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:

Co-composting with AVC POME Treatment System for Haranky Palm Oil Mill
Version 06, 14th April 2009

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

This project is a co-composting project in the Haranky palm oil mill located in Sabah, Malaysia. The local private company, Brite-Tech Ventures Sdn.Bhd, which was established to implement and operate water treatment and co-composting projects, is the developer and owner of the project. The company is a joint venture between two wastewater treatment companies, Brite-Tech Bhd and Aquakima Sdn.Bhd. Both companies have a proven track record of conducting wastewater projects in Malaysia.

The process of crude palm oil production generates 3 types of solid waste: Empty Fruit Bunches (EFB), Mesocarp Fibres (Fibres) and Palm Kernel Shells (PKS). Also the liquid Palm Oil Mill Effluent (POME) with a high chemical oxygen demand (COD) is generated.

POME is currently treated in series of anaerobic and aerobic processes in open lagoons (ponds) before being discharged into the waterways. During the anaerobic digestion in lagoons, methane gas is generated and emitted into the atmosphere. The lagoons are required to provide enough hydraulic retention time (HRT) to bring the COD of the wastewater down to the the level of the local discharge standards.

Fibres and PKS are currently used in the palm oil mill's energy plant to generate electricity and steam. The mill is not connected to the power grid and thus steam and power in the mill operation hours is provided from this biomass energy plant and is carbon neutral. Outside mill operation hours power is supplied from a diesel genset.

The project is aimed at reducing the methane emission from the anaerobic digestion of POME by avoiding the current anaerobic wastewater treatment method. Instead, the organic components in the liquid wastewater will be removed by flocculation to form of insoluble organic solids (highly concentrated POME solids) which is dewatered in the process using an "AVC" container technology. Flocculent is added to increase the efficiency of the sedimentation in the container. The project will treat all the POME from the palm oil mill using optimum number of AVC's based on the manufacturer's recommendations. The number of AVC units[1] is based on the prospective load and may vary with processing amounts and actual operating experience.

The POME solids will be mixed with solid biomass waste, typically shredded Empty Fruit Bunch (EFB) or fibres from the palm oil mill processing in an aerobic co-composting technique, creating an organic fertiliser. The composting is a process of controlled biological decomposition of organic materials. The process is aerobic due to mechanical aeration as well as strict control of key parameters , especially oxygen level, during the composting process, which ensures optimal conditions for the decomposition. As

[1] Based on the Ban Dung Palm Oil Mill FFB processing capapcity of 250,000 and 350 days of operation, 792 m^3 of POME will be generated per day. The AVC POME handling capacity is approximately 150m^3/day. Thus a minimum of 5 units of AVC's are required with additional 1 standby unit.

an aerobic process, the composting process is carbon-neutral. Dewatering the POME using the AVC System reduces the moisture content of the solids, reducing any leachate run-off as can be experienced in conventional composting processes using POME. The final compost is produced within approximately 1 month time.

The AVC System used for dewatering the POME, was developed by Simon Moos A/S, from Denmark and has been used extensively in Denmark for wastewater treatment. The technology is manufactured locally under a joint-venture agreement between Simon Moos A/S and Aquakimia Sdn. Bhd.

The project will reduce the negative environmental impact of the current POME treatment by removing the process of digestion in anaerobic ponds, which generate and discharge methane into the atmosphere and create odours, and generally will reducing pollution in waterways from palm oil residues. The project will further improve the fertilizer and soil conditioning value of the composted biomass waste and POME and reduce the use of inorganic fertilisers used.

The project is a co-composting project that will lead to sustainable development through conversion of a present waste product to a valuable fertilizer. The process is an environmentally sound and efficient use of POME in a composting process, which also improves the utilisation of the EFB. The production of fertiliser will reduce fertiliser import to Malaysia and avoid foreign exchange by creating a domestic ressource. The technology is provided by a partnership between a Danish company and a local company, which ensures technology transfer from an Annex 1 country into Malaysia and improves the availability of environmental friendly technologies and ensures provision of service and maintenance locally.

The project will fulfil the development policies of the 3rd Outlook Perspective Plan of Malaysia, where it is highlighted (item 7.69 page 187), that

> "*The major environmental and natural resource concerns during the OPP3 period, will include improving air and water quality, efficient management of solid waste and toxic and industrial waste, developing a healthy urban environment and the conservation of natural habitats and resources... In addition, zero emission technologies will be promoted to reduce energy consumption and facilitate the reuse and regeneration of new materials from waste. The industrial sector will be encouraged to adopt cleaner technology production.*"

From the statement above the project satisfies the national sustainable environment policy by improving air and water quality and minimizing the waste from palm oil mills, reusing and regenerating the waste into an improved fertilizer product.

A.3. Project participants:

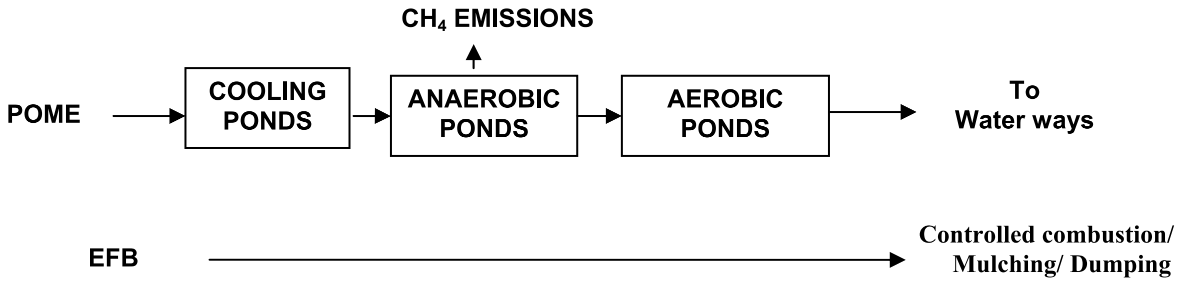
Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Malaysia, (host)	Private entity: Brite Tech Ventures	No

	Sdn. Bhd.	
Denmark	Danish Ministry of Climate and Energy	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.		

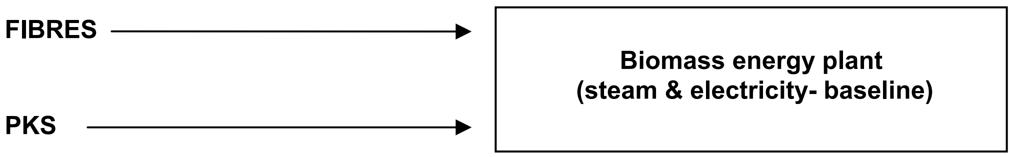
A.4. Technical description of the small-scale project activity:

Baseline – Current Practice
The project activity will change the current conventional waste management treatment for POME at the mill. The flow chart (figure 1) below shows the treatment process of POME in the baseline scenario.

Figure 1: ***Flow Chart for Baseline Scenario***



POME is currently being treated in a series of anaerobic and aerobic ponds before discharged into the natural waterways.



Fibres, PKS and EFB are currently used in a biomass fired energy plant to generate steam and electricity at the palm oil mill, i.e. the utilisation of biomass is carbon neutral in the baseline scenario. The mill has approximately 60% excess biomass available in terms of the energy content of the biomass[2]. As fibres and PKS are dry, whereas EFB has 60-70% moisture content, the fibres and PKS are preferred. These two biomass fuels can cover the mills energy demand and leaving all the EFB in excess. Some of the EFB is taken back by the crop suppliers, while the rest needs to be handled by incineration in the boiler or dumping.

[2] Noel Wambeck. Oil Palm Process Synopsis, 1999, page 160, Design Calculation for Energy Balance.

Project – Co-composting of POME and EFB/Fibres
The raw POME consists of fruit sugar, carbohydrates such as pectins (High Molecular weight water soluble colloidal carbohydrates), palm oil, fatty acids and its derivatives. If these materials are separated from the POME, the remaining contaminants in the wastewater would be simpler to treat. The AVC POME dewatering system will be separating all the materials mentioned above and reducing the POME COD levels approximately 90% from the original COD levels.

There will be two kinds of output from the AVC dewatering system. One is the lower COD content wastewater (AVC wastewater) and the other is POME solids. The AVC wastewater will be treated further in the existing aerobic ponds before being discharged to the waterways.

The main reason for dewatering the POME is to reduce the amount of water going to the co-composting site, reducing leachate run-off to reduce the time of processing the POME and EFB. The final compost is produced within approximately 1 month time.[3]

The flow chart below (figure 2) depicts the full cycle processing from pressed EFB to organic fertiliser.

Stage 1
POME from the palm oil mill's existing cooling ponds will be channelled into AVC POME Dewatering system.

Stage 2(a)-2(c)
The AVC POME Dewatering system will separate the POME into low COD content AVC wastewater and POME solids with concentrated COD.

Stage 3(a) – (b)
The solid biomass waste (EFB/Fibres) and the POME solids will be co-composted to produce organic fertiliser in an aerobic composting process using windrows on a concrete floor. The windrows will be turned to ensure aerobic condition is well maintained in the windrows. The oxygen content in the compost pile is checked every day and if the oxygen content is below 10% the compost windrow will be turned to ensure aerobic condition is maintained within 5%-21% range. The windrows will be covered with an air permeable sheet to avoid the interference of rain, but allow ventilation. A roof over the compost area may be considered in the future to divert rain water fully from the compost site.
Proper drainage system will be designed to ensure that the run-off water from the composting site will be channelled into aerobic ponds. The run-off water will be treated aerobically before discharging to the water ways according to the local discharge standards.

Stage 4
The organic fertiliser with rich nutrients will be sold to plantation owners or other buyers.

Stage 5(a) – (b)
As the AVC wastewater has a low COD content, a further treatment in existing aerobic treatment ponds before discharged to the waterways is sufficient to comply with local discharge standards.

Figure 2: Flow Chart for Project Scenario

[3]Organic Composting of Palm Oil Mill effluent solid, Brite Tech Ventures,

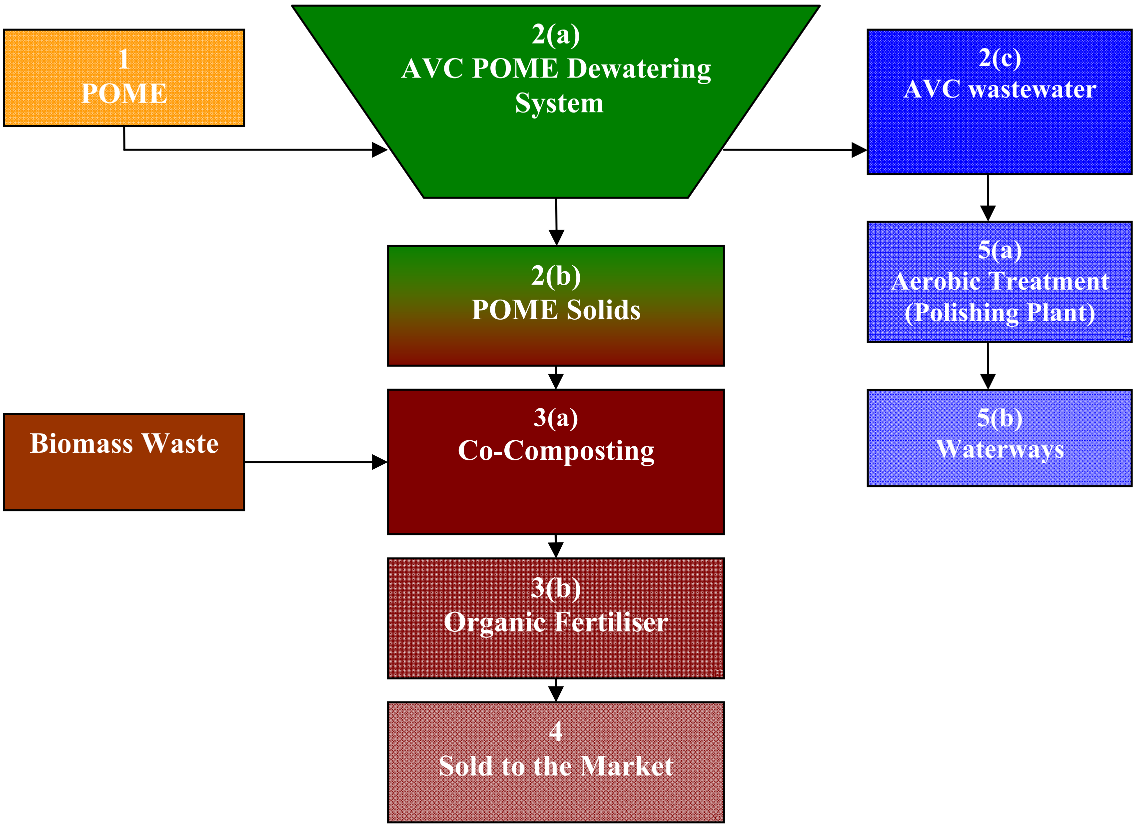


Table 1 below sums up the baseline and project scenarios through comparison of the two.

Table 1: Comparing the Baseline and Project Scenarios

Characteristics	Baseline Scenario	CDM Project Scenario
POME treatment system	Treatment in a series of anaerobic open ponds followed by aerobic ponds. The anaerobic pond treatment emits methane into the atmosphere. Anaerobic ponds are necessary to comply with local discharge standards.	Treatment in AVC POME Dewatering system. POME solids with high COD content co-composted with a smaller amount of biomass solid in aerobic process. AVC wastewater treated in existing aerobic ponds, which is sufficient to comply with local discharge standards.

In the baseline, the POME is treated in an anaerobic process to bring down the COD levels to an acceptable level, emitting methane into the atmosphere. The CDM project will dewater the POME and use the dewatered POME in an aerobic co-composting process with a smaller amount of solid biomass typically shredded EFB / fibres, producing an organic fertiliser. The remaining wastewater has a low COD levels for aerobic pond treatment to suffice. The result is a carbon-neutral processing of the POME and an output of organic fertiliser.

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

The project location is at the Haranky Palm Oil Mill in Lahad Datu, Sabah.
The location is shown on the map of Malaysia below.

Longitude and Latitude location:

05.2132°N
118.0642°E

A.4.1.1. Host Party(ies):

The host country is Malaysia

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

Sabah

A.4.1.3. City/Town/Community etc:

Lahad Datu

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

Brite Tech Ventures Sdn Bhd operates from its Head Quarters in Shah Alam, Malaysia and the address is given below;

Lot 14(PT 5015),
Jalan Pendamar 27/90,
Seksyen 27,
40400 Shah Alam,
Selangor Darul Ehsan,
Malaysia.

The name and address of the palm oil mill involved in this project activity is given below.

Haranky Palm Oil Mill
Kwantas Oil Sdn. Bhd. - Haranky Palm Oil Mill,
Batu 24, Ladang Haranky,
Lahad Datu-Sandakan Highway,
91100 Lahad Datu
Sabah, Malaysia

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

The project is a small scale project activity and falls under the category **III.F** according to the Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities. It is an "***Avoidance of methane production from decay of biomass through composting***" project, diverting POME from anaerobic open ponds without methane recovery to an AVC POME dewatering system before used in an aerobic co-composting process with solid biomass waste.

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

Year	Annual estimation of emission reductions in tonnes of CO2 e
1*	25,621
2	25,621
3	25,621
4	25,621
5	25,621
6	25,621
7	25,621
8	25,621
9	25,621
10	25,621
Total estimated reductions (tonnes of CO2 e)	256,210
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2 e)	25,621

*Please refer to section C.2.2.1 for the starting date of the crediting period.
Detailed calculation is given in annex 3.

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

There is no Public Funding involved in this project.

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

The project activity is not a debundled component of a larger project activity and there is no registered small-scale CDM project activity and there will not be applied to register another small-scale CDM project activity:

- With the same project participants; and
- In the same project category and technology/measure; and
- 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 of a larger project activity.

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:

Title of baseline methodology: "***Avoidance of methane production from decay of biomass through composting*** ", **Type III.F, Version 05,** in Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities.

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

Small-scale methodology III.F is applicable to this project activity as it is co-composting wastewater and solid biomass in the form of EFB / fibres and avoids the generation of methane from wastewater (POME) treated in anaerobic lagoons without methane recovery. The characteristic of the anaerobic lagoons in the palm oil mills satisfies the following applicability criteria;

Methodology	Project
Co-composting wastewater and solid biomass waste	Co-composting POME (wastewater) and EFB / fibres (solid biomass waste) from palm oil mill.
Wastewater would have been treated in an anaerobic wastewater treatment system without methane recovery.	POME would have been treated in a series of anaerobic and aerobic ponds without methane recovery.
Measures are limited to those that results in emission reductions of less than or equal to 60 kt CO_{2eqv} annually	Total emission reductions are less than 60 kt CO_{2eqv} annually. Please refer to Section A.4.3.

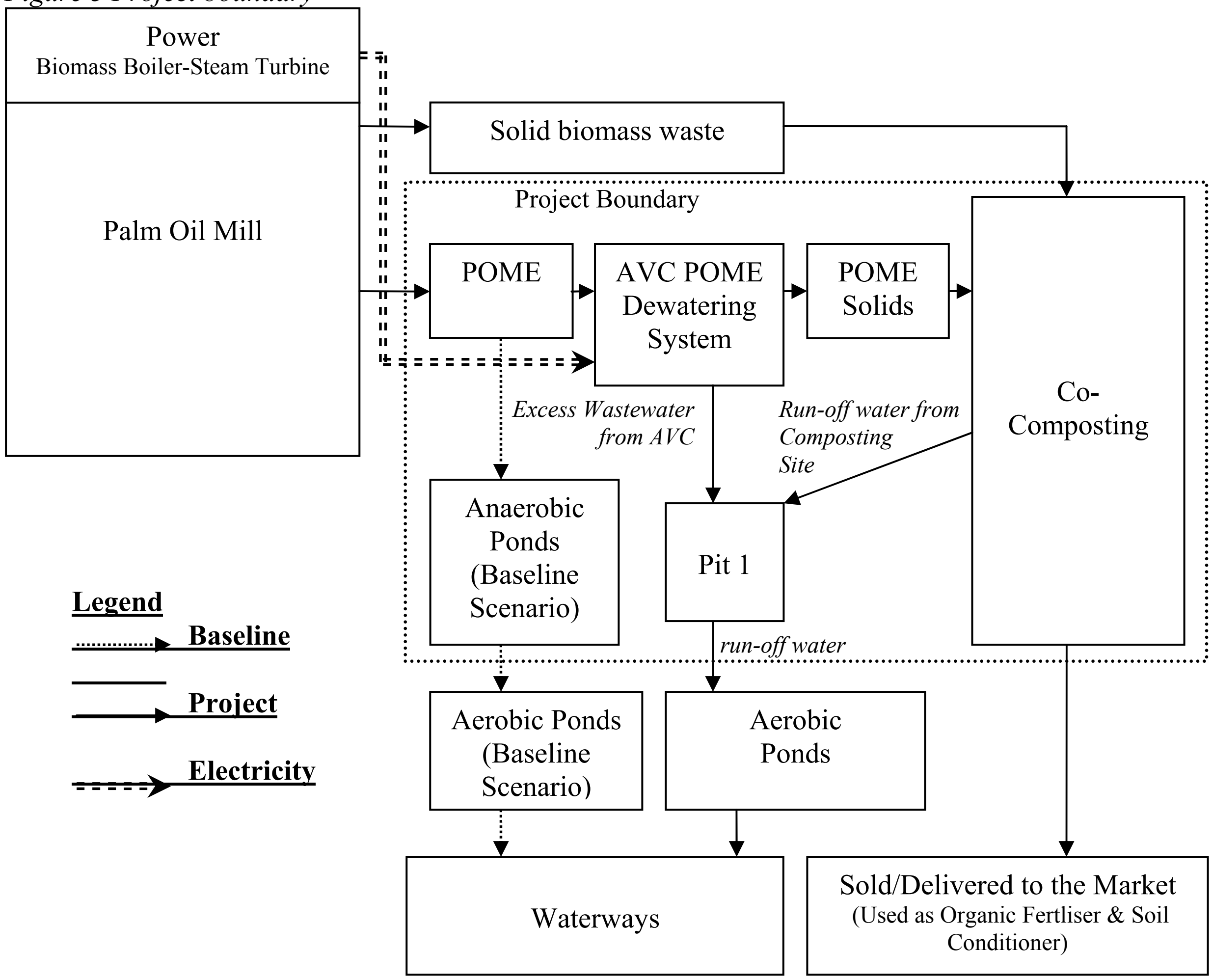
All anaerobic ponds are without aeration system and the depths of the open lagoons are greater than 2 m. Malaysian ambient temperature is always higher than 15°C which makes the anaerobic lagoons active throughout the year.

B.3. Description of the project boundary:

The physical, geographical project boundary is in the palm oil mill where the co-composting facility is located with AVC POME Dewatering System.

Please find the project boundary depicted in Figure 3 below.

Figure 3 Project boundary



Described below are the emission sources and gases that are within the project boundary.

Table 2: Emission sources and gases within the project boundary

	Source	**Gas**	**Comment**
Baseline emissions	Anaerobic open ponds	CH_4	Methane generated from the open ponds without methane recovery.
Project emissions	Power	CO_2	There will be some project emissions from diesel consumption for the compost turners, trucks and front loaders. The power for other energy consuming activities, e.g. shredding the EFB and pumping the POME, is generated from biomass fuel and is thus carbon neutral.

	Runoff water	CH_4	The wastewater from AVC POME Dewatering System and runoff water from the composting site will be treated aerobically in aerobic ponds. Project emission from both sources will be calculated in this project activity.
	Transportation	CO_2	Project emissions for this source are from transportation of the final organic fertiliser to the point of use.

B.4. Description of baseline and its development:

>>

The baseline scenario is a continuation of the current practice based on the consideration of the following factors:

A. Current processing of POME and common practice processing of POME
B. Current processing of solid biomass and common practice processing of solid biomass
C. Current processing compliance with laws and regulations
D. Feasibility

A) *POME* is currently treated in a series of anaerobic and aerobic ponds before being discharged into the waterways. This is common practice within the palm oil mill industry in the treatment of POME and used by 90% of all mills, whereas the balance 10% is using open tanks for the anaerobic treatment[4].

B) Solid biomass waste used in this project activity will be EFB's and fibres. The project requires about 6% of the total EFB generated at the mill[5]. As the mill has approximately 60% surplus of biomass fuel in terms of energy, there will be no shortage of fuel for the mill's biomass plant, which supplies steam and power to the mill and the project.

C) Treatment of POME using a series of anaerobic and aerobic ponds is in compliance with existing laws and regulations. The palm oil mill has enough pond treatment-capacity to meet the demand of POME treatment. Using EFB for combustion, mulching and controlled dumping is also in compliance with existing laws and regulations.

[4] Pusat Tenaga Malaysia, Feasibility study on Grid Connected Power Generation using biomass cogeneration technology, January 2000, p.g 25.

[5] For each ton of FFB processed about 21% EFB is being generated, which amounts to about 50,000 tonnes EFB per year for this mill. The EFB to dried POME solids weight ratio for the composting process is about 20%, The AVC will dewater 147,000 tonnes by 90%, so the total POME solids for composting is about 15,000 tonnes, which will be mixed with 20% EFB, which amounts to 3,000 tonnes EFB per year. This is about 6% of the total available EFB in the mill.

D) The mill has already built and invested in the existing ponding system for POME treatment and other treatment technologies will incur additional investments to the mill.

Assumptions in the baseline scenario include the following:

- Treating *POME* in a series of anaerobic and aerobic ponds without methane recovery will still be the common practice and in compliance with the guidelines from the local authorities within the project activity period.
- No installations of alternative technologies of methane recovery/elimination in connection with POME treatment will become feasible as stand-alone projects within the project period.

Key information, assumptions and data to determine the baseline scenario and the project scenario are presented in the table below.

Key Parameters and Assumptions

Assumptions and Source of Values Used in the Baseline Estimation

No	Parameters	Value	Unit	Source
1	Average FFB Throughput	250,000	t FFB/yr	3 years historical average (2004-2006)
2	COD content,	50	kgCOD/m3	Industrial Standard
3	POME Generation Ratio	0.6	m3/tFFB	Pusat Tenaga Malaysia, Feasibility study on Grid Connected Power Generation using biomass cogeneration technology, January 2000, p.g 32.
4	Mill Operation Hours	7700	hr/yr	Project Proponent
5	EFB Generation Ratio	21%	t EFB/ t FFB	Pusat Tenaga Malaysia, Feasibility study on Grid Connected Power Generation using biomass cogeneration technology, January 2000, p.g 12.

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:

This section describes how the emissions are reduced below those that would have occurred in the absence of the project activity, in accordance with the requirements in Attachment A to Appendix B of simplified modalities and procedures for small-scale CDM project activities.

The project will be implemented by Britetech Ventures, who will invest, built and operate the project. In order to do so, the project must have an acceptable return in order to be a viable. Britetech Ventures and the technology provider Aquakimia have not implemented any similar projects without support from CDM except from one pilot project including 1 AVC to demonstrate the technology's performance. The reason is the investment cost and operation costs are considered high for palm oil mill owners.

Investment Barrier

Investment barrier analysis has been selected for this project activity as the project generates economic benefits by selling the produced organic fertiliser only. The financial indicator used is the project's IRR.

As an investment decision tool, the IRR is suitable for this project type and decision context, where only a single project is analysed for the rate of return of the invested capital. If the IRR is higher than the expected rate of return of the investor (the benchmark) the project will be chosen. If lower the project will be rejected.

The Malaysian Central Bank releases the Base Lending Rates, BLR's at which the Malaysian banks follow as a benchmark to provide financing to projects. The project proponent's investment criteria is that the project should have an IRR of more than the past 5 years average Malaysian BLR.

The table below shows the historical BLR values from annual report of central bank of Malaysia. The average BLR for the past 5 years was 6.2%. This value will be used in the benchmark analysis of this project activity.

Year	2002	2003	2004	2005	2006	Average
BLR	6.39	6	5.98	6.2	6.6	6.2

Source: http://www.bnm.gov.my/files/publication/ar/en/2006/zcp07_table_A.26.pdf

<u>Sub-step 2c – Calculation and comparison of financial indicators</u>
The co-composting of the solid biomass waste and POME will produce organic fertiliser, which has a potential of displacing inorganic fertiliser in plantations. The price of the organic fertiliser is estimated based on the monetary value of the nutrients it contains by comparing with the price of inorganic fertiliser. A price premium is factored in for the soil conditioning value of the organic fertiliser compared to inorganic fertiliser. The source of income for the project comes from the revenue from selling organic fertiliser.

The project proponent is liable to pay the mill owner for the use of mill facilities for the AVC system (e.g land rental and power a.o.). The project utilises approximately 2 - 3 acres of their land for co-composting and AVC dewatering systems.

IRR is calculated based on project cash outflows and cash inflows only, irrespective the source of financing. Please refer to Annex 5 for the detailed calculations.

The table below summarises the financial analysis by providing the IRR values with respect to the CER prices.

Table 3: IRR at different CER prices

Financial indicator/CER price	**0 €**	**6 €**	**8 €**	**10 €**
IRR-Project Activity (%)	negative	negative	7.3%	16.5%

The project becomes feasible at the CER price of approximately above 7.8 **€**.

The financial analysis shows that this project activity is only attractive with CDM.

<u>Sensitivity analysis</u>
The sensitivity analysis is made by varying the following parameters in the financial analysis:

a) Compost Price
b) Compost Production
c) Investment Cost

d) Operation and Maintenance Cost

The paragraphs below discuss the sensitivity analysis results for of all four parameters listed above.

Compost Price

This sensitivity analysis is based on an assumption that the market price of the organic fertiliser will increase in the future. The IRR calculation in the baseline uses an expected compost amount and an average market price for per tonne of organic fertiliser in the base year. The sensitivity analysis shows that the project will not become feasible even with an increase of organic fertiliser market price.

The sensitivity analysis is made assuming that the project receives no financial support from CDM. The expected organic fertliser market price and the corresponding IRR values are shown in the table below.

% Of Change	100%	199%
Compost Price (RM/tonne)	150	298
IRR	negative	6.2%

The compost base price[6] of RM 150 per tonne was determined using the NPK value in the final compost from the project activity and comparing with the inorganic fertiliser prices before the starting date of the project activity (e.g Ammonium Sulphate, Rock Phosphate, Muriate of Potash).

The sensitivity analysis shows that the compost price should be more than 199% higher the expected price of RM 150 per tonne to reach the project benchmark of 6.2%. Such high increase is very unlikely occur and would mean that commodity prices in general is increased, which would increase inflation and thereby other costs for the operation of the project activity.

Compost Production

This sensitivity analysis is a variation of the compost output from the project. Increased output will increase the revenue, but will also lead to an increase in the operation costs to produce this additional compost. The results are shown in the table below.

% Of Change	100%	823%
Compost Production (tonne)	4,800	39,509
IRR	negative	6.2%

An increase in the compost production of 823% will meet the expected project benchmark of 6.2%.
To increase the compost production the project proponent need to increase the plant capacity and invest in additional equipment and increase the land area. Such an increase is considered impossible as the project activity is expected to consume all the POME from the mill in the proposed project activity.

[6] Compost Price and Composition Justification, Brite Tech Ventures

Investment
This sensitivity varies the investment in order to analyse at what minimum investment the project will become viable.

% Of Change	100%	0%
Investment	4,220,000	-
IRR	negative	negative

The project cash flow is negative without CDM. Even with zero investment cost the project IRR is still not positive.It is considered unlikely that the project can be carried out without any investment costs.

O&M Costs
This sensitivity analysis varies the O&M costs in order to identify the level of costs that will satisfy the benchmark criteria.

% Of Change	100%	30%
O&M Cost (RM)	1,008,000	297,360
IRR	negative	6.2%

The project proponent needs to reduce the O&M to 30% of the expected costs to meet the IRR benchmark. This is an unlikely scenario as the decrease in O&M will also reduce the compost production as the project will not be able to treat 100% of the POME. Reduced O&M cost will results in lesser man power, consumables such as polymer, and diesel which will not be sufficient to treat the POME and produce the same amount of compost.

Conclusion
Based on the investment barrier analysis carried out above, the project is proven to be additional. CDM registration will benefit the project by improving the project IRR to reach the benchmark. The expected impacts of CDM registration are;

- The project will be able to reduce anthropogenic GHG emissions.
- Revenue from the sale of CER will be able to make the project viable;
- Showcasing a new technology that could be an inspiration for other palm oil mills to engage in similar CDM projects to the benefit of the environment.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>
Small-scale methodology III.F Ver 05 is applicable to this project activity as it is co-composting wastewater (POME) and solid biomass (EFB/fibres), avoiding the generation of methane from wastewater (POME) being treated in anaerobic lagoons without methane recovery. Please refer to B.2 for further justification of choice of methodology.

Project emissions:
This section will explain on the methodological choices made in connection with calculating the project emissions.

<u>Project emissions from co-composting process</u>

The co-composting process is a controlled process, where mechanical aeration is carried out to ensure aerobic digestion and optimum composting conditions. Thus, there will be no significant methane emissions from anaerobic digestion in the co-composting project according to AMS III.F

However project emissions may come from other sources such as transportation, power and diesel consumption and treatment of run-off water. The formula below describes each sources of project emission in accordance to the response by SSC WG on clarification #SSC_181 during the SSC meth panel meeting dated 2nd July 2008.
(http://cdm.unfccc.int/methodologies/SSCmethodologies/Clarifications/index.html?p=2)

As the project activity includes co-composting of waste water in the form of POME, the AMS.III.F paragraph 11 prescribes that run-off water must be subtracted from the baseline emissions, thus the run-off water emissions is included here as a project emission.

The formula for calculating the project emissions can be simplified to be the sum of emissions from transport, power and run-off water.

$$\underset{(t\ CO_2)}{PE_y} = \underset{(t\ CO_2)}{PE_{y,transp}} + \underset{(t\ CO_2)}{PE_{y,power}} + \underset{(t\ CO_2)}{PE_{y,run\text{-}off}}$$

Where;
PE_y = is the total project emission in the year "y"
$PE_{y,transp}$ = is the emission from incremental transportation in the year "y",
$PE_{y,power}$ = is the project emission from electricity or diesel consumption in the year "y".
$PE_{y,runoff}$ = is the methane emissions potential from the run-off water in the year "y",

<u>Project emissions from transportation,</u> **$PE_{y,transp}$**

The transportation requirements for the project activity are divided on three sources:

1) *Transport of solid biomass waste to the composting site.*
The composting site is within the palm oil mill compound, so there is no increment in distance and emissions compared to the baseline where the solid biomass (EFB) was disposed.

2) *Transport of POME from the anaerobic pond to composting site.*
POME will be transported to the composting site using pumps. The power consumption will be part of the project emissions from electricity consumption below.
3) *Transport of final compost to the soil application site*

Transport of final compost is additional to the baseline emissions and will be included as project emissions. Thus the formula for project emission from transportation from paragraph 5 of AMS III.F is as shown below.

$$PE_{y,\ transp} = Q_y/CT_y \times DAF_w \times EF_{CO2} + Q_{y,comp}/CT_{y,comp} \times DAF_{comp} \times EF_{CO2}$$

As there is no incremental transportation of solid biomass waste and the transportation of waste water is a part of the power consumption the $DAF_w = 0$. Therefore the only project emissions from transportation are from the transportation of final compost. The formula for project emissions from transportation can be expressed as per below:

$$\underset{(tCO_{2e}/yr)}{PE_{y,\ transp}} = \underset{(tonnes/yr)}{Q_{y,\ comp}} \div \underset{(tonnes/truck)}{CT_{y,\ comp}} \times \underset{(km/truck)}{DAF_{comp}} \times \underset{(kgCO2/km)}{EF_{CO2}} \div 10^3$$

Where;

$Q_{y,\ comp}$ is quantity of final compost product produced in the year, *y* (tonnes)
$CT_{y,\ comp}$ is average truck capacity for final compost product transportation (tonnes/truck)
DAF_{comp} is average distance for final compost product transportation (km//truck)
EF_{CO2} is CO2 emission factor for fuel use due to transportation (kgCO2/km, IPCC default values or local values may be used).

Average truck capacity used for compost distribution to the plantation is 10 ton trucks. Estimated distance traveled by each truck for compost distribution is within the 50 km radius from the mill. Total distance traveled by each truck is assumed to be 100 km maximum.

Project emissions from power consumption, **$PE_{y,power}$**

Project emissions from the equipment usage for the composting facility is from the energy usage. There are two energy usages:

1) *Electricity consumption by electrical driven pumps and other electrical equipment.*
The electricity for the co-composting plant which is mainly for the pumping and effluent mixing station comes from the palm oil mill biomass cogeneration plant. Thus the electricity supplied to the co-composting facility is carbon neutral. Furthermore, the co-composting facility will be operating (e.g pumping POME, mixing effluents) during the palm oil mill operation hours. Thus the project emissions from power consumption will be carbon neutral therefore it is insignificant for this project activity.

2) *Diesel consumption for mechanical equipment*
There will be some diesel consumption for the mechanical turners used in co-composting facility to turn the compost periodically. This consumption will lead to project emissions, which will be taken into account.

The formulae to calculate the project emission from power consumption of diesel source is given below:

$$\underset{(t\ CO_2/yr)}{PE_{diesel,}} = \underset{(liters/yr)}{Q_{diesel}} \times \underset{(kg/liter)}{D_{diesel}} \times \underset{(TJ/Gg)}{NCV_{diesel}} \times \underset{(t\ CO_2/TJ)}{EF_{diesel}} \div 10^6$$

Where;

$PE_{diesel,}$	is the project emission from diesel consumption for the mechanical turners at the co-composting facility.
Q_{diesel}	is the quantity of diesel consumption for the on-site co-composting process
D_{diesel}	is the diesel density at standard temperature and pressure. (MSDS Caltex : 0.85 kg / liter).
NCV_{diesel}	is the net calorific value of diesel
EF_{diesel}	is the road transport default CO_2 emission factor for diesel.

Reference: Option B, "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" Ver 02.

$$\underset{(t\ CO_2)}{PE_{y,power}} = \underset{(t\ CO_2)}{PE_{y,diesel}}$$

<u>Project emissions from run-off water,</u> **$PE_{y,runoff}$**

According the AMS.III.F paragraph run-off water must be monitored and calculated. The project activity has two sources of run-off water:

- Run-off water from AVC POME Dewatering System,
- Run-off water from co-composting site

Run-off water from AVC POME Dewatering System will be be channelled to a pit where also run-off water from compost site will be channelled into. Some of the run-off water will be recycled back to the compost site and the rest will be sent to aerobic ponds for aerobic treatment before discharged to the waterways according to the local discharge standards. The formula to calculate project emissions from runoff water is given below.

$$\underset{(t\ CO_2)}{PE_{y,run\text{-}off}} = \underset{(m^3)}{Q_{y,run\text{-}off}} \times \underset{(tonnes/\ m^3)}{COD_{y,run\text{-}off}} \times \underset{(kg\ CH_4/kg\ COD)}{B_{o,ww}} \times MCF_{run\text{-}off} \times GWP\_CH_4$$

Where;

$Q_{y,run\text{-}off}$	is the volume of the runoff water from the project actvity in the year "y". A flow meter will be installed and the data (m^3) will be recorded monthly. The yearly flow will be based on the sum of the monthly-recorded value. The value in the PDD is estimated based on project proponent's data. Actual values will be measured during the crediting period.
$COD_{y,run\text{-}off}$	is Chemical Oxygen Demand of the runoff water in the year "y". The value used in this

PDD is based on project proponent's estimation. Actual values will be measured during the crediting period.

$B_{o,ww}$ is maximum methane producing capacity of the inlet POME. A value of 0.21 kg CH_4/kg COD is used according to AMS III.F.

$MCF_{run-off}$ is the methane correction factor for the run-off water. A default MCF higher value of 0.1 is used according to table III.H.1 (AMS III.H Ver 6) as the runoff water is treated in a well managed aerobic system.

GWP_CH$_4$ is the global warming potential (GWP) for CH_4. An IPCC default value of 21 is used.

The project emissions are therefore:

$$\underset{(t\ CO_2)}{PE_y} = \underset{(t\ CO_2)}{PE_{y,transp}} + \underset{(t\ CO_2)}{PE_{y,power}} + \underset{(t\ CO_2)}{PE_{y,runoff}}$$

Baseline emissions:

From paragraph 6

$$\underset{(t\ CO_2)}{BE_{y,}} = \underset{(t\ CO_2)}{BE_{CH4,SWDS,y}} - \underset{(t\ CH_4)}{MD_{y,reg}} \times GWP\_CH_4 + \underset{(t\ CH_4)}{MEP_{y,ww}} \times GWP\_CH_4$$

Where;

BE_y is the baseline emission in the year "y"

$BE_{CH4,SWDS,y}$ is the yearly methane generation potential of the EFB composted by the project activitin the year "y". Estimating conservatively, the EFB in this project emits no methane as most of the EFB from the palm oil mill goes for mulching in the plantation. The value is therefore zero.

$MD_{y,reg}$ is the amount of methane that would have to be captured and combusted in the year "y" to comply with prevailing regulations. No methane would have been captured and combusted to comply with prevailing regulations, and the value is therefore zero.

$MEP_{y,ww}$ **is** methane emission potential in the year "y" of the POME. The only source of baseline emissions is from the anaerobic digestion of POME.

The methane emission potential of the POME can be calculated using the formulae below.

From paragraph 6

$$\underset{(t\ CH_4)}{MEP_{y,ww}} = \underset{(m^3)}{Q_{y,ww}} \times \underset{(tonnes/\ m^3)}{COD_{y,ww,untreated}} \times \mathbf{B_{o,ww}} \times MCF_{ww,treatment} \times GWP\_CH_4$$

Where;

Where;

BE_y is the baseline emission in the year "y"

$BE_{CH4,SWDS,y}$ is the yearly methane generation potential of the EFB composted by the project activity in the year "y". Estimating conservatively, the EFB in this project emits no methane as most of the EFB from the palm oil mill goes for mulching in the plantation. The value is therefore zero.

$MD_{y,reg}$ is the amount of methane that would have to be captured and combusted in the year "y" to comply with prevailing regulations. No methane would have been captured and combusted to comply with prevailing regulations, and the value is therefore zero.

$MEP_{y,ww}$ methane emission potential in the year "y" of the POME. The only source of baseline emissions is from the anaerobic digestion of POME.

GWP_CH_4 is the global warming potential (GWP) for CH_4. An IPCC default value of 21 is used.

POME and EFB / fibres generated from the palm oil mill will be co-composted at the composting site. Baseline emissions come from the anaerobic digestion of POME in open lagoons. To estimate conservatively, no baseline emissions from EFB are taken into consideration in this project activity.

The methane emission potential of the POME can be calculated using the formulae below.
From paragraph 7

$$\underset{(t\ CH_4)}{MEP_{y,ww}} = \underset{(m^3)}{Q_{y,ww}} \times \underset{(tonnes/\ m^3)}{COD_{y,ww,untreated}} \times \mathbf{B_{o,ww}} \times MCF_{ww,treatment}$$

Where;

$Q_{y,ww}$ is the volume of the POME co-composted in the year "y". A flow meter will be installed and the data (m^3) will be recorded monthly. The yearly flow will be based on the sum of the monthly-recorded value. This value is estimated based on project proponent estimation in the PDD. Actual values will be measured during the crediting period.

$COD_{y,ww,untreated}$ is Chemical Oxygen Demand of POME in the year "y". entering the composting process in the year "y". Weekly measurements will be taken to measure the COD (tonnes/m^3) content and will be recorded electronically. The monthly average COD value will be used to calculate the yearly weighted average COD value based on the monthly volume of POME. The weighted average COD calculated for every year will be applied in the CER calculations. The value used in this PDD is extracted from " *Feasibility Study On Grid Connected Power Generation Using Biomass Cogeneration Technology"*, 2000,PTM, p.25 and is for PDD calculation purposes only. Actual value will be measured during the crediting period.

$B_{o,ww}$ is maximum methane producing capacity of the inlet POME. A value of 0.21 kg CH_4/kg COD is used according to AMS III.F.

$MCF_{ww,treatment}$ is the methane correction factor for the wastewater treatment system in the baseline scenario. To be conservative a default MCF lower value of 0.8 is used according to AMS III.F.

The total Baseline emissions are therefore:

$$\underset{(t\ CO_2)}{BE_{y,}} = \underset{(t\ CH_4)}{MEP_{y,ww}} \times GWP\_CH_4$$

Leakage emissions:
There will be no significant leakage in this composting project as all the equipments used in the project activity are new and bought for the purpose of the project activity. No equipments or treatment technology transferred from another activity.

Emission reductions:

This section will expand on the methodological choices made in connection with calculating the emission reductions based on the methodological choices in the previous sections.

From paragraph 9

$$\underset{(t\ CO_2/yr)}{ER_y} = \underset{(t\ CO_2/yr)}{BE_y} - \underset{(t\ CO_2/yr)}{PE_y} - \underset{(t\ CO_2/yr)}{Leakage_y}$$

Where;
ER_y is the emission reduction in the year "y"

Since there are no leakages associated with this project activity the emission reduction will be the baseline emissions minus the project emissions as given in the formula below.

$$\underset{(t\ CO_2/yr)}{ER_y} = \underset{(t\ CO_2/yr)}{BE_y} - \underset{(t\ CO_2/yr)}{PE_y}$$

No other additional formula used for calculating emission reduction other than those provided in this section.

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

Data / Parameter:	$B_{o,ww}$
Data unit:	kg CH_4/kg COD
Description:	Maximum methane producing capacity of the inlet POME
Source of data used:	AMS III.F.
Value applied:	0.21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value as defined in AMS III.F
Any comment:	-

Data / Parameter:	$MCF_{ww,treatment}$
Data unit:	-
Description:	Methane correction factor for the wastewater treatment system in the baseline scenario
Source of data used:	AMS III.F
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	Lower value as defined in AMS III.F and according to the clarification stipulated in Annex 5 from SSC meth panel meeting dated 2nd July 2008.
Any comment:	-

Data / Parameter:	GWP_CH_4
Data unit:	-
Description:	The global warming potential (GWP) for CH_4
Source of data used:	AMS III.F.
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value as defined in AMS III.F

Data / Parameter:	D_{diesel}
Data unit:	kg/liter
Description:	Diesel Density
Source of data used:	MSDS of Diesel from Caltex Malaysia
Value applied:	0.85
Justification of the choice of data or description of measurement methods and procedures actually applied :	Density of diesel is obtained from MSDS of Caltex Malaysia.
Any comment:	-

Data / Parameter:	EF_{diesel}
Data unit:	t CO_2/TJ
Description:	CO_2 emission factor for road transport vehicles using diesel
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Energy Table 3.2.1, p.g 3.16
Value applied:	74.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	To be conservative, the upper limit of carbon emission factor for diesel oil selected from data source mentioned above.
Any comment:	The emission factor is used to calculate project emission from mechanical turners used at the co-composting site.

Data / Parameter:	NCV_{diesel}
Data unit:	TJ/Gg
Description:	Net calorific value of diesel
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Energy Table 1.2, p.g 1.18

Value applied:	43.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	To be conservative, the upper limit of NCV of diesel oil is selected according to 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Any comment:	This value is used to calculate project emission from mechanical turners used at the co-composting site.

Data / Parameter:	EF_{CO2}
Data unit:	t CO_2/km
Description:	CO_2 emission factor for heavy duty diesel engines
Source of data used:	Universiti of Malaya(2005)"Energy Used in the Transportation Sector of Malaysia", page 230.
Value applied:	0.0009
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on IPCC 2006, 1 liter of diesel emits 2.73 kg CO_2. A heavy duty truck can travel approximately 3 km using 1 liter of diesel according to the source of data mentioned above. Thus, the emission factor for heavy duty diesel engine is obtained by dividing 2.73 kg CO_2/liter with 3 km/liter. To be conservative it is estimated that the mechanical turners used in the co-composting site will be heavy duty diesel engines.
Any comment:	-

Data / Parameter:	$MCF_{run-off}$
Data unit:	-
Description:	methane correction factor for the runoff water .
Source of data used:	Table III.H.1, AMS III.H Ver 6
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	A default MCF higher value of 0.1 is used according to table III.H.1 as the runoff water is treated in a well managed aerobic system. The higher value of MCF was selected to be conservative. The aerobic ponds are well managed in the baseline scenario to ensure the BOD of the final discharge effluent are kept well below the effluent discharge standard set by the local department of environment. Since the project will pump all the runoff water to the existing well managed aerobic ponds, the palm oil mill has an obligation to meet the same final discharge standards as in the baseline by maintaining the aerobic ponds under well managed conditions.
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

>>

Baseline Emissions

A	B	C	D	E	F= A x B x C x D x E /1000
Q_{ww} m^3/yr	$COD_{ww,untreated}$ $kgCOD/m^3$	$B_{o,ww}$ $kgCH_4/kgCOD$	$MCF_{ww,treatment}$	GWP_CH 4	MEP_{ww} = BE t CO_2/yr
150,000	50	0.21	0.8	21	26,460

Project Emissions

Project emission from diesel consumption at the co-composting site for the mechanical turners and AVC waste water is calculated in the tables below.

Project Emissions from Diesel Consumption

A	B	C	D	E = A x B x C x D/10^6
Q_{diesel} liters/yr	D_{diesel} kg/liter	NCV_{diesel} TJ/Gg	EF_{diesel} t CO_2/TJ	PE_{diesel} t CO_2/yr
28,080	0.85	43.3	74.8	77

Project emissions from Run-off water comes from excess water of AVC and run-off rainwater from composting site. The estimation of project emissions from both sources are given below.

Project Emissions from Run-off water

A*	B**	C	D	E	F= A x B x C x D x E/10
$Q_{ww,runoff}$ (m^3/yr)	COD_{runoff} (kgCOD/m^3)	B_o ($kgCH_4$/kgCOD)	MCF	GWP_CH_4	PE_{runoff}
163,000	10.0	0.21	0.1	21	719

* Based on assumption that $Q_{ww, runoff}$=Q_{ww} and an annual rainfall of 3.5 m over the composting site equal to 15,000 m^3/year

*Assuming that AVC dewatering system has an efficiency of 80%. Actual COD value will be measured during the monitorin period.

Since there will be no significant project emission from transportation of solid biomass waste and POME to the composting site, only the project emission from transportation of compost will be calculated. The estimated project emission from transportation is estimated as shown below.

A	B	C	D	E = A/B x C x D
Q_{comp}, Quantity of Compost Tones/yr	CT_{comp}, Average Truck Capacity tonnes/truck	DAF_{comp}, Average Incremental Distance km/truck	EF_{CO2} t CO_2 /km	PE_{transp} t CO_{2e}/yr
4,800	10	100	0.0009	43

The total project emission will be from transportation of compost, diesel consumption by the tractors and run-off water. The total project emissions will be:

A	B	C	D = A + B + C

PE_{transp} tCO_{2e}	PE_{power} tCO_{2e}	PE_{runoff} tCO_{2e}	PE tCO_{2e}
43	77	719	839

Leakage

There is no significant leakage in this project activity.

Please refer to Annex 3 for more details on estimation of emission reductions throughout the crediting period.

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

>>

Year	Estimation of project activity emissions tCO_{2e}	Estimation of baseline emissions tCO_{2e}	Estimation of leakage tCO_{2e}	Estimation of overall emissions reductions tCO_{2e}
1	839	26,460	0	25,621
2	839	26,460	0	25,621
3	839	26,460	0	25,621
4	839	26,460	0	25,621
5	839	26,460	0	25,621
6	839	26,460	0	25,621
7	839	26,460	0	25,621
8	839	26,460	0	25,621
9	839	26,460	0	25,621
10	839	26,460	0	25,621
Total (tonnes of CO_{2e})	8,390	264,600	0	256,210

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

Title of the approved monitoring methodology is : "***Avoidance of methane production from decay of biomass through composting*** ", **Type III.F, Version 05,** in Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities.

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)	
Data / Parameter:	$Q_{y,ww}$
Data unit:	m^3
Description:	Volume of POME co-composted in a year "y"
Source of data to be used:	Flow meter data record sheet at the co-compost plant.
Value of data	150,000 m^3/yr
Description of measurement methods and procedures to be applied:	Measurement will be taken from an installed flow meter at the AVC POME Dewatering System The compost plant technician will record the flow meter reading every day in a record sheet. The monthly and yearly volume of POME used in co-composting will be calculated based on the available record sheet data.
QA/QC procedures to be applied:	The compost plant supervisor will verify the record sheets every day and all the data kept in both soft copy and hardcopy at the compost plant for at least 2 years after the crediting period. The flow meter will also be calibrated as required by the manufacturer's recommendations.
Any comment:	The data range given above is between typical and maximum POME generation scenarios in a 45t/h palm oil mill. This value will be calculated from the formulae given below for the PDD estimation purposes; Average FFB processing capacity (tFFB/yr) x POME Production Factor (m^3/tFFB) The uncertainty of the data for this parameter is expected to be low.

Data / Parameter:	$Q_{ww, runoff}$
Data unit:	m^3/month
Description:	Volume of excess water run-off from co-composting site
Source of data to be used:	Continuously measured
Value of data	The maximum value will be the amount of waste water entering the system and the rain fall over the composting site, which amounts to 163,000 m^3/yr. The actual clear water volume after solid/organic separation in the AVC Sludge Dewatering System and from the compost site will be monitored during the project implementation. For present estimation purpose, it is assumed same as $Q_{y,ww}$.
Description of measurement methods and procedures to be applied:	Flow meter will be installed at the outlet of collection pit where all treated water from the AVC containers and compost site will flow to the aerobic treatment pond. Continuous measurements are carried out using the flow meter and the measurements will be recorded daily by the plant technician.

QA/QC procedures to be applied:	The compost plant supervisor will verify the record sheets every day and all the data kept in both soft copy and hardcopy at the compost plant for at least 2 years after the crediting period. The flow meter will also be calibrated as required by the manufacturer's recommendations.
Any comment:	Separate pits are installed to collect runoff water from AVC and rainwater from compost perimeter. The uncertainty of the data for this parameter is expected to be low.

Data / Parameter:	$COD_{y,ww,untreated}$
Data unit:	kg COD/m^3
Description:	Chemical Oxygen Demand, COD of the POME in a year "y"
Source of data to be used:	Test Reports from COD sampling at the palm oil mill and the third party accredited laboratory.
Value of data	50 +/- 20% kg COD/m^3
Description of measurement methods and procedures to be applied:	There will be 5 COD samples taken in a month. 4 of them will be taken and measured by in house expertise and one will be taken and measured by the third party accredited laboratory. Date, time and place of sampling must be noted. The average of the 5 samples will be calculated to be the monthly COD value. Wastewater samples will be collected and analysed by a SAMM accredited laboratory using the Department of Environment (Malaysia) Revised Standard Methods (1985) for Analysis of Rubber and Palm Oil Mill Effluent. The analysis results will be forwarded to the plant engineer for comparison, verification and record keeping. The data will be compared for consistency of results in the systematic in-house laboratory testing.
QA/QC procedures to be applied:	The compost plant engineer will verify the record sheets every month and all the data kept in both soft copy and hardcopy at the compost plant for at least 2 years after the crediting period. If the results between the in-house lab sampling and the accredited laboratory significantly differ, trouble-shooting e.g. re-sampling and re-testing will be carried out. The laboratory equipments shall be calibrated according to the service schedule. The appointed laboratory will be a SAMM accredited facility.
Any comment:	The uncertainty of the data for this parameter is expected to be low. The monthly COD value will be used to calculate the yearly weighted average COD value based on the monthly volume of POME. The weighted average COD calculated for every year will be applied in the CER calculations.

Data / Parameter:	$COD_{ww,runoff}$
Data unit:	kg COD/m^3
Description:	COD of the run-off water from co-composting site.
Source of data to be used:	Sampling

Value of data	10 (Based on approximately 80%* COD reduction of untreated POME, $COD_{y, ww, untreated}$)
Description of measurement methods and procedures to be applied:	The monitoring of $COD_{ww, runoff}$ will be done at the collection pit where all treated water from the AVC containers and the compost site will flow to. Weekly sampling and testing using in-house laboratory analyzer. Once every month, sample will be collected and analysed by a SAMM accredited laboratory using the Department of Environment (Malaysia) Revised Standard Methods (1985) for Analysis of Rubber and Palm Oil Mill Effluent. The analysis results will be forwarded to the plant engineer for comparison, verification and record keeping. The data will be compared for consistency of results in the systematic in-house laboratory testing.
QA/QC procedures to be applied:	The compost plant engineer will verify the record sheets every month and all the data kept in both soft copy and hardcopy at the compost plant for at least 2 years after the crediting period. If the results between the in-house lab sampling and the accredited laboratory significantly differ, trouble-shooting e.g. re-sampling and re-testing will be carried out. The laboratory equipments shall be calibrated according to the service schedule. The appointed laboratory will be a SAMM accredited facility.
Any comment:	The uncertainty of the data for this parameter is expected to be low. The monthly COD value will be used to calculate the yearly weighted average COD value based on the monthly volume of run-off water from AVC. The weighted average COD calculated for every year will be applied in the CER calculations. *The 80% efficiency is a conservative value based on a pilot study project using AVC in a Malaysian palm oil mill.

Data / Parameter:	$Q_{y,comp}$
Data unit:	tonnes
Description:	Quantity of compost produced in year '*y*'
Source of data to be used:	Weighing-scale records
Value of data	4,800 t/yr
Description of measurement methods and procedures to be applied:	Value of the data applied will be a total weight of final compost.

QA/QC procedures to be applied:	Weighed on calibrated scale; also cross check with sales of compost. The maintenance, frequency of calibration and control procedures are established by the QA/QC team. Calibration and maintenance are carried out periodically in accordance to appropriate industry standards to ensure accuracy. Therefore the uncertainty level of the data is expected to be low. Records of calibration will be kept at site. All monitoring data will be electronically archived for a period of 2 years after crediting.
Any comment:	

Data / Parameter:	Q_{Bio}
Data unit:	tonnes
Description:	Quantity of EFB or mesocarp fibre used for composting in year '*y*'
Source of data to be used:	Weighing-scale records
Value of data	3000 t/yr
Description of measurement methods and procedures to be applied:	The solid biomass waste will be either EFB or mesocarp fibre which will be weighed on the weigh bridge before sent to the co-composting site on trucks.
QA/QC procedures to be applied:	Weighed on calibrated scale; also cross check with historical records of biomass used. The maintenance, frequency of calibration and control procedures are established by the QA/QC team. Calibration and maintenance are carried out periodically in accordance to appropriate industry standards to ensure accuracy. Therefore the uncertainty level of the data is expected to be low. Records of calibration will be kept at site. All monitoring data will be electronically archived for a period of 2 years after crediting.
Any comment:	

Data / Parameter:	Q_{Sld}
Data unit:	m^3/yr
Description:	Quantity of sludge produced by the AVC Sludge Dewatering System used for composting in year '*y*'
Source of data to be used:	Depth-scale in the AVC units.
Value of data	15,000,000
Description of measurement methods and procedures to be applied:	The volume of dewatered sludge from the AVC containers will be measured using a depth scale before unloading the sludge. The volume of the dewatered sludge will be calculated using the known dimensions of the AVC unit and measured depth values for each load of the AVC.

QA/QC procedures to be applied:	Weighed on calibrated scale; also cross check with historical records of sludge used. The maintenance, frequency of calibration and control procedures are established by the QA/QC team. Calibration and maintenance are carried out periodically in accordance to appropriate industry standards to ensure accuracy. Therefore the uncertainty level of the data is expected to be low. Records of calibration will be kept at site. All monitoring data will be electronically archived for a period of 2 years after crediting.
Any comment:	

Data / Parameter:	$CT_{y, comp}$
Data unit:	tonnes/truck
Description:	Average truck capacity for compost distribution
Source of data to be used:	Continuously recorded
Value of data	10 (typical truck capacity at plantation)
Description of measurement methods and procedures to be applied:	The operator will record each truck's capacity used for compost distribution to plantation area.
QA/QC procedures to be applied:	Data from weighing bridge measurement can used to reconfirm the recorded data accuracy. The weighing scale is to be regularly maintained and calibrated according to ISO standards. All monitoring data will be electronically archived for a period of 2 years after crediting.
Any comment:	The scales are subject to annual calibration that will be done by the manufacturer in accordance to appropriate industry standards to ensure accuracy. Therefore the uncertainty level of the data is expected to be low. Records of calibration will be kept at site.

Data / Parameter:	DAF_{comp}
Data unit:	km/truck
Description:	Average distance traveled by truck for compost distribution
Source of data to be used:	Truck's speed/distance recording meter
Value of data	100
Description of measurement methods and procedures to be applied:	The truck driver will record the meter reading prior to trip and after the compost distribution trip to measure distance traveled by the truck for each distribution trip. A database of point of delivery and distance will be developed which can be used as a reference for calculating the project emissions from transportation.
QA/QC procedures to be applied:	Confirmation by supervisor & Bills/invoices for fuel purchased from fuel suppliers. All monitoring data will be electronically archived for a period of 2 years after crediting.
Any comment:	

Data / Parameter:	$Q_{y, diesel}$
Data unit:	litres/year

Description:	Diesel fuelled tractor attached with turner to turn the compost piles/heaps
Source of data used:	Measure volume of diesel consumed by tractor
Value of data	28,080 (Estimated)
Description of measurement methods and procedures to be applied:	Actual quantity of diesel used will be monitored from the monthly bills or invoices for diesel purchase. On site tractor operation hours will also be monitored to counter check the diesel quantity from the bills,
QA/QC procedures to be applied:	Confirmation by supervisor & Bills/invoices for diesel purchased from fuel suppliers. On site tractor operation hours will also be monitored to counter check the diesel quantity from the bills. All monitoring data will be electronically archived for a period of 2 years after crediting.
Any comment:	

Data / Parameter:	T
Data unit:	°C
Description:	The temperature of EFB-POME solids mixture in the compost windrow
Source of data to be used:	Record Sheets of temperature measurement.
Value of data	35°C - 75°C
Description of measurement methods and procedures to be applied:	A hand held meter will be used and data will be monitored daily with 1 reading per day for each windrow. The data will be recorded in a daily record sheet and kept in both soft and hardcopy at the compost plant.
QA/QC procedures to be applied:	The records will be verified daily by the compost plant manager and kept in both hardcopy and softcopy format at the compost plant. The meter will be calibrated according to manufacturer's recommendations.
Any comment:	The data sampling should be done at the middle of the windrow.

Data / Parameter:	O_2
Data unit	%
Description:	The oxygen content in EFB-POME solids mixture in the compost windrow
Source of data to be used:	Record Sheets of oxygen content measurement.
Value of data	5% - 21%
Description of measurement methods and procedures to be applied:	A hand held meter will be used and data will be monitored daily with 1 reading per batch will be taken by compost technician. The data will be recorded in a daily record sheet and kept in both soft and hardcopy at the compost plant.
QA/QC procedures to be applied:	Once the reading is below 10%, the compost windrow will be turned. The records will be verified daily by the compost plant manager and kept in both hardcopy and softcopy format at the palm oil mill. The meter will be calibrated according manufacturers recommendations.

Any comment:	

Data / Parameter:	Delivery
Data unit:	-
Description:	Sales or delivery of organic fertiliser to the application sites
Source of data to be used:	Delivery orders
Value of data	tonnes/recipient
Description of measurement methods and procedures to be applied:	Records of all delivery orders will be compiled. Delivery measured in tonnes will be summarized for each individual recipient annually. In situ verification of the proper soil application of the compost will be done at the estates to ensure aerobic conditions for further decay. Verification will be done at representative sample at delivery sites.
QA/QC procedures to be applied:	All bills or invoices of compost sale will include information about organic fertiliser end-use destination. All monitoring data will be electronically archived for a period of 2 years after crediting.
Any comment:	

Data / Parameter:	Assessment of Common Practices
Data unit:	-
Description:	To demonstrate annually through assessment of common practices at proximate palm oil mills that the POME would have been treated in an anaerobic system without methane recovery in the absence of project activity
Source of data to be used:	In-situ verification and/or based on official reports on current prevailing POME treatment practices.
Value of data	N/A
Description of measurement methods and procedures to be applied:	Verification shall be done at nearby mills or based on official data obtained.
QA/QC procedures to be applied:	All monitoring data will be electronically archived for a period of 2 years after crediting period.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

Operation of composting process

To ensure an aerobic co-composting process the EFB-POME mixture will be sampled daily for oxygen, and temperature. The measurements will be taken by the composting plant technician and kept in a log sheet, which will be verified by the compost plant manager daily. To ensure a high accuracy in measurements, all meters will be calibrated according to manufacturers' recommendation.

Soil application

The compost is sold/delivered in the neighbouring plantations to be used a fertiliser. The organic fertilizer will be applied evenly in thin layers at the palm oil plantations which will be aerobic in nature to optimise the benefits from organic fertiliser. The final compost product will be weighed before leaving the plant at the weighbridge. Refer to parameter "delivery" in the monitoring plan.

Common Practice

To demonstrate that the amount of wastewater co-composted in the project activity would have been treated in an anaerobic system without methane recovery in the absence of the project activity, the existing rules and regulations regarding the use of anaerobic ponds without methane recovery will be assessed annually. This will demonstrate if the anaerobic ponds continually would have lived up to existing legislation and thus have been used in absence of the project.

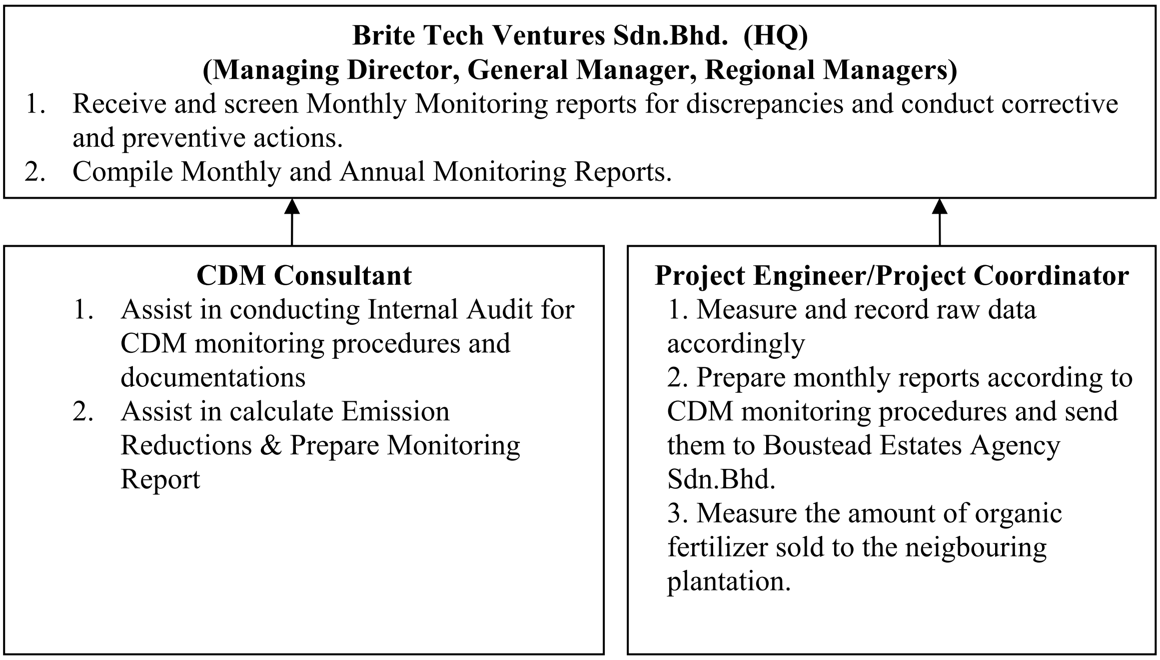
Operation and Management Structure

Brite Tech Ventures Sdn Bhd. has an operational and management structure in place to monitor emission reductions from the project activity.

Specific personnel will be assigned to be responsible for project management as well as for all the different parameters to be monitored and reported. Specifically, the following roles and responsibilities will be assigned:

Managing Director	– Financial and policy matters
General Manager	– Overall support and operation of all the CDM Projects in Malaysia
Regional Managers	– Regional Managers would be responsible for the localized CDM Projects in their area.
Project Coordinator	– Design, training, system establishment and managing the CDM project
Project Engineer	– Construction, operation and maintenance of the CDM project
Technicians/Supervisors	– Daily operations including sampling, recording of readings and filing of records.

Brite-Tech Ventures will receive and screenmonthly monitoring reports from the project site and assign a third party consultant or in-house expertise to calculate the emission reduction and prepare annual monitoring reports. All the raw data available at project site will also be available at the head quarters.



All the data will be kept for at least two years after the crediting period in both hard copy and soft copy at the Brite-Tech Ventures, Head Office in Kuala Lumpur.

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 monitoring methodology was completed on 10th October 2007 by:

Mr. Henrik Rytter Jensen
Danish Energy Management A/S
Vestre Kongevej 4-6
DK-8260 Viby J, Denmark
Tel: +45 8734 0600
Fax: +45 8734 0601
E-mail: henrik.rytter.jensen@dem.dk

Mr.Thirupathi Rao
Danish Energy Management
36th Floor, Menara Maxis
Kuala Lumpur City Centre
50088 Kuala Lumpur
Malaysia
Tel : +6 03 2615 0014
Fax : +6 03 2615 0088
E-mail : rao@dem.dk

Danish Energy Management is a CDM consultant to the Project and 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:

>>
1st July 2009 (The site construction and installation of AVC system will only begin after project registration.)

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

>>
12 years

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

C.2.1. Renewable crediting period

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:

C.2.2.1. Starting date:

>>
1st August 2009.

The project starting is determined by the expected registration date of the project. As the project will start physical implementation when CDM registration is completed, it is expected that the project will be operational about 1½ month after registration.

C.2.2.2. Length:

>>
10 years

SECTION D. Environmental impacts

>>

The co-composting system is a controlled process with no hazardous effluent or other adverse effects from the composting process. The co-composting system ensures that no POME is treated in conventional anaerobic system or discharged directly into the river, i.e. no methane is generated and released into the atmosphere. The risk of air and water contamination from POME is minimised in comparison to the baseline POME treatment method.

The project is aimed at reducing the methane emission from the anaerobic digestion of POME by avoiding the current anaerobic wastewater treatment method. Instead, the organic components in the liquid wastewater will be removed with the help of flocculation agent in the form of insoluble organic solids (highly concentrated POME solids) through a dewatering process using an “AVC” technology. Flocculent is added to increase the efficiency of the sedimentation in the container. The flocculent is environmentally friendly, consisting organic compounds without any heavy metal content. The flocculent is a type of polyacrylamide polymer; and vastly used in drinking water treatment plants in Malaysia. The flocculation agent is has insignificant impact to the soil.

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

>>

The Malaysian Authorities do not require an Environmental Impact Analysis for this project activity and the environmental impacts are considered insignificant. The project complies with all regulations related to establishment and operation of composting sites and solid waste and wastewater treatment.

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:

>>

Not applicable.

SECTION E. Stakeholders' comments

>>
This project activity is within the existing boundary of palm oil mill land. As mentioned in the previous section the environmental impact of the project is insignificant and it improves the water and air quality in the surrounding environment. Thus the project has minimal involvement from the local stakeholders.

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

>>
The management of Brite-Tech Ventures Sdn.Bhd. invited local stakeholders for a presentation on the CDM co-composting project and to receive comments. An advertisement was placed in two local newspapers "News Straits Times" and "Berita Harian" on 11th May 2007, which was approximately 2 weeks before the stakeholder's consultation meeting to provide sufficient time for the related parties to attend the meeting.

The meeting was held in Royal Palm Hotel, Lahad Datu, Sabah on 5th June 2007 from 9.00a.m to 11.00am. The meeting started at 9.30 a.m. with a welcoming speech by the mill manager, followed by a presentation on CDM and the project activity by the CDM consultant and project developer. Below is the list of parties attended the meeting and the site visit.

No:	Department/Organization	No of Representatives
1	Jabatan Tenaga Kerja, Lahad Datu, Sabah	1
2	Kwantas Oil Sdn Bhd	4
3	Brite-Tech Ventures Sdn Bhd	2
4	Millivest Sdn. Bhd.	4
5	Jabatan Kerja Raya, Lahad Datu, Sabah	1
6	Jabatan Kastam Di-raja, Lahad Datu, Sabah	2
7	Jabatan Bomba & Penyelamatan, Lahad Datu, Sabah	1
8	Sg. Tenegang Plantation, Lahad Datu, Sabah	1
9	Local Resident Representative, Kg. Paris 3, Lahad Datu, Sabah	3
10	Kilang Sg. Tenegang, TH Plantation, Lahad Datu, Sabah	1
11	CDM Consultant, Danish Energy Management, K.L	1
12	Aquakimia Sdn Bhd, K.L.	4
13	Brite-Tech (S) Sdn. Bhd.	1
	Total	**26**

E.2. Summary of the comments received:

>>
There were a number of comments received from the stakeholders attended the meeting. Below are the summary of the comments received presented in a table format.

ID	Questions / Comments	Name & Organization

1	Where is the system being installed at present and at what cost?	Mr.Isa Mat, Kilang Sg. Tenegang, TH Plantation
2	Where is the suction point to the AVC system and how is the process?	Hj. Jhonny Anwar, Sg. Tenegang Plantation
3	Please elaborate more how the system work to reduce the GHG?	Mr. Jaya Rabeka, Jabatan Kerja Raya
4	Is the AVC system suitable for Sewage Treatment?	
5	Is this process based on filtration principal? One unit AVC is it sufficient for processing all the effluent from the mill?	Mr.Isa Mat, Kilang Sg. Tenegang, TH Plantation
6	How long to fill up one unit of AVC system? How long the solid can be dewatered in the AVC system and sent to composting plant?	Hj. Jhonny Anwar, Sg. Tenegang Plantation
7	What is the solid content in the sludge?	
8	What is the N.P.K. value of the composted solid?	
9	This CDM project is help to save our river and our environment. We appreciate for the project.	Hj. Andi Kandas, Local resident representative
10	Other CDM project - Biogas system can generate extra income to the Palm Oil Mill.	Hj. Jhonny Anwar, Sg. Tenegang Plantation
11	Can the AVC system combined with the Bio-gas project?	
12	Please look into the safety and health requirement when implementing the project.	Mr. Sino, Jabatan Bomba & Penyelematan
13	Is there any methane gas coming out when composting the dewatered solid?	Mr. Jaya Rabeka, Jabatan Kerja Raya

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

>>

ID	Answers
1	No installation yet at the moment. But we have done a year test at one of the Palm Oil Mill in Perak, Malaysia using the AVC system and achieved very good results. We are now in the process of preparing the PDD for registration to UNFCCC. Upon successful registration, we will start the project at the mills soon. The project investment cost is borne by Danish government and the mills are not required to pay any cost.
2	Normally, we will start from 1st Anaerobic pond after the cooling pond. The flocculation process will only work optimally at < 50 degree C. The flocculant, polymer will be dosed inline when the POME from the 1st Anaerobic pond is being pumped to the AVC system. The flocculated solids will be trapped inside the AVC container while the reject water will gravitate out from the system. The facultative and aerobic ponds are still remained to further treat the reject water to meet the DOE discharge limit.
3	One of the GHGs, methane is generated from the anaerobic ponds in the palm oil mill. In this CDM project, we are using the AVC system to replace the anaerobic ponds to avoid the methane formation. This will help to reduce the GHG emission to environment.
4	Yes, the AVC system can be used in Sewage Treatment Plant. We have an actual

	working plant located at Kuala Lumpur to dewater the septic tanker sludge.
5	Yes, it is a filtration process. The number of AVC unit required is highly depends on the production capacity of the mill. For example, a 45MT FFB/hr mill may need about 4 – 6 units of AVC to fully process the effluent generated from the production.
6	To fill up one unit of AVC may take about 2-3 hours. After that, the dewatering process may take another 3-4 hours. To compost the dewatered solid may take about 3 – 4 weeks time.
7	The AVC dewatered solid is about 20 – 25% dried solid contents.
8	The NPK value is more applicable to the inorganic fertilizer. For the compost, it contains a lot of humus & microorganism which can enrich the plantation soil as well as act as vitamin for the palm tree.
9	Comment noted.
10	Comment noted. The Biogas project using the membrane cover for the anaerobic ponds is mainly on trapping the methane gas but our system is avoiding the methane generation. No improvement on the treated water quality (BOD, COD & S.S.) and pond silting problems still remained with the Biogas project.
11	No. If using of our AVC system, no methane gas will be generated; so there will be no source for the biogas.
12	Comment noted.
13	No, composting process is an aerobic process.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project Owner :

Organization:	Brite Tech Ventures Sdn. Bhd
Street/P.O.Box:	Lot 14 (PT 5015), Jalan Pendamar 27/90, Seksyen 27
Building:	
City:	Shah Alam
State/Region:	Selangor Darul Ehsan
Postfix/ZIP:	40400
Country:	Malaysia
Telephone:	603-56332688
FAX:	603-56365948
E-Mail:	akimia@streamyx.com
URL:	www.aquakimia.com.my
Represented by:	
Title:	Mr.
Salutation:	
Last Name:	Chow
Middle Name:	
First Name:	B. P.
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

CER Buyer :

Organization:	Danish Ministry for Climate and Energy
Street/P.O.Box:	Amaliegade 44
Building:	
City:	Copenhagen K
State/Region:	
Postfix/ZIP:	DK 1256
Country:	Denmark
Telephone:	+45 33 92 67 00
FAX:	+45 33 11 47 43
E-Mail:	ens@ens.dk
URL:	
Represented by:	
Title:	Counsellor
Salutation:	Mr.
Last Name:	Bo Monsted
Middle Name:	
First Name:	
Department:	Embassy of Denmark, 22nd floor Wisma Denmark, 86 Jalan Ampang, 50450 Kuala Lumpur, Malaysia
Mobile:	
Direct FAX:	+603 20322015
Direct tel:	+60320322001
Personal E-Mail:	bomons@um.dk

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for this project activity.

Annex 3

BASELINE INFORMATION

Baseline Emissions

Step 0: Estimation of volume of POME:

A	B*	C= A x B
tFFB/yr	POME factor (m^3/tFFB)	Q_{ww} (m^3/yr)
250,000	0.6	150,000

*Average value of tonnes of FFB processed per year is obtained from the palm oil mill
**Refer to section B.4 on the key parameters and assumption table.

Volume of POME was based on project proponent conservative assumption. Actual volume may vary according to the tones of fresh fruit bunches processed.

Step 1: Baseline Emissions from POME

	A*	B**	C	D	E	F= A x B x C x D x E /1000
Year	Q_{ww} (m^3)	$COD_{ww,untreated}$ (kgCOD/m^3)	$B_{o,ww}$ (kgCH_4/kgCOD)	$MCF_{ww,treatment}$	GWP_CH_4	MEP_{ww} = BE
1	150,000	50	0.21	0.8	21	26,460
2	150,000	50	0.21	0.8	21	26,460
3	150,000	50	0.21	0.8	21	26,460
4	150,000	50	0.21	0.8	21	26,460
5	150,000	50	0.21	0.8	21	26,460
6	150,000	50	0.21	0.8	21	26,460
7	150,000	50	0.21	0.8	21	26,460
8	150,000	50	0.21	0.8	21	26,460
9	150,000	50	0.21	0.8	21	26,460
10	150,000	50	0.21	0.8	21	26,460

*Volume of POME was based on project proponent conservative assumption. Actual volume may vary according to the tones of fresh fruit bunches processed.
** Project Proponent Estimation; please refer to section B.4 on the key parameters and assumptions table

Project Emissions

STEP 1 : Project Emission From Transportation of Compost

Year	A	B	C	D	E = A/B x C x D
	Q_{comp}, Quantity of Compost tonnes	CT_{comp}, Average Truck Capacity tonnes/truck	DAF_{comp}, Average Incremental Distance km/truck	EF_{CO2} t CO_2 /km	$PE_{transp-compost}$ t CO_{2e}
1	4,800	10	100	0.0009	43
2	4,800	10	100	0.0009	43
3	4,800	10	100	0.0009	43
4	4,800	10	100	0.0009	43
5	4,800	10	100	0.0009	43
6	4,800	10	100	0.0009	43
7	4,800	10	100	0.0009	43
8	4,800	10	100	0.0009	43
9	4,800	10	100	0.0009	43
10	4,800	10	100	0.0009	43

STEP 2: Project Emissions from Diesel Consumption

Year	A*	B**	C	D	E = A x B x C x D / 10^6
	Q_{diesel} liters/yr	D_{diesel} kg/liter	NCV_{diesel} TJ/Gg	EF_{diesel} t CO_2/TJ	PE_{diesel} t CO_2/yr
1	28,080	0.85	43.3	74.8	77
2	28,080	0.85	43.3	74.8	77
3	28,080	0.85	43.3	74.8	77
4	28,080	0.85	43.3	74.8	77
5	28,080	0.85	43.3	74.8	77
6	28,080	0.85	43.3	74.8	77
7	28,080	0.85	43.3	74.8	77
8	28,080	0.85	43.3	74.8	77
9	28,080	0.85	43.3	74.8	77
10	28,080	0.85	43.3	74.8	77

*Based on project proponents assumption. Actual data will be measured during the crediting period

**Caltex Malaysia

Step 3:Project Emissions from Run-Off Water

Year	A	B	C	D	E	F= A x B x C x D x E/1000
	$Q_{ww,run-off}$ (m^3)	$COD_{run-off}$ (kgCOD/m3)	Bo ($kgCH_4$/kgCOD)	$MCF_{run-off}$	GWP_CH_4	$PE_{run-off}$
1	163,000	10.0	0.21	0.1	21	719
2	163,000	10.0	0.21	0.1	21	719
3	163,000	10.0	0.21	0.1	21	719
4	163,000	10.0	0.21	0.1	21	719
5	163,000	10.0	0.21	0.1	21	719
6	163,000	10.0	0.21	0.1	21	719
7	163,000	10.0	0.21	0.1	21	719
8	163,000	10.0	0.21	0.1	21	719
9	163,000	10.0	0.21	0.1	21	719
10	163,000	10.0	0.21	0.1	21	719

Step 4: Total Project Emissions

Year	**A**	**B**	**C**	**D = A + B + C**
	PE_{transp} tCO_{2e}	**PE_{power} tCO_{2e}**	**$PE_{run-off}$ tCO_{2e}**	**PE tCO_{2e}**
1	43	77	719	839
2	43	77	719	839
3	43	77	719	839
4	43	77	719	839
5	43	77	719	839
6	43	77	719	839
7	43	77	719	839
8	43	77	719	839
9	43	77	719	839
10	43	77	719	839

Annex 4

MONITORING INFORMATION

Monitoring & Quality Assurance Information Table

No	Parameter	Symbol	Unit	Recording Frequency	Data; measured [m], calculated [c],	Location	Method	Person Recording/ Calculating / Compiling Data	Person Verifiying Data	Used For CER Calculation [CER] or Quality Assurance [QA]
1	Quantity of POME	$Q_{y,ww}$	m^3	daily	M	Flow meter at the outlet of cooling ponds	Totaliser reading from a flow meter.	Compost Technicians	Project Engineer/Coordinator	CER
2	Quantity of run-off water	$Q_{ww,,run-off\_}$	m^3/month	daily	M	Flow meter at the the outlet of collection pit	Totaliser reading from a flow meter.	Compost Technicians	Project Engineer/Coordinator	CER
4	COD of POME	$COD_{y,ww\ untreated}$	kg COD/ m^3	monthly	M	Project Proponent Laboratory, Accredited Laboratory	Lab Analysis	Compost Technicians	Project Engineer/Coordinator	CER
5	COD of run-off water	$COD_{ww,\ run-off\_}$	kg COD/ m^3	weekly	M	Project Proponent Laboratory, Accredited Laboratory	Lab Analysis	Compost Technicians	Project Engineer/Coordinator	CER

No	Parameter	Symbol	Unit	Recording Frequency	Data; measured [m], calculated [c],	Location	Method	Person Recording/ Calculating / Compiling Data	Person Verifiying Data	Used For CER Calculation [CER] or Quality Assurance [QA]
6	Quantity of compost	$Q_{y,comp}$	tonnes	monthly	m & c	Respective Palm Oil Mill	Weigh Bridge measuring tonnes of compost produced	Compost Technicians	Project Engineer/Coordinator	CER
7	Truck capacity distribution	$CT_{y, compost}$	Tones/truck	daily	m & c	Respective Palm Oil Mill	Record truck's capacity	Compost Technicians	Project Engineer/Coordinator	CER
8	Distance traveled by truck	DAF_{comp}	km/truck	daily	m & c	Respective Palm Oil Mill	Record truck's capacity	Compost Technicians	Project Engineer/Coordinator	CER
9	Diesel Consumption	Q_{diesel}	Liters/year	monthly	m	Diesel pump station at the composting plant	Diesel Consumption obtained from diesel purchase invoices	Compost Technicians	Project Engineer/Coordinator	CER
10	Windrow Temperature,	T	°C	before & after turning of windrows	m	Compost Windrows	Temperature Probe	Compost Technicians	Project Engineer/Coordinator	QA

No	Parameter	Symbol	Unit	Recording Frequency	Data; measured [m], calculated [c],	Location	Method	Person Recording/ Calculating / Compiling Data	Person Verifiying Data	Used For CER Calculation [CER] or Quality Assurance [QA]
11	Oxygen Content,	O_2	%	before & after turning of windrows	m	Compost Windrows	Oxygen Probe	Compost Technicians	Project Engineer/Coordinator	QA
12	Delivery	Q_{sales}	Tones/recipient	daily	m	Compost Plant/Office	Invoices	Compost Technicians	Project Engineer/Coordinator	QA
13	Quantity of Biomass used for co-composting	Q_{Bio}	tonnes	Every truck load of EFB or fibres to the compost site	m & c	Respective Palm Oil Mill	Weigh Bridge measuring tonnes of compost produced	Compost Technicians	Project Engineer/Coordinator	QA
14	Quantity of Sludge used for co-composting	Q_{Sld}	m^3	Every loading of AVC units	m & c	Respective Palm Oil Mill	Depth Measuring scale in the AVC	Compost Technicians	Project Engineer/Coordinator	QA
15	Assessment of Common Practice	-	-	Annual	c	Proximate Palm Oil Mills	In-Situ Verification	Compost Technicians	Project Engineer/Coordinator	QA

Annex 5
FINANCIAL ANALYSIS

AVC Co-Composting Project IRR Analysis

Without CDM

Year	0	1	2	3	4	5	6	7	8	9	10	11	12
Cash Inflow													
Compost Sales		720,000	747,360	775,760	805,239	835,838	867,599	900,568	934,790	970,312	1,007,184	1,045,457	1,085,184
Residual Value		-	-	-	-	-	-	-	-	-	-	-	110,000
Total Inflow		**720,000**	**747,360**	**775,760**	**805,239**	**835,838**	**867,599**	**900,568**	**934,790**	**970,312**	**1,007,184**	**1,045,457**	**1,085,184**
Cash Outflow													
Capital Cost	4,220,000	-	-	-	-	-							
Total O&M Cost	-	1,008,000	1,046,304	1,086,064	1,127,334	1,170,173	1,214,639	1,260,796	1,308,706	1,358,437	1,410,057	1,463,639	1,519,258
Total Outflow	**4,220,000**	**1,008,000**	**1,046,304**	**1,086,064**	**1,127,334**	**1,170,173**	**1,214,639**	**1,260,796**	**1,308,706**	**1,358,437**	**1,410,057**	**1,463,639**	**1,519,258**
Net Cashflow (Without CDM)	**(4,220,000)**	**(288,000)**	**(298,944)**	**(310,304)**	**(322,095)**	**(334,335)**	**(347,040)**	**(360,227)**	**(373,916)**	**(388,125)**	**(402,873)**	**(418,183)**	**(434,074)**

Compost Generated Annualy	4800	tonnes/yr
Compost Price	150	RM/tonne
Inflation Rate	3.8%	
NPV	(6,684,304)	RM
Project IRR (Without CDM)	**#DIV/0!**	

Year	RM/CER	0	1	2	3	4	5	6	7	8	9	10	11	12
CER's	**37.45**		26000	26000	26000	26000	26000	26000	26000	26,000	26,000	26000	0	0
Income From CDM			973,650	973,650	973,650	973,650	973,650	973,650	973,650	973,650	973,650	973,650	-	-
Net Cashflow (Without CDM)		(4,220,000)	(288,000)	(298,944)	(310,304)	(322,095)	(334,335)	(347,040)	(360,227)	(373,916)	(388,125)	(402,873)	(418,183)	(434,074)
Net Cashflow (With CDM)		**(4,220,000)**	**685,650**	**674,706**	**663,346**	**651,554**	**639,315**	**626,610**	**613,422**	**599,734**	**585,525**	**570,776**	**(418,183)**	**(434,074)**

Project IRR (With CDM)	**6.2%**	
NPV	**(0)**	
Exchange Rate	4.8	RM/EUR
Required CER Price (EUR/CER)	**7.8**	**EUR/CER**