transp} + PE_{y,power} + PE_{y,comp} + PE_{y,runoff} + PE_{y,res\ waste} \quad \textbf{(4)}$$

Where:

PE_y	Project activity emissions in the year *y* (tCO_2e)
$PE_{y,transp}$	Emissions from incremental transportation in the year *y* (tCO_2e)
$PE_{y,power}$	Emissions from electricity and/or fossil fuel consumption in the year *y* (tCO_2e)
$PE_{y,comp}$	Methane emissions during composting process in the year *y* (tCO_2e)
$PE_{y,runoff}$	Methane emissions from runoff water in the year *y* (tCO_2e)
$PE_{y,res\ waste}$	In case of produced compost is subjected to anaerobic storage or disposed in landfill: methane emissions from anaerobic decay of the residual organic content (tCO_2e)

B.6.1.2.1 Emissions from incremental transportation

The project emissions due to incremental transport distances are calculated based on the incremental distance between:

(i.) The collection points of biomass and the compost treatment site as compared to the baseline solid waste disposal site;

(ii.) The collection points of wastewater and compost treatment site as compared to the baseline wastewater treatment system;

(iii.) Treatment site and the sites for soil application, landfilling and further treatment of the produced compost.

(i) Transport of EFB to compost plant

The EFB from the palm oil mill to the composting would be transported via trucks. However, the distance from the palm oil mill to the solid waste disposal site is about the same with the distance between the palm oil mill and the project activity. In both cases as described above, the distance travelled is about 400m (round trip). Thus, the average incremental distance is assumed as zero. Hence, no project emissions are accounted for transport of EFB to the compost plant.

(ii) Wastewater transport

No wastewater will be transported via vehicle in the project activity. Hence, no project emissions are accounted for transport of wastewater to the compost plant.

(iii) Transport of produced compost to sites for soil application

The project emissions due to transport of the produced compost to the sites for soil application are calculated as per the following formula as per equation (3) of AMS III.F/ version 10

$$PE_{y,transp} = (Q_y/CT_y) * DAF_w * EF_{CO2,transport} + (Q_{y,treatment}/CT_{y,treatemnt}) * DAF_{treatment} * EF_{CO2,transport} \quad \textbf{(5)}$$

Where:

Q_y	Quantity of raw waste/manure treated and/or wastewater co-treated in the year *y* (tonnes)
CT_y	Average truck capacity for transportation (tonnes/truck)
DAF_w	Average incremental distance for raw solid waste and/or wastewater transportation (km/truck)
$EF_{CO2,transport}$	CO_2 emission factor from fuel use due to transportation ($kgCO_2$/km, IPCC default value or local values may be used) [20]
$Q_{y,\ treatment}$	Quantity of compost produced in the year y (tonnes)
$CT_{y,\ treatment}$	Average truck capacity for compost transportation (tonnes/truck)
$DAF_{treatment}$	Average distance for compost product transportation (km/truck)

As stated above, the emissions from transportation of EFB to the project site are 0. Also, no wastewater is transported to the project site, therefore, equation 5 becomes,

$$PE_{y,transp} = (Q_{y,treatment}/CT_{y,treatment}) * DAF_{treatment} * EF_{CO2,transport} \quad \textbf{(6)}$$

B.6.1.2.2 .Project emissions from electricity and/or fossil fuel consumption

$$PE_{y,power} = PE_{FC,j,y} + PE_{EC,y} \quad \textbf{(7)}$$

Where:

$PE_{y,power}$	Emissions from electricity and/or fossil fuel consumption in the year *y* (tCO_2e)
$PE_{FC,j,y}$	Project emissions from fossil fuel combustion in process j during the year *y* (tCO_2/yr)
$PE_{EC,y}$	Project emissions from electricity consumption in year *y* (tCO_2e)

As the electricity required to operate the facilities in the project activity are sourced from palm oil mill's renewable biomass based electricity generation. Hence, project emissions from electricity consumption are zero.

[20] "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" has referred weighted average CO_2 emission factor of fuel (diesel) as $EF_{CO2,i,y.}$ However, there are 2 types of emission factor of diesel used in the calculations. For clarity, weighted average CO_2 emission factor due to onsite consumption has been referred as EF_{CO2}. Whilst, weighted average CO_2 emission factor for transportation of finished compost has been referred as $EF_{CO2,transport}$.

Therefore,

$PE_{y,power} = PE_{FCj,y}$ **(7a)**

Diesel may be consumed for running the vehicles and other facilities. The emissions due to diesel consumption are calculated as per "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"/ Version 2. As per equation (1) of the tool,

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad \textbf{(7b)}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO_2/ yr)
$FC_{i,j,y}$	Is the quantity of fuel type *i* combusted in process *j* during the *y* (mass or volume unit/yr)
$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
i	Are the fuel types combusted in process *j* during the year *y*

Based on the Option B and equation (4) of "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"/ Version 2, $COEF_{i,y}$ could be calculated using the following equation:

$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,diesel}$ **(7c)**

Where:

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type *i* in the year *y* (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type *i* in the year *y* (GJ/mass or volume unit)
$EF_{CO2,diesel}$	Is the weighted average CO_2 emission factor of fuel type *i* in the year *y* (tCO_2/GJ) [21]
i	Are the fuel types combusted in process *j* during the year *y*

B.6.1.2.3 Project emissions during composting process in the year *y*

In order to maintain the composting process aerobic, an oxygen meter will be used at the composting site. Also, the constant turning of the composting material in the windrows througout the composting period means that aeration, thus aerobic process, is ensured. This should allow for zero methane emissions from the composting process. For ex-ante estimates, the emissions due to composting process are considered to be zero. Nonetheless, the oxygen content of the material in the windrows shall be continously monitored, and project emisions would be considered if oxygen content is less than 8%. The emissions during composting process will be calculated as per equation 4 of the methodology as follows:

[21] "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" has referred weighted average CO_2 emission factor of fuel (diesel) as $EF_{CO2,i,y.}$ However, there are 2 types of emission factor of diesel used in the calculations. For clarity, weighted average CO_2 emission factor due to onsite consumption has been referred as $EF_{CO2,diesel}$. Whilst, weighted average CO_2 emission factor for transportation of finished compost has been referred as $EF_{CO2,transport}$.

$PE_{y\,comp} = Q_y * EF_{composting} * GWP\_CH4$ **(8)**

Where:

Q_y Quantity of raw waste composted in the year *y* (tonnes).

$EF_{composting}$ Emission factor for composting of organic waste and/or manure (tCH_4/ton waste treated). Emission factors can be based on facility/site-specific measurements, country specific values or IPCC default value (table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gas 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.

$EF_{composting}$ can be set to zero for the portions of Q_y for which the monitored oxygen content of the composting process in all points within the windrow are above 8%. This can be done via sampling with maximum margin of error of 10% at a 90% confidence level. For this purpose a portable oxygen meter can be used with lancets of at least 1 m length. In the case of forced aerated in-vessel and forced aerated pile composting systems continuous measurements may also be done using online sensors.

B.6.1.2.4 – Project emissions from runoff water

The composting site will be covered with special material as described before and the run-off water will be collected and recyled back into the composting piles for moisture and /or nutrient. The primary wetting agent for the composting process will be the runoff water; if further wetting agent is required, additional POME shall be pumped from the anaerobic lagoon. Thus, the project emission from runoff water is estimated as zero.

However, if excess runoff water is generated which could not be used as a wetting agent, it will be disposed to existing mill's POME treatment plant. The runoff water is expected to be small and does not contribute significantly to the existing treatment plant.

Project emissions from runoff water from the composting yard ($PE_{y,runoff}$) are calculated as per equation (5) of AMS III.F/ version 10, which is as follows:

$PE_{y,runoff} = Q_{y,ww,runoff} * COD_{y,ww,runoff} * B_{o,ww} * MCF_{ww,treatment} * UF_b * GWP\_CH4$ **(9)**

Where:

$Q_{y,ww,runoff}$ Volume of runoff water in the year *y* (m^3)

$COD_{y,ww,runoff}$ Chemical oxygen demand of the runoff water leaving the composting yard in the year *y* (tonnes/m^3)

For ex *ante* estimation, the volume of runoff water may be based in the area of the composting yard and the yearly average rainfall, and the COD for domestic wastewater may be used. For *ex post* calculations the measured volume and COD shall be used.

$B_{o,ww}$ Methane producing capacity of the wastewater (IPCC default value of 0.25 kg CH_4/kg COD)

$MCF_{ww,treatment}$ Methane correction factor for wastewater treatment system where the runoff water is treated (MCF value as per relevant provisions in AMS-III.H)

UF_b Model correction factor to account for model uncertainties (1.12)

B.6.1.2.5 – Project emissions from anaerobic storage of compost

The compost produced in the project activity will be sold and it will not be disposed in a landfill. The compost will be transported to plantations and evenly applied in the palm oil plantation in between the palm trees. Thus, it is unlikely that the final compost will be subjected to anaerobic storage which may cause methane emissions from anaerobic decay of final compost. Thus, this component of the project emissions is considered zero for the project activity.

B.6.1.2.6 – Leakage

In the project activity, no equipment has been transferred from another activity or the existing equipment is not transferred to another activity.

The leakage assessment due to the general guidance for biomass project activity is not required for the project for the following reasons:

a. Leakage assessment is not required for Type III projects[22].
b. Leakage assessment for biomass is mainly for Type I projects.
c. As per 'General guidance on leakage in biomass project activities' version 03, the only option applicable for biomass would be 'competing use of biomass' which would be applicable if EFB was gainfully used in the baseline scenario.

Since EFB mulching was not practiced nor was EFB put to use for any other purposes and was only landfilled in the baseline scenario, competing use is not applicable. Thus, leakage assessment is not required for the project activity. Therefore, there are no leakage issues for the project activity.

B.6.2. Data and parameters that are available at validation:

ID no.	**A**
Data / Parameter:	φ_y
Data unit:	-
Description:	Model correction factor to account for model uncertainties for the year *y*
Source of data used:	Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1
Value applied:	0.85
Justification of the	The project is located in Perak, Malaysia which has an average annual temperature (MAT)[23] and mean annual precipitation (MAP)[24] of greater than

[22] As per paragraph 21 of Small Scale CDM Methodology AMS. III.F version 10

choice of data or description of measurement methods and procedures actually applied :	20°C and 1000 mm. Based on climatic conditions mentioned under Table 5 of the tool "Emissions from solid waste disposal sites" /Version 06.0.1", 'humid/wet conditions' apply for the project activity; Accordingly, the corresponding default value for φ_y (for humid/wet conditions) as per Table 3 has been used.
Any comment:	Table 3 is applicable to Option 1 in the procedure "Determining in the model correction factor (φ_y)"

ID no.	**B**
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:	Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value as per tool.
Any comment:	When methane passes through the top-layer, part of it is oxidized by methanotrophic bacteria to produce CO_2. The oxidation factor represents the proportion of methane that is oxidized to CO_2. This should be distinguished from methane correction factor (MCF) which is to account for situation that ambient air might intrude into the SWDC and prevent methane from being formed in the upper layer of SWDS.

ID no.	**C**
Data / Parameter:	**F**
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1
Value applied:	0.5
Justification of the choice of data or description of	Default value as per tool

[23] Page 11 & 12; Presentation by Wan Azli Wan Hassan, Malaysian Meteorological Department, Ministry of Science, Technology and Innovation (wan_azli_influence_of_climate_change_on_malaysia's_wx_pattern.pdf)
[24] Page 11 & 12; Presentation by Wan Azli Wan Hassan, Malaysian Meteorological Department, Ministry of Science, Technology and Innovation (wan_azli_influence_of_climate_change_on_malaysia's_wx_pattern.pdf)

measurement methods and procedures actually applied :	
Any comment:	Upon biodegradation, organic material is covered to a mixture of methane and carbon dioxide.

ID no.	**D**
Data / Parameter:	**$DOC_{f,y}$**
Data unit:	Weight fraction
Description:	Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data used:	Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value as per tool for Application B as per tool has been applied
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS. This default value can only be used for i) Application A; or ii) Application B if the tool is applied to MSW.

ID no.	**E**
Data / Parameter:	**MCF_y**
Data unit:	-
Description:	Methane correction factor
Source of data used:	Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	The SWDS in the project does not have a water table above the bottom of the SWDS. The site is an unmanaged solid waste disposal sites with depth of greater than 5 metres[25]. Accordingly, the corresponding value for unmanaged solid waste disposal sites – deep has been applied as per the tool.
Any comment:	The SWDS in the project is an unmanaged site with depth greater than 5 meters and with no water above the bottom of the SWDS.

ID no.	**F**

[25] Photographic proof of the depth of SWDS with more than 5m has been provided to the DOE.

Data / Parameter:	**DOC_j**
Data unit:	-
Description:	Fraction of degradable organic carbon in the waste type *j* (weight fraction)
Source of data used:	Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1
Value applied:	0.20
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value as per tool. The tool mentions that, the characteristics of EFB are similar to wet garden waste. Hence, the corresponding value for garden waste as per the default value in the tool has been used.
Any comment:	The procedure for the ignition loss test is described in BS EN 15169:2007 Characterization of waste. Determination of loss on ignition in waste, sludge and sediments. The percentages listed in table 4 are based on a wet waste basis which is concentrations in the waste as it is delivered to the SWDS. The IPCC Guidelines also specify DOC values on a dry waste basis, which are the concentrations complete removal of all moist from waste, which is not believed practical for this situation.

ID no.	**G**
Data / parameter:	**k_j**
Data unit:	l/yr
Description:	Decay rate for the waste type *j*
Source of data:	Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1 and IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Values to be applied:	0.17
Justification of the choice of data or description of measurement methods and procedures actually applied :	The project is located in tropical area with the average annual temperature (MAT) and mean annual precipitation (MAP) 20°C and 1000 mm[26]. Appropriate default values based on table 5 of tool from "Emissions from solid waste disposal sites" has been used.
Any comment:	The project us located in tropical area with average annual temperature (MAT) and mean annual precipitation (MAP) of greater than 20°C and 1000 mm as indicated above.

[26] Presentation by Wan Azli Wan Hassan, Malaysian Meteorological Department, Ministry of Science, Technology and Innovation (wan_azli_influence_of_climate_change_on_malaysia's_wx_pattern.pdf)

ID no.	**H**
Data / Parameter:	**GWP_{CH4}**
Data unit:	t CO_2e / t CH_4
Description:	Global Warming Potential of methane
Source of data:	IPCC 2006 Guidelines
Value to be applied:	21 for the first commitment period. Shall be updated for future commitment periods according to any future COP/MOP decisions.
Any comment:	-

ID no.	**I**
Data / Parameter:	**$B_{o,ww}$**
Data unit:	kg CH_4/kg COD
Description:	Methane producing capacity of wastewater
Source of data used:	IPCC default value
Value applied:	0.25
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per AMS-III.F Version 10
Any comment:	The wastewater produced from the project activity is the run off water and this quantity is expected to be small. Also, all the runoff water will be collected in a collection tank and recycled back to the windrow piles. In case of excess runoff during rainy season, wastewater will be pumped to the existing POME treatment plant where run off water will be treated.

ID no.	**J**
Data / Parameter:	**$MCF_{ww,treatment}$**
Data unit:	-
Description:	Methane correction factor for the wastewater treatment system where the runoff water is treated
Source of data used:	MCF value as per table III.H.1 of CDM approved small scale methodology AMS-III.H / version 16
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	AMS-III.F / version 10 mentions to adopt this value from AMS-III.H. Since the runoff water, if any, will be treated in an anaerobic deep lagoon (depth more than 2 meters), the corresponding value has been taken as per the Table III.H.1 of AMS-III.H / version 16.
Any comment:	The wastewater produced from the project activity is the run off water and this quantity is expected to be small. Also, all the runoff water will be collected in a collection tank and recycled back to the windrow piles. In case of excess runoff during rainy season, wastewater will be pumped to the existing POME treatment plant where run off water will be treated.

ID no.	**K**
Data / Parameter:	**UF_b**
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	As per methodology AMS-III.F / version 10
Value applied:	1.12
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per AMS-III.F / version 10
Any comment:	The wastewater produced from the project activity is the run off water and this quantity is expected to be small. Also, all the run off water will be collected in a collection tank and recycled back to the windrow piles. In case of excess run off during rainy season, wastewater will be pumped to the existing POME treatment plant where run off water will be treated.

B.6.3 Ex-ante calculation of emission reductions:

B.6.3.1 Baseline emissions

As per equations 2, 2a and 3 in section B.6.1, the baseline emissions of the project activity are calculated as follows:

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

For the ex-ante calculation of $BE_{CH4,SWDS,y}$ the following parameters are used:

Data	Value Applied	Justification
φ_y	0.85	As per Methodological Tool Emissions from solid waste disposal sites" /Version 06.0.1
f_y	0	In Malaysia there is no legal obligation to capture and flare/use methane gas at solid waste disposal sites.
GWP_{CH4}	21t CO_2e/t CH_4	AMS III F/ Version 10
OX	0.1	Default value as per Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1
F	0.5	Default value as per Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1

$DOC_{f,y}$	0.5	Default value as per Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1
MCF_y	0.8	Default value as per Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1
$W_{j,x}$ (Q_y)	66,000 tons/ year	Quantity of EFB composted in the project activity. This is same as Q_y The project activity is designed to cater 66,000 tons of EFB per annum.
DOC_j	0.20	The EFB is categorized as garden waste as per Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1. Hence, corresponding value for garden waste has been applied as per Table 4 of the tool.
k_j	0.17	The EFB is categorized as garden waste as per Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1. Hence, corresponding value for garden waste has been applied as per Table 5 of the tool.

Baseline emissions calculated as per above formula for the crediting period in the table 8.

Table 9– Baseline emissions for the crediting period

Avoided methane	**Year 2013**	**Year 2014**	**Year 2015**	**Year 2016**	**Year 2017**	**Year 2018**	**Year 2019**	**Year 2020**	**Year 2021**	**Year 2022**
Deposited year 1	8,841	7,458	6,292	5,309	4,479	3,779	3,188	2,689	2,269	1,914
Deposited year 2		8,841	7,458	6,292	5,309	4,479	3,779	3,188	2,689	2,269
Deposited year 3			8,841	7,458	6,292	5,309	4,479	3,779	3,188	2,689
Deposited year 4				8,841	7,458	6,292	5,309	4,479	3,779	3,188
Deposited year 5					8,841	7,458	6,292	5,309	4,479	3,779
Deposited year 6						8,841	7,458	6,292	5,309	4,479
Deposited year 7							8,841	7,458	6,292	5,309
Deposited year 8								8,841	7,458	6,292
Deposited year 9									8,841	7,458
Deposited year 10										8,841
BE $_{CH4,SWDS,y}$ (tCO_2e/year)	**8,841**	**16,299**	**22,591**	**27,900**	**32,379**	**36,158**	**39,345**	**42,035**	**44,304**	**46,218**

B.6.3.2 Project activity emissions

B.6.3.2.1 Project emissions from increased transportation

The project emissions due to transportation are calculated as per equation 6(a) as follows:

$PE_{y,transp} = (Q_{y,treatment}/CT_{y,treatment}) * DAF_{treatment} * EF_{CO2,transport}$ [27]

The estimated compost production, $Q_{y,treatment}$ has been estimated as 22,440 tons/ year.

The produced compost is expected to be consumed in the nearby plantation and the distance of transportation is expected to be around 5 km and therefore, 10 km for a round trip. However, some times compost may be sold to external buyers too and the maximum distance of compost transportation is expected to be 60 km (120 km return trip). Therefore, a return trip of 120 km has been considered for ex-ante estimates. Actual distance of compost transportation will be monitored during crediting period and considered for project emissions.
The CO_2 emission factor from diesel used for transportation purpose is calculated based (please refer tab "PE" in attached spread sheet for detailed calculations) whereby 1 litre of diesel contributes to 2.7 kg CO_2 released to the atmosphere. It is estimated that a heavy duty truck can travel approximately 3km[28] using 1 litre diesel.

Thus EF_{CO2} *:* 2.7 $kgCO_2/l \div 3$ km/l = 0.9 $kgCO_2/km$.

Therefore, $PE_{y,transp}$ = 22,440 ton/ year * 120 km/trip * 0.9 kg CO_2/ km * 1

-------- ----- (ton/kg)

20(ton/ trip) 1000

= **120 ton CO_2 e**

B.6.3.2.2 Project emissions from fossil fuel consumption

The project emissions due to fossil fuel consumption are calculated as per equation below:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

$FC_{i,j,y\ l}$ has been estimated as 108,720 litres/ year. The estimated amount of diesel consumption has been calculated in the financial spreadsheet. Actual quantity of diesel consumed will be monitored during crediting period.

The following assumptions have been considered for the following calculation:

a. Density of diesel[29]: 0.84kg/litre
b. Net calorific value of diesel[30]: 43.3 TJ/Gg

[27] "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" has referred weighted average CO_2 emission factor of fuel (diesel) as $EF_{CO2,i,y.}$ However, there are 2 types of emission factor of diesel used in the calculations. For clarity, weighted average CO_2 emission factor due to onsite consumption has been referred as $EF_{CO2,diesel}$. Whilst, weighted average CO_2 emission factor for transportation of finished compost has been referred as $EF_{CO2,transport}$.

[28] University of Malaya (2005) "Energy Used in the Transportation Sector of Malaysia", Page 230.

[29] Average value – The Malaysian Diesel Standards http://www.doe.gov/v2/files/legislation/pua0145y2007.pdf

c. CO_2 emission factor for diesel[31]: 74.8 tCO_2/GJ

$PE_{FC,j,y}$ = 108,720 litres / year x $1/1000^2$ x 0.84 kg/litre x 74.8 tCO_2/GJ x 43.3 TJ/Gg = **296t CO_2 e**

Thus, the total project emissions can be calculated using the following formula:

Total project emissions, PE_y	=	$PE_{y,transp}$ + $PE_{y,power}$
	=	**120 ton CO_2 e + 296 t CO_2 e**
	=	**416 t CO_2 e**

B.6.3.3. Emissions reductions

The emission reductions are given as follows:

ER_y = $BE_y - (PE_y + LE_y)$

Where:

ER_y Emission reduction in the year *y* (tCO_2e)
BE_y Baseline emissions in the year *y* (tCO_2e)
PE_y Project activity emissions in the year *y* (tCO_2e)
LE_y Leakage emissions in the year *y* (tCO_2e)

The year wise emission reductions during the crediting period are calculated and presented in section B.6.4. Detailed calculations are given in the attached spread sheet Appendix 1 – CER calculation and financial projection_Pantai Remis.

[30] IPCC 2006 default value

[31] IPCC 2006 default value

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
Year 2013	8,841	416	0	8,424
Year 2014	16,299	416	0	15,883
Year 2015	22,591	416	0	22,175
Year 2016	27,900	416	0	27,484
Year 2017	32,379	416	0	31,963
Year 2018	36,158	416	0	35,741
Year 2019	39,345	416	0	38,929
Year 2020	42,035	416	0	41,619
Year 2021	44,304	416	0	43,888
Year 2022	46,218	416	0	45,802
Total tonnes of CO_2e	316,071	4,161	**0**	**315,654**

Please note there are minor differences in calculations due to rounding off of decimals. Please refer attached spread sheet for detailed calculation.
**Year 1 starts from the day of registration.*

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

B.7.1 Data and parameters monitored:

ID no.	**01**
Data / Parameter:	$\mathbf{Q_y}$
Unit:	tonnes
Description:	Quantity of raw waste (EFB) treated in the year *y*
Source of data:	Plant records
Value of data:	66,000 tons/ year
Brief description of	Trucks carrying EFB to the project activity will be weighed in a weighing bridge.

measurement methods and procedures to be applied:	The data will be complied and recorded monthly.
QA/QC procedures to be applied (if any):	The weighing bridge will be subject to periodic calibration as per supplier's recommendations or at least once in 3 years. If the weighing bridge is faulty or sent for calibration, the average value of the parameter per day of the monitoring period shall be used for calculation. The data will be calculated ensuring a 90/10 confidence level.
Any comment:	This value is same as $\mathbf{W}_{j,x}$ specified in the Methodological Tool "Emissions from solid waste disposal sites" /Version 06.0.1 Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**02**
Data / Parameter:	$\mathbf{Q}_{y,\ treatment}$
Unit:	Tonnes
Description:	Quantity of compost produced in the year *y*
Source of data:	Plant records
Value of data:	22,440 tons / year
Brief description of measurement methods and procedures to be applied:	Weight of compost produced will be weighed in weighing bridge. The data will be compiled and recorded monthly.
QA/QC procedures to be applied (if any):	The quantity will be cross checked with compost sales. The weighing machine will be subject to periodic calibration as per supplier's recommendations or at least once in 3 years. If the weighing bridge is faulty or sent for calibration, the average value of the parameter per day of the monitoring period shall be used for calculation. The data will be calculated ensuring a 90/10 confidence level.
Any comment:	Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**03**
Data / Parameter:	$\mathbf{DAF}_{treatment}$
Unit:	km/truck
Description:	Average incremental distance for compost transportation
Source of data:	Plant records
Value of data:	120
Brief description of measurement methods and procedures to be applied:	On-site measurement. Distance travelled by each truck transporting compost will be monitored and recorded in a logbook on monthly basis.
QA/QC procedures to be applied (if any):	Distance will be cross checked with fuel consumption.
Any comment:	Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**04**
Data / Parameter:	$FC_{i,j,y}$
Unit:	Litres/yr
Description:	Quantity of fuel type *i* (diesel) combusted in process *j* during the year *y*
Source of data:	Plant records
Value of data:	108,720 litres/year
Brief description of measurement methods and procedures to be applied:	Fuel purchase bills/invoices from fuel suppliers will be monitored and recorded continuously with monthly aggregation.
QA/QC procedures to be applied (if any):	Quantity will be cross checked with log book records of actual fuel consumption on site.
Any comment:	Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**05**
Data / Parameter:	$\mathbf{O_2}$
Unit:	%
Description:	Aerobic conditions of the composting process - percentage of dissolved oxygen
Source of data:	Plant records
Value of data:	More than 8%
Brief description of measurement methods and procedures to be applied:	To check the aerobic conditions of the composting process, the percentage of dissolved oxygen will be recorded 3 times a week using the oxygen meter with lancets of at least 1 m length to measure oxygen in respective points at every 5 meters within the windrow. Sampling shall be done via multiple sample measurements through different stages of the composting process with maximum margin of error of 10% at a 90% confidence level.
QA/QC procedures to be applied (if any):	Oxygen meter will be maintained and calibrated as per supplier's recommendation or at least once in 3 years. If the oxygen meter is faulty or sent for calibration, the average value of last two months shall be used for calculation.
Any comment:	Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**06**
Data / Parameter:	$\mathbf{Q_{y,ww,\,runoff}}$
Unit:	m^3
Description:	Volume of runoff water in the year *y*
Source of data:	Plant records
Value of data:	0 It is expected that all runoff water will be recycled back to the compost pile.
Brief description of measurement methods and procedures to be applied:	The excess runoff water disposed outside the project boundary or to the POME treatment plant will be monitored and measurements will ensure a 90/10 confidence/precision level. Data will be aggregated on monthly basis.

QA/QC procedures to be applied (if any):	The flow measuring equipment will be calibrated at least once in 3 years and maintained as per supplier's recommendation.
Any comment:	Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**07**
Data / Parameter:	**$COD_{y, ww, runoff}$**
Unit:	$tCOD/m^3$
Description:	Chemical oxygen demand of the runoff water leaving the composting yard in the year y ($tonnes/m^3$)
Source of data:	Plant records
Value of data:	Not applicable as run off water has been considered nil for ex-ante estimates.
Brief description of measurement methods and procedures to be applied:	COD will be analysed as per acceptable national/international standards.
QA/QC procedures to be applied (if any):	In case excess runoff water is transported outside the composting yard, then samples will be representatively taken from unfiltered wastewater Measurements will ensure a 90/10 confidence/precision level. Data will be aggregated on a monthly basis.
Any comment:	No wastewater is expected to leave the composting yard as all the wastewater generated will be recycled back to the windrows. Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**08**
Data / Parameter:	**CT_y**
Unit:	Tons/truck
Description:	Average truck capacity for waste transportation
Source of data:	Plant records
Value of data:	5
Brief description of measurement methods and procedures to be applied:	Each truck transporting waste will be weighed on the weighing bridge and the average truck capacity will be calculated accordingly. Data will be aggregated at least monthly.
QA/QC procedures to be applied (if any):	The weighing bridge will be subject to periodic calibration as per supplier's recommendations or at least once in 3 years. If the weighing bridge is faulty or sent for calibration, the average value of the parameter per day of the monitoring period shall be used for calculation. The data will be calculated ensuring a 90/10 confidence level.
Any comment:	Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**09**
Data / Parameter:	$\mathbf{CT}_{y,\ treatment}$
Unit:	Tons/truck
Description:	Average truck capacity for compost transportation
Source of data:	Plant records
Value of data:	20
Brief description of measurement methods and procedures to be applied:	Each truck transporting compost will be weighed on the weighing bridge and the average truck capacity will be calculated accordingly. Data will be aggregated at least monthly.
QA/QC procedures to be applied (if any):	The weighing machine will be subject to periodic calibration as per supplier's recommendations or at least once in 3 years. If the weighing bridge is faulty or sent for calibration, the average value of the parameter per day of the monitoring period shall be used for calculation. The data will be calculated ensuring a 90/10 confidence level.
Any comment:	Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**10**
Data / Parameter:	Soil application of the compost
Unit:	
Description:	Soil application of the compost
Source of data:	Plant records
Value of data:	-
Brief description of measurement methods and procedures to be applied:	As palm oil plantations will be the main buyer of compost, an annual site verification of one user site shall be done on a sampling basis to ensure that the compost is applied correctly at site. Monitoring procedures will also include documenting the sales or delivery of the final product (compost). Sales receipt of compost will be kept in records in seriatim.
QA/QC procedures to be applied (if any):	Verification shall be conducted by qualified employees of the project proponent having qualification and working experience in palm oil industry, waste management and/or environmental field.
Any comment:	Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**11**
Parameter:	$\mathbf{f}_y$
Unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year

	y
Source of data:	Maximum value from the following will be considered: (a) Contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured.
Value of data:	0
Brief description of measurement methods and procedures to be applied:	Maximum value from the following will be considered: (a) Contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured. Data will be monitored as per Application B; annually
QA/QC procedures to be applied (if any):	-
Any comment:	Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**12**
Parameter:	**NCV**$_{i,y}$
Unit:	GJ/ton
Description:	Weighted average net calorific value of fuel type *i*(diesel) in year *y*
Source of data:	Table 1.2 of Chapter 1 of Vol. 2 (Energy), IPCC 2006 Guidelines on National GHG Inventories
Value of data:	43.3
Brief description of measurement methods and procedures to be applied:	IPCC default value at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
QA/QC procedures to be applied (if any):	Data will be monitored as per option (d) – of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" version 2. Any revision in the IPCC Guidelines will be taken into account
Any comment:	Since IPCC default value is adopted, weighted average CO_2 emission factor need not be calculated. Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**13**
Parameter:	**ρ**$_{i,y}$
Unit:	kg/litre
Description:	Weighted average density of fuel type *i* (diesel) in year *y*
Source of data:	Environmental Quality (Control of Petrol and Diesel Properties) Regulations

	2007, Minstry of Environment, Government of Malaysia
Value of data:	0.84
Brief description of measurement methods and procedures to be applied:	As per data published by a government agency of Malaysia and can be considered equivalent to 'Regional or national default value' which is option (c) of the data source for the parameter.
QA/QC procedures to be applied (if any):	Data will be monitored as per option (c) – of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" version 2. Any change in the 'regional or national value' will be duly adopted.
Any comment:	Since publicly available (national value) data is adopted, weighted average density need not be calculated. Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**14**
Parameter:	**$EF_{CO2,transport}$**
Unit:	$kgCO_2/km$
Description:	CO_2 emission factor of fuel used for transportation
Source of data:	Calculated
Value of data:	0.9
Brief description of measurement methods and procedures to be applied:	As per University of Malaya (2005) "Energy Used in the Transportation Sector of Malaysia", Page 230, a heavy duty truck can travel 100 km in 32.85 litres diesel, i.e. 0.3285 litre /km (which is equal to 3km/litre). Density of diesel = 0.84 kg/litre As per IPCC, Net calorific value of diesel = 43.3 TJ/Gg CO_2 emission factor for diesel = 74.8 tCO_2/GJ Therefore, CO_2 emissions from 1 litre diesel shall be = {(0.84*43.3*74.8)/(1000)} $kgCO_2$/litre = 2.7 $kgCO_2$/litre Thus CO_2 emission factor of fuel used for transportation: 2.7 $kgCO_2$/litre ÷ 3 km/litre = 0.9 $kgCO_2/km$
QA/QC procedures to be applied (if any):	If there is any publicly available change in the data, same will be taken into account.
Any comment:	Used to calculate emissions from incremental transportation due to compost transportation. Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**15**

Parameter:	**$EF_{CO2,diesel}$**
Unit:	tCO_2/GJ
Description:	Weighted average CO_2 emission factor of fuel type *i* (diesel) in year *y*
Source of data:	Table 1.4 of Chapter 1 of Vol. 2 (Energy), IPCC 2006 Guidelines on National GHG Inventories
Value of data:	74.8
Brief description of measurement methods and procedures to be applied:	IPCC default value at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
QA/QC procedures to be applied (if any):	Data will be monitored as per option (d) – of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" version 2. Any revision in the IPCC Guidelines will be taken into account
Any comment:	Since IPCC default value is adopted, weighted average CO_2 emission factor need not be calculated. Data will be stored for 2 years from the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later.

ID no.	**16**
Parameter:	**$EF_{composting}$**
Unit:	t CH_4/ton waste treated on a wet weight basis
Description:	Emission factor for composting of organic waste
Source of data:	AMS III F / version 10
Value of data:	***For ex-ante calculations:*** 0 as it is considered that the oxygen content of the composting process will be above 8%. ***For ex-post:*** (i) 0.004, for the portions of Q_y for which the monitored oxygen content of the composting process in points within the windrow are below 8%; and (ii) 0 for the portions of Q_y for which the monitored oxygen content of the composting process in all points within the windrow are above 8%.
Brief description of measurement methods and procedures to be applied:	Default value as per AMS III F/ version 10 and IPCC 2006 Guidelines - Table 4.1, chapter 4, Volume 5)
QA/QC procedures to be applied (if any):	-
Any comment:	For the ex-ante calculations $EF_{composting}$ has been set to zero for the total quantity of compostable matter. The oxygen content of the composting process will be monitored to ensure that it is above 8% throughout the crediting period. This factor will be applied to calculate project emissions for the quantity for which

	oxygen content is less than 8%

B.7.2 Description of the monitoring plan:

The project participants will develop a monitoring plan containing monitoring methodology including methods, indicators and frequencies to meet the requirement laid down in AMS. IIIF /Version 10.

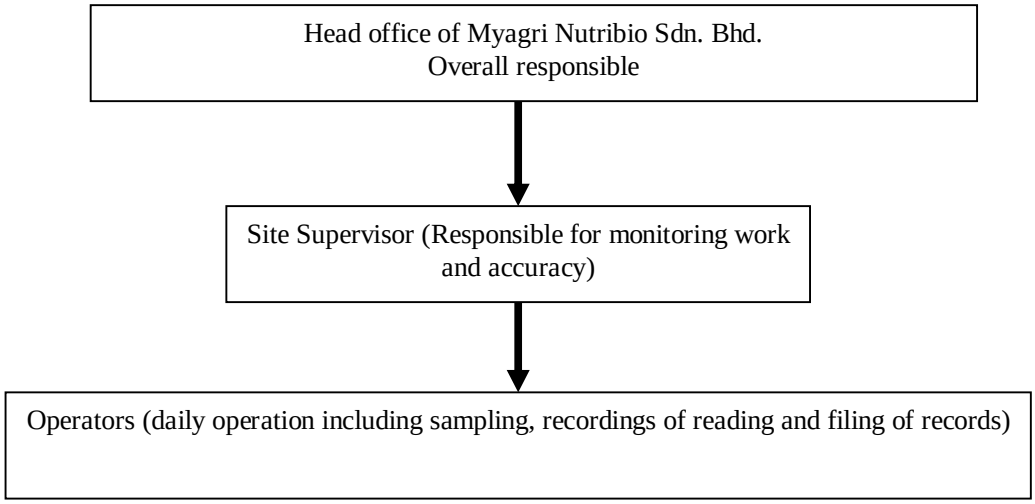


Figure 7: Organization of monitoring management team

Monitoring Management

Head Office of Myagri Nutribio Sdn. Bhd. will be overall responsible for implementation of the monitoring plan including quality management of the monitoring. The supervisor at the project activity shall regularly report to the head office regarding the performance of project activity. The management shall provide guidance and instruction regarding improvement of performance of the project activity and develop the monitoring reports for the emission reductions for the project activity for the purpose of verification and certification of Certified Emission Reductions (CERs). Myagri Nutribio Sdn. Bhd. is planning to obtain Eco Certification for the composting plant.

Plant in charge / Site Supervisor / Site In charge

The Site supervisor of the project activity will be directly responsible for monitoring the data of the project activity. He shall regularly inspect the performance of the project, including the transport of EFB, processing of compost, operation of turner, condition of composting and disbursement of compost. He shall record all non-performance and rectify the fault soonest. All non-performance shall be recorded in writing and reported to the management for further guidance, if necessary. He is responsible for the safe-keeping and storage of all monitoring data. He shall also supervise the technicians regarding the daily operation, inspection and maintenance as well as the collection and storage of data from the project activity. He shall also summarize the data and submit to the management periodically.

Operators / technicians

The operators will be responsible for daily operation and maintenance of the project activity. They shall report to the Site supervisor.

Training

Training forms an integral part of the monitoring plan. Training will be conducted to all employees involved in the CDM project. A Training Plan will be developed with the view of enabling each employee to have sufficient skills in the monitoring, storage and evaluation of the performance of the project activity. The training shall be so that each employee will acquire sufficient technical knowledge in carrying out his duties and responsibilities. The training will include lectures and on-the-job training.

Standard Operating Procedures (SOP)

A set of SOP[32] will be developed for the monitoring of the CDM project activity. It shall contain procedures for each task in the monitoring of emission reduction as well as data quality control procedures.

The SOP will also include procedures for emergency and unintended leakage. The technicians at site will be trained to cope with emergency situation so that corrective actions could be taken immediately to prevent any unintended event.

Site audits

Myagri Nutribio Management or its appointed representative shall make periodic site audits to ensure that monitoring and operational procedures are being observed in accordance with the Monitoring Plan. All findings will be documented.

Data Storage

All data are to be stored in electronic form. The database shall be periodically updated and stored in CDs as a back up. These CDs shall be checked annually and any defective one shall be replaced by duplicate copy from other site.

All monitoring records shall be kept for verification up to at least two years after the end of the project activity or the last issuance of CERs for this project activity, whichever occurs later.

[32] The current "SOP for Correction Action Plan (Revision02) is still a draft version and has been updated constantly. The project proponent is working on improving the SOP. Kindly be informed that the construction of the project activity is still in progress. The final version of the SOP is expected to be completed before the starting of 1st crediting period.

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

The baseline study and the monitoring methodology were completed on 24th August 2011.

Name of person(s)/entity(ies) determining the baseline:

Ethaya Rajan Mokanatas
Email: rajan@ytl.com.my

YTL-SV Carbon Sdn Bhd
Level 4 Annexe Block
Lot 10 Shopping Centre,
50250, Kuala Lumpur, Malaysia
Phone: + 60 3 2144 7200
Fax: + 60 3 2144 7573

The entity determining the baseline is not a project participant.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

30/01/2013 (Expected date of contract award for earthwork)

C.1.2. Expected operational lifetime of the project activity:

15 years 0 months

C.2 Choice of the crediting period and related information:

The project will apply fixed crediting period

C.2.1. Renewable crediting period

Not applicable

C.2.1.1. Starting date of the first crediting period:

Not applicable

C.2.1.2. Length of the first crediting period:

Not applicable

C.2.2. Fixed crediting period:

Applicable for the project activity

C.2.2.1. Starting date:

01/10/2013

C.2.2.2. Length:

10 years 0 months

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Under Malaysian Environmental Quality (Environmental Impact Assessment)(Prescribed Activities) Order 1987, a detailed Environmental Impact Assessment (EIA) study is not required to be conducted for the project activity.

An application with all necessary details has to be submitted to the Department of Environment and approval has to be obtained for operating the project facility. Application has already been submitted and environmental approval has been obtained. Same would be available for inspection during validation.

However a brief analysis due to the project is done in this section.

Impact on Air

There are no emissions to the atmosphere from the project activity. Small quantities of compost may float around during turning sieving process or sieving process. This is a very small quantity which would eventually settle in the compost yard itself. Hence, there would be no significant impact on air due to project activity.

Impact on water

The wastewater produced from the project activity is the runoff water and this quantity is expected to be small. However all the runoff water will be collected in a collection tank and recycled back to the windrow piles. However, during rainy seasons, there may be some excess runoff. This excess runoff will be pumped to the existing POME treatment plant where the runoff water will be treated. Hence, there would be no significant impact on water courses due to project activity.

Impact on land

The composting process will happen at concrete flooring and there would be no solid wastes disposed from the project activity on any land. Hence, there would be no significant impact on land because of the project activity.

Impact due to odour

As the project activity involves organic decomposing, there could be slight undesirable odour in the project area. But however due to maintenance of good aerobic conditions in the compost piles, undesirable odour will be very limited, and its effect will not be felt outside the project area. Also, odour due to aerobic composting process would be much lesser than anaerobic decomposition that would have happened in the absence of the project activity. Therefore, project activity would actually reduce odour nuisance in the absence of the project activity. Hence, project activity has positive impact on the environment as far as odour is considered.

Therefore, the impacts due to the project are very negligible.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The impacts due to the project activity are negligible.

SECTION E. Stakeholders' comments

A stakeholders meeting was held at the premise of Dewan Rukun Tetangga Changkat Jering at 12.00 pm on 26/07/2011. An advertisement was published in a newspaper on 15/07/2011 inviting interested stakeholders to attend the consultation process. Letters of invitation were also sent to relevant government agencies and other local stakeholders. The residents of local communities were personally invited.

At the stakeholders meeting, a description of current situation was first presented. This was followed by the detailed explanation of new facilities to be installed under the project activity. The benefits of the project such as odour reduction, improvement of environmental quality were explained. The implementation plan of the project was further explained to the participants. After the briefing, a question and answer session was held to clarify any question raised by stakeholders regarding the implementation of the project.

Table 9: Details of participants of the meetings

Invited Stakeholders	**Representatives**
Local residents	71
Consultants	1
Government agencies	5
Total	**78**

Detailed list of participants has been provided for inspection during validation.

JEMPUTAN MESYUARAT UNTUK PIHAK BERKEPENTINGAN

Myagri Nutribio Sdn Bhd sedang memajukan sebuah projek berdasarkan **"Clean Development Mechanism"** (CDM) di Kilang Kelapa Sawit Pantai Remis, Pantai Remis, Perak.

Aktiviti projek ini akan menyumbang kepada pengurangan pelepasan gas-gas rumah hijau, atau **"Greenhouse Gas (GHG) Emission Reduction"** dengan cara mengelakkan pelepasan gas metana akibat pereputan sisa-sisa kilang sawit. Hal ini dapat dielakkan dengan memproses sisa kilang sawit menggunakan sistem pengkomposan terkawal dan seterusnya mengaplikasikan kompos tersebut sebagai baja organik.

Sebagaimana yang tertakluk dalam syarat pendaftaran projek dengan Lembaga Eksekutif CDM-UNFCCC, Myagri Nutribio Sdn Bhd ingin menjemput pihak yang berminat untuk hadir ke mesyuarat penerangan mengenai projek ini. Berikut adalah masa, tarikh dan tempat berlangsungnya taklimat tersebut:-

Tarikh : 26 Julai 2011
Masa : 9.30 pagi
Tempat : SJK(C) KHUEN HEAN, 32500 CHANGKAT JERING Perak

Sekiranya anda berminat, sila hubungi wakil kami, En KC Liew di tel. no. 03-8925 8681, telefon bimbit 016-2130762 atau di e-mel cheng@myagrigroup.com.

Figure 8: Newspaper advertisement for the stakeholders meeting

E.1. Brief description how comments by local stakeholders have been invited and compiled:

Photo 1: Public announcement of local stakeholders' meeting

Photo 2: Presentation by the project participant

Photo 3: Question and answer session

Photo 4: Some of the stakeholders

Table 10 - Summary of the comments received:

Stakeholder	**Question/Comments**
Hj Mohd Mahauddin b Md Taib	Where is the location of the project?
Phang Ting Hang	Will this project produce negative impacts to the environment?
Phang Ting Hang	If your bio-organic product is as good as you claim, why is the product not sold to the general public?
Liew Ching Ni	Is the methane gas collected in this project?

E.2. Summary of the comments received:

Comments /Questions	**Response by the project activity**
Location of project activity	The bio-organic plant will be adjacent to the Pantai Remis Palm Oil Mill in Changkat Kruing.
Impacts to the environment	The aim of this project is to avoid negative impact to the environment via avoidance of methane emission, which is a greenhouse gas. The composting project also utilizes green wastes from the plantation and from palm oil mill operations; such as empty fruit bunches, decanter cake, and boiler ash. The end product, which is mature compost, will then be applied in the plantation to reduce dependence on chemical fertilizers. Therefore, this project is entirely to improve the environment.
Compost to general public	The bio-organic product is mainly intended for plantation use, specifically

	oil palm. In the future, we plan to sell the organic fertilizer to the general public once we can increase the production capacity to overcome the plantation demand.
Is methane collected?	No. The project's aim is to simply avoid production and emission of methane, not to collect it.

E.3. Report on how due account was taken of any comments received:

No major comment was received from the stakeholders. The project proponent managed answered all the queries raised during the Stakeholders' meeting.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

1. Contact information of Project Participant of Host Party

Organization:	Myagri Nutribio Sdn. Bhd.
Street/P.O.Box:	No 29, Jalan Impian Putra 1/4, Taman Impian Putra
Building:	-
City:	Bandar Seri Putra
State/Region:	Selangor
Postfix/ZIP:	43600
Country:	Malaysia
Telephone:	+60389273809
FAX:	+60389255013
E-Mail:	info@myagrigroup.com
URL:	www.myagrigroup.com
Represented by:	
Title:	Managing Director
Salutation:	Ms
Last Name:	Md Taib
Middle Name:	-
First Name:	Norhayati
Department:	
Mobile:	+60162235118
Direct FAX:	-
Direct tel:	-
Personal E-Mail:	info@myagrigroup.com

2. Contact information of Project Participant of Annex I Party

Organization:	Gazprom Marketing & Trading Limited
Street/P.O.Box:	20 Triton Street
Building:	-
City:	London
State/Region:	London
Postfix/ZIP:	NW1 3BF
Country:	United Kingdom
Telephone:	+44 (0) 207 756 0052
FAX:	+44 (0) 207 756 9740
E-Mail:	Global_Carbon@gazprom-mt.com
URL:	www.gazprom-mt.com
Represented by:	Ignacio Gistau
Title:	Director of Global Clean Energy
Salutation:	Mr.

Last Name:	Gistau
Middle Name:	
First Name:	Ignacio
Department:	Global Clean Energy
Mobile:	n/a
Direct FAX:	+44 (0) 207 756 9740
Direct tel:	+44 (0) 207 756 0052
Personal E-Mail:	Global_Carbon@gazprom-mt.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding provided by any Annex I Party for the project activity

Annex 3

BASELINE INFORMATION

EFB produced (wet basis) - 66,000 tons/year

All the baseline calculations are presented in section B.6.3.

Annex 4

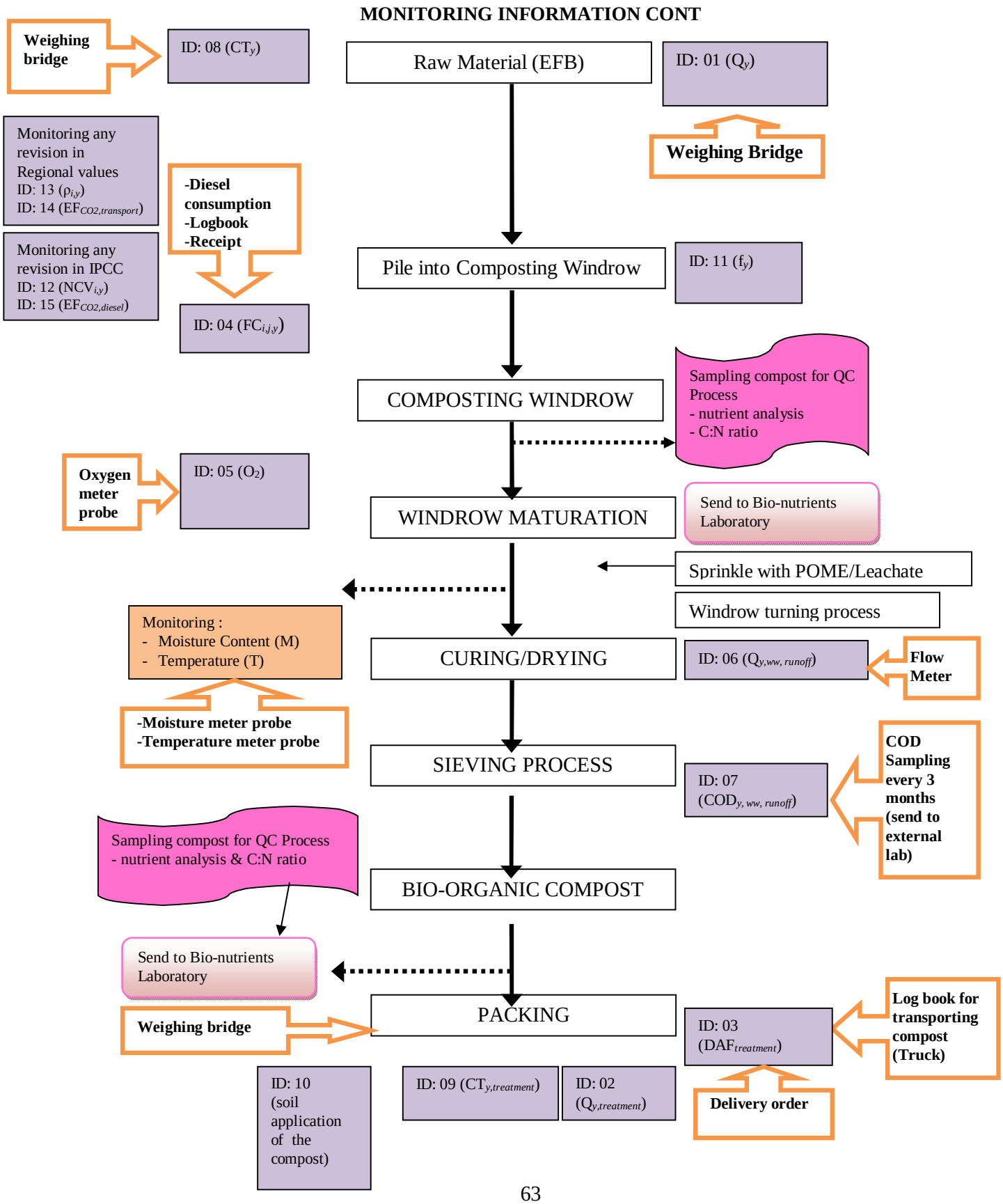
MONITORING INFORMATION

ID No	Parameter	Symbol	Unit	Recording Frequency	Data Measured (M)/ Calculated (C)/ Sampling (S)	Method	Person In charge	Verifier
1	Quantity of raw waste (EFB) treated in the year *y*	Q_y	tonnes	Monthly	M	Weighing bridge records	Weighing bridge clerk	Plant supervisor
2	Quantity of compost produced in the year *y*	$Q_{y,treatment}$	tonnes	Monthly	M	Weighing bridge records	Weighing bridge clerk	Plant supervisor
3	Average incremental distance for compost transportation	$DAF_{treatment}$	km	Monthly	C	On-site measurement. Log book for transporting compost and via delivery orders issued to clients	Weighing bridge clerk	Plant supervisor
4	Quantity of fuel type *i* (diesel) combusted in process *j*	$FC_{i,j,y}$	Litres/yr	Continuously with monthly aggregation	M	Invoices	Plant operator	Plant supervisor

	during the year *y*							
5	Aerobic conditions of composting process - percentage of dissolved oxygen	O_2	%	3 times a week	M	Oxygen meter	Plant operator	Plant supervisor
6	Volume of runoff water in the year *y*	$Q_{y,ww,runoff}$	m3	Monthly	M	Flow meter	Plant operator	Plant supervisor
7	Chemical oxygen demand of the runoff water leaving the composting yard in the year *y*	$COD_{y, ww, runoff}$	tCOD/ m^3	Monthly – on site	M	Monthly sampling and analysis at the plant laboratory	Plant operator	Plant supervisor
8	Average truck capacity for waste transportation	CT_y	tons/truck	Monthly	M	Weighing bridge records	Weighing bridge clerk	Plant supervisor
9	Average truck capacity for compost	$CT_{y,treatment}$	tons/truck	Monthly	M	Weighing bridge records	Weighing bridge clerk	Plant supervisor
10	Soil application of the compost	Soil application of the compost	-	Annually	S	Sampling, survey and verification at site.	Qualified technical employees	Head of R&D

						Documenting the sales or delivery of the compost.		
11	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year *y*	f_y	-	Annually	M	Follow the latest regulation requirement. Historical plant data	Plant operator	Plant supervisor
12	Weighted average net calorific value of fossil fuel type *i* (diesel) in year *y*	$NCV_{i,y}$	GJ/ton	Annually	-	Any revisions in the IPCC Guidelines will be taken into account	Plant supervisor	Head of Research & Development
13	Weighted average density of fuel type *i* (diesel) in the year *y*	$\rho_{i,y}$	kg/litre	Annually	-	Any revisions in the regional or national value will be taken into account	Plant supervisor	Head of Research & Development
14	CO_2 emission factor of fuel used for	$EF_{CO2,transport}$	$kgCO_2/km$	Annually	C	Any revisions in the regional or national value	Plant supervisor	Head of Research & Development

	transportation					will be taken into account		
15	Weighted average CO2 emission factor of fuel type *i* (diesel) in the year *y*	$EF_{CO2,diesel}$	tCO_2/GJ	Annually	-	Any revisions in the IPCC Guidelines will be taken into account	Plant supervisor	Head of Research & Development
16	Emission factor for composting of organic waste	EF composting	t CH4/ton waste treated on a wet weight basis	Annually	-	Default value as per the methodology, based on the aerobic conditions of composting process - percentage of dissolved oxygen	Plant supervisor	Head of Research & Development


MONITORING INFORMATION CONT
Weighing bridge
ID: 08 (CT$_y$)
Raw Material (EFB)
ID: 01 (Q$_y$)
Weighing Bridge
Monitoring any revision in Regional values
ID: 13 (ρ$_{i,y}$)
ID: 14 (EF$_{CO2,transport}$)
-Diesel consumption
-Logbook
-Receipt
Monitoring any revision in IPCC
ID: 12 (NCV$_{i,y}$)
ID: 15 (EF$_{CO2,diesel}$)
ID: 04 (FC$_{i,j,y}$)
Pile into Composting Windrow
ID: 11 (f$_y$)
COMPOSTING WINDROW
Sampling compost for QC Process
- nutrient analysis
- C:N ratio
Oxygen meter probe
ID: 05 (O$_2$)
WINDROW MATURATION
Send to Bio-nutrients Laboratory
Sprinkle with POME/Leachate
Windrow turning process
Monitoring :
- Moisture Content (M)
- Temperature (T)
CURING/DRYING
ID: 06 (Q$_{y,ww,\ runoff}$)
Flow Meter
-Moisture meter probe
-Temperature meter probe
SIEVING PROCESS
ID: 07 (COD$_{y,\ ww,\ runoff}$)
COD Sampling every 3 months (send to external lab)
Sampling compost for QC Process
- nutrient analysis & C:N ratio
BIO-ORGANIC COMPOST
Send to Bio-nutrients Laboratory
Weighing bridge
PACKING
ID: 03 (DAF$_{treatment}$)
Log book for transporting compost (Truck)
ID: 10 (soil application of the compost)
ID: 09 (CT$_{y,treatment}$)
ID: 02 (Q$_{y,treatment}$)
Delivery order

- - - - -


Weighing Bridge
Weighing Bridge