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:

Methane Emissions Control by Composting Wastes from Palm Mill in Malaysia
Version 1.0
Date:7 March 2008

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

The project objective is the realisation of a composting plant for biomass residues derived from palm oil mills and avoidance of methane emissions from anaerobic decomposition of biomass –organic waste and bio-solids –through controlled aerobic decomposition. The aerated composting process will avoid methane emissions and also result in compost as a product that can be utilized as a soil conditioner in the palm plantation, agriculture, horticulture, land rehabilitation and landscaping.

The project will treat biomass residues derived from palm oil mills which co-composts empty fruit bunches(EFB), POME slurry from decanters as well as POME in advance of land irrigation into the palm plantation. The decanter system is a special technology for the removal of water contents and solids involved in the crude palm oil stream.

In addition to the treatment of the biomass residues, the project is to reduce the GHG emissions from anaerobic digestion of POME in the open lagoons (ponds) by applying a part of POME onto the windrows of EFB in an aerobic co-composting technology.
In order to keep the humidity in the windrows, POME is sprayed onto the windrows so that the microbes would be active in the windrows, which results in high temperature in the windrows. Then the moisture in the windrows is vaporized and reduced during co-composting process.

The aeration in the windrows will be timely and aerobically exposed to a large amount of air for control of the oxygen level adequate for microbes action by a mechanical turner.

This system will reduce both methane generation from dump sites of EFB in the palm plantation and water pollution problem in the river due to the discharge of POME in the baseline scenario.

On the other hand, the application of the compost product will reduce the negative environmental impact of POME in term of organic matter of POME and EFB disposal stockpiles in the plantation. In addition, it will also reduce the use of chemical fertilizers by 5 to 10%.

Finally, the project will lead to a sustainable palm industry through reducing the pollution by greenhouse gas and polluted materials from palm oil mills, and the improvement of soil condition by the application of compost product as an organic fertilizer.

The project fulfils the development policies of the 3rd Outlook Perspective Plan Malaysian(OPP3), stated under item 7.69 on page 187.
"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 environmental 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 wastes. The industrial sector will be encouraged to adopt cleaner technology production."

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: Borneo Samudera Sdn.Bhd. (Subsidiary company of Sawit Kinabalu Berherd)	No
Japan	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 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:

The project location is shown in the Map below.

A.4.1.1. Host Party(ies):

Malaysia

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

Sabah State / Malaysia

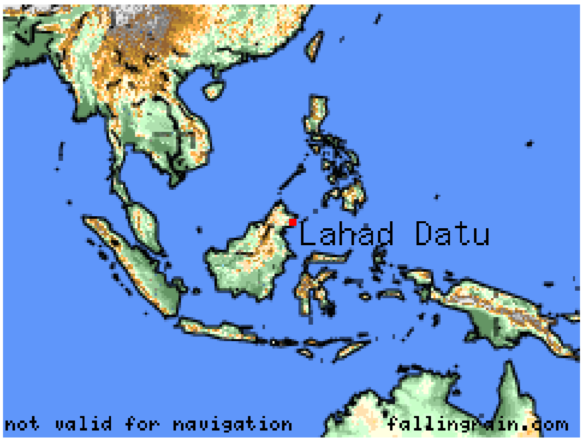
A.4.1.3. City/Town/Community etc:

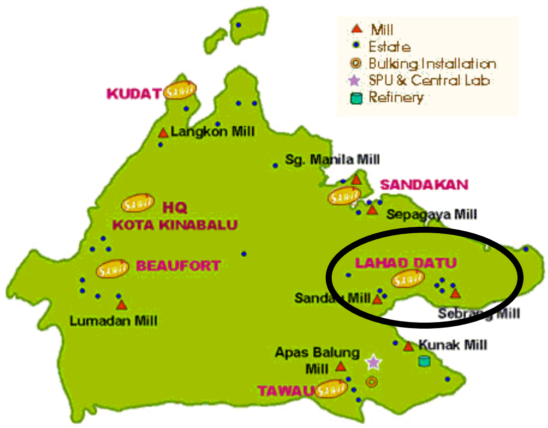
Lahad Datu City / Sabah State /Malaysia

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

The project will be implemented in Sebrang Palm Oil Mill operated by Borneo Samudera Sdn.Bhd., the subsidiary company of Sawit Kinabalu Bhd. whose head office is in Kota Kinabalu.

The mill is located about 60km east from Lahad Datu Airport.
Lahad Datu is basically a planters' town surrounded by miles of cocoa and oil palm plantations.
It is a 40 minutes flight from Kota Kinabalu. The mill is located about 1 hour from Lahad Datu Airport and 2 hours from Sandakan by road.





Map 1. Project location

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

Type and category(ies) of the small-scale project activity

TypeIII- Other Project Activities
Category III.F. - Avoidance of methane production from the decay of biomass through composting, Version 05, 10 Aug 07

This is a project for co-composting project which avoid the production of methane from the biomass waste (EFB) that would otherwise have been left to decay anaerobically without methane recovery and the wastewater(POME) that would otherwise have been treated in an anaerobic wastewater treatment system without methane recovery.

The project is not a project to create renewable energy or realize energy efficiency but rather a project that can reduce emissions less than 60 kt CO_2 equivalent annually. Therefore, according to small-scale CDM modalities, the project activity falls under Type - III Other project activities, and category III-F - - Avoidance of methane production from decay of biomass through composting.

Technology of the small-scale project activity

The project activity modifies the conventional process of managing the palm oil mills residues and wastes like EFB and POME including POME sludge.

The process flow chart (fig.1) shows the BAU (business as usual) process to treat EFB and POME. POME is treated in the open lagoons (ponds) such as the cooling ponds, anaerobic ponds and aerobic ponds before being discharged into the river. EFB are dumped into the palm plantation without methane recovery.

The process flow chart (fig.2) shows the project scenario. The POME discharged from the tertiary anaerobic pond is used in the project activity. In addition to POME, POME sludge from the decanters will be mixed with EFB for co-composting. The methane emitted from the organic level of POME and POME sludge used for co-composting will be eliminated by the aerobic treatment in the windrows of the stockpiles in the project activity without methane recovery. Furthermore the methane emissions from the dumpsite of EFB in the palm plantation as in the baseline scenario will be eliminated by the composting project.

Though the moisture of EFB is as high as 60 to 65%, it is necessary to spray additional water onto the windrows of EFB so that adequate moisture would be maintained for generating microbe action in the windrows against moisture evaporation to the atmosphere. The POME and POME sludge will be used as the sources of moisture and/or nutrients to the co-composting process.

During the co-composting process, EFB and POME sludge will be converted to active compost. The period for co-composting will be only 6 weeks. The active compost has the best quality as an organic fertilizer for mature palm plantation and is capable of replacing some portion of the inorganic chemical fertilizer.
The technology we introduce in this project is the Japanese technology which is developed in the field of livestock. Project implementation would realize technology transfer from Japan to Malaysia.

It has advanced features written in B.5 Step3 Sub-step3a Technological Barriers.

BAU and Project Scenario

Characteristics	BAU Scenario	Project Scenario
POME treatment	Anaerobic process: Anaerobic Open Lagoons (3 ponds in series) emitting methane to the atmosphere	Aerobic process: POME is sprayed onto EFB windrows mixed with POME slurry, and aerobically treated by mechanical turners in the composting windrows.
EFB handling	Anaerobic decayed:	Aerobic process:

	Stockpiles in the palm plantation	**Aerobic composting - to be applied into the palm plantation as an active organic fertilizer which would reduce some portion (5 to 10%) of inorganic chemical fertilizers.**

Fig 1.Flowchart of the BAU Scenario:

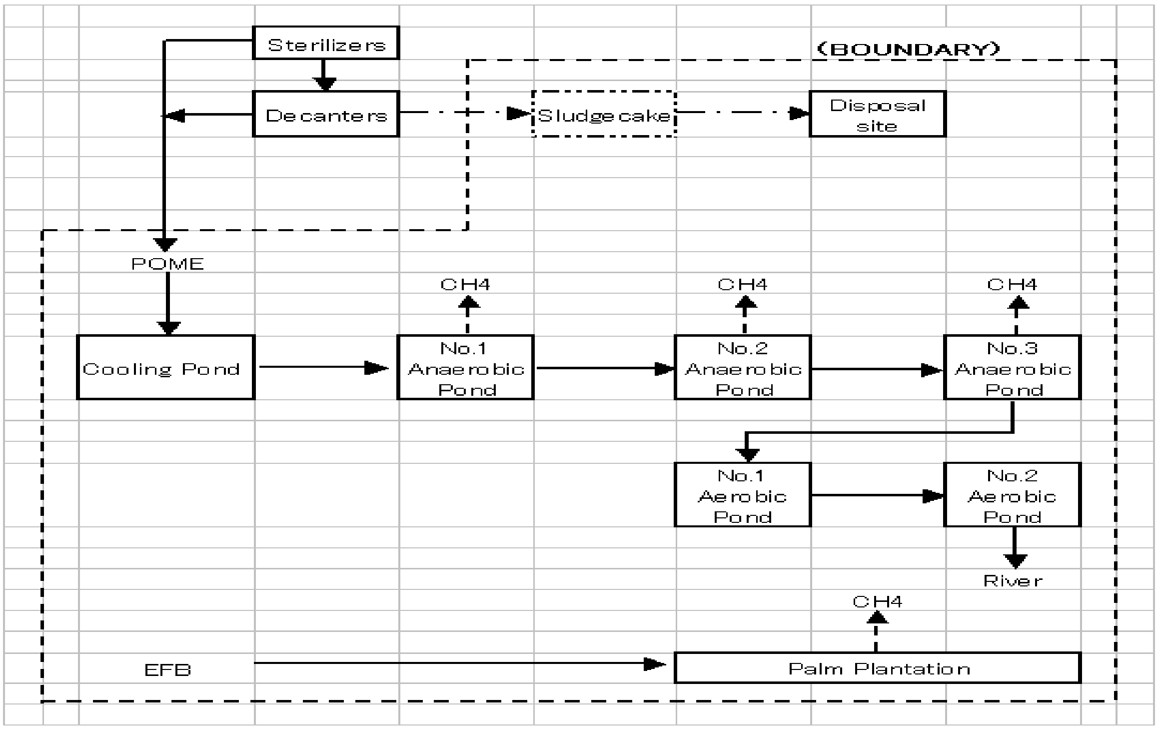
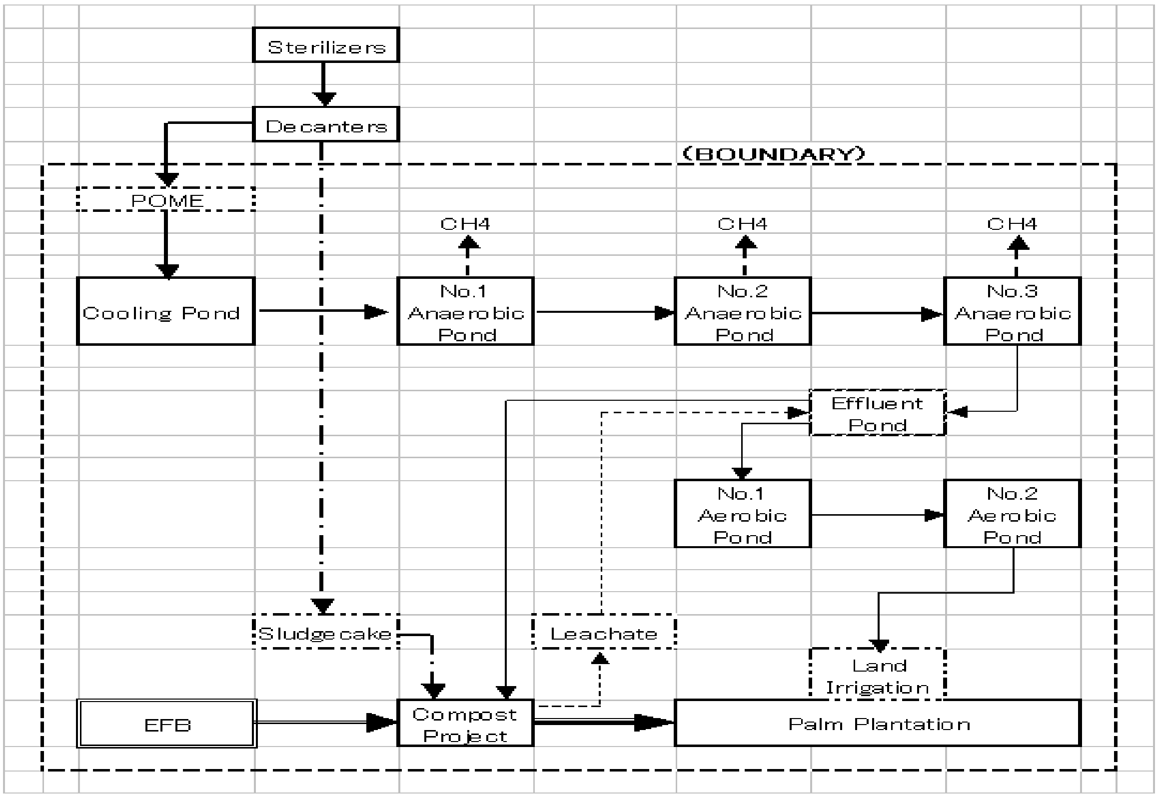


Fig 2. Flowchart of the Project Scenario:



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

The estimation of the emission reductions during the first crediting period is provided in Table A.1. Total estimated emission reductions in the first crediting period are 279,406 tCO_2e.

Table A.1 Estimation of the Emission Reductions in the First Crediting Period

Years	Estimation of annual emission reductions in tones of CO2e
2009	36,568
2010	37,692
2011	38,778
2012	39,826
2013	40,838
2014	41,815
2015	42,759
Total estimated reductions (tones of CO2e)	278,277
Total number of crediting years	7
Annual average of the estimated reductions over the crediting period	39,754

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

There is no public funding from Annex I countries available for the project.

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

According to Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities, a proposed small-scale project activity cannot be deemed to be a debundled component of a large project activity because, at the moment of registration of the project proposal, there is a 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:

Title of the approved baseline methodology and monitoring methodology:
"Avoidance of methane production from the decay of biomass through composting." AMS Ⅲ. F./Version 5, of the Indicative Simplified Baseline and Monitoring Methodologies for Small- Scale CDM project activities.

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

The project uses approved small-scale methodology AMS Ⅲ. F. version 5: Avoidance of methane production from the decay of biomass through composting.

The following meet the applicable requirement of the methodology above-mentioned.

(a) The project comprises measures to avoid the production of methane from biomass or organic matters that would have otherwise been left to decay anaerobically in a solid waste disposal site without methane recovery.
(b) This project is also for co-composting wastewater and solid biomass waste, where wastewater would otherwise have been treated in an anaerobic wastewater treatment system without methane recovery. The wastewater in the project scenario is used as a source of moisture and/or nutrients to the composting process e.g. composting of empty fruit bunches (EFB), a residue from palm oil production, with the addition of palm oil mill effluent (POME) and POME sludge, which is the wastewater co-produced from palm oil production.
(c) The emission reductions from the project would be less than 60 kt CO2e annually, referring to Section B.6.4.

Therefore approved methodology type Ⅲ. F. version 5 is applied for the project activity.

B.3. Description of the project boundary:

The project boundary is the physical, geographical site:

(a) where the EFB would have been disposed and the methane emission occurs in the absence of the project activity,
(b) where the co-composting POME would have been treated anaerobically in the absence of the project activity,
(c) where the treatment of EFB and POME sludge which is a part of POME through composting takes place,
(d) where the soil application of the produced compost takes place,
(e) and the itineraries between (a),(b),(c) and (d), where the transportation of POME, POME sludge and compost occurs.

In conclusion, the project boundary is delimited by the boundary of the co-composting facility, the anaerobic and aerobic lagoons (ponds) and the palm plantation (the EFB and solid waste dumping site is within the palm plantation).

See Figure 2 Flowchart of the Project Scenario:

B.4. Description of baseline and its development:

The baseline for the methane avoidance component as defined in AMSⅢF. is the situation where, in the absence of the project, EFB are left to decay within the project boundary and methane is emitted to the atmosphere in an uncontrolled manner. And methane generated from POME and POME sludge in the open anaerobic ponds is emitted to the atmosphere, too.

Since the total amount of methane emission from intended-scale mill is under 60kt/y, AMS.Ⅲ. Ｆ/ Version 5 can be applied.

Define realistic and credible alternatives to the project activity that can be the baseline scenario

<u>EFB Treatment</u>

Scenario EFB 1: EFB are used for mulching the palm plantations

At some sites, EFB are transported back to the plantations and left for mulching. However, the cost of removal and management of EFB on flat land (i.e. where bulldozers can be used to spread EFB) is on the order of RM 14/MT (approx.. USD 4/MT) or more. If the terrain does not allow for this kind of treatment, then it must be spread manually, incurring higher costs. And the layer of less than 0.5 meters is spread generally for mulching so that the area for mulching will be vast.

Further problems arise in areas where the available workforce is limited and hence limit the labor available for mulching. Therefore the area where mulching can be conducted is very limited compared to the large amount of EFB production from palm oil mills. This results in the increasing cost of labor and encourages dumping or landfilling of EFB.

Scenario EFB 2 : EFB are used as biomass fuel for power generation and/or steam generation

It is common practice that the biomass residues of palm kernel shells(PKS) and mesocarp fibers are used for their own needs of palm oil mills lately instead of diesel fuel due to the increasing price. There is no need for enflaming EFB for supplying steam and electricity for in-house use.

And the reason why EFB is not used is because EFB with high moisture of 60 to 65% has comparatively low calorific value compared to PKS and fiber.

The power would most likely have been produced by an existing or new grid connected to power stations in Sabah grid for which the contribution from CDM must be provided, since there are significant financial barriers.

Scenario EFB 3 : EFB are dumped or landfilled on site or into the palm plantation

EFB are dumped in the palm plantations or left to decay in an uncontrolled manner, which is the common practice for waste management of EFB in the absence of the project activity.

POME Treatment

Scenario POME 1: Closed digester tanks are installed to collect the generated biogas (methane) and to flare it

An alternative, which would deliver approximately the same services as the proposed activity (composting project), is to install closed digester tanks to collect the generated biogas (methane) and to flare it. However this is not a likely scenario, for there are no rules or regulations to direct palm oil mills to capture the gas and flare it. This could be another alternative CDM project if financial analysis shows positive results.

Scenario POME 2: Aerobic ponds are erected to control methane generations from anaerobic ponds in the baseline.

Another alternative is to erect aerobic ponds to control methane generation from anaerobic lagoons in the baseline. Again this is not a likely scenario as this would require an additional investment, large enough area and energy consumption for aeration etc., which could be utilized for planting palm trees rather than treating POME.

Scenario POME 3: POME is treated in the existing open lagoons (ponds)

Most of the palm oil mills in Malaysia are treating POME in open lagoons (ponds). In the absence of the project activity, the current situation will continue as this is an effective way of treating POME and there are no rules or regulations opposing anaerobic treatment and emissions of methane to the atmosphere.

Scenario POME 4: Making compost utilizing both dumped EFB and POME as humidification additive.

This is the proposed project scenario without CDM.

In terms of IRR, business feasibility of the project is negative if the ratio of the cost reduction for chemical fertilizer should be 5% of the cost for fertilizing chemical fertilizer in their own plantation without CDM credit.

On the other hand, if CDM credit is taken into consideration, this project is feasible as a business as the table below shows. Therefore this proposed project without CDM credit faces investment barrier.

Relation between CER price and IRR

CER price ($/CER)	operation period	0	8	10	12
IRR (before tax)	10yr	(—)	2.44%	6.86%	10.84%
	21yr	(—)	10.13%	13.43%	16.49%
IRR (after tax)	10yr	(—)	1.83%	5.38%	8.74%
	21yr	(—)	8.57%	11.50%	14.24%

It should be concluded, from what has been said above, that ScenarioEFB1, Scenario EFB2, Scenario POME1, Scenario POME2 and Scenario POME4 can not be baseline.

Therefore, we can identify the baseline for the methane avoidance component as defined in **AMSIIIF** as baseline of this proposed project.

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 have occurred in the absence of the project activity using the "Tool for the demonstration and assessment of additionality (version 04)", which is a step by step approach, to define the baseline scenario and the project activity.

Step 1: Identification of alternatives to the project activity consistent with mandatory laws and regulations

<u>Sub-step 1a. Define alternatives to the project activity:</u>
Identify realistic and credible alternatives available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity.

These alternatives are to include:

<u>EFB Treatment</u>
- Scenario EFB 1 : EFB is used for mulching the palm plantation
- Scenario EFB 2 : EFB is used as biomass fuel for power generation and/or steam generation
- Scenario EFB 3 : EFB is dumped or landfilled on site or in palm plantations

<u>POME Treatment</u>
- Scenario POME 1 : Closed digester tanks are installed to collect the generated biogas (methane) and to flare it
- Scenario POME 2 : Aerobic ponds are erected to avoid methane generations from anaerobic ponds in the baseline.
- Scenario POME 3 : POME is treated in the existing open lagoons (ponds)
- Scenario POME 4 : Making compost utilizing both dumped EFB and POME as humidification additive.

<u>Sub-step 1b. Consistency with mandatory laws and regulations:</u>
All the alternatives defined above are in compliance with applicable laws and regulations in Malaysia.

And as detailed in the previous section (B.4), the appropriate baseline scenario is the situation where, in the absence of the project, EFB is left to decay within the project boundary and methane is emitted to the atmosphere in an uncontrolled manner. And methane generated from POME and POME sludge in the open anaerobic ponds is emitted to the atmosphere too. But the proposed project activity is not the only alternative and the project moves to the next step.

Step 3: Barrier Analysis
The tool for the demonstration and assessment of additionality (version 04) as published in Annex 13 of the thirty-sixth meeting of the Executive Board (EB-36) provides for the selection of either Step 2: Investment Analysis or Step 3: Barrier Analysis. Project proponents selected Step 3: Barrier Analysis for the proposed project activity.

<u>Sub-step 3a Identify barriers that would prevent the implementation of the proposed CDM project activity:</u>
The following barriers are identified for the proposed project activity.

Investment barriers
The technology is considered one of the most advanced systems and specialized mechanical turners with

gentle automatic motion are required for which the investment cost is very high. According to the sample exams conducted in Japan with EFB imported from Malaysia, the technology could be applied with success. However, because of the cost, it seems to be risky for local financial institutions to invest in the project unless the project is implemented as a CDM project.

Technological Barriers
This compost project uses the advanced technology with the characteristics developed in Japan as follows:
Indoor and weather impervious type automatic linear crane turner makes 24hours continual unmanned operation possible.(one monitor is necessary)
In this technology, suction ventilation system and pneumatic ventilation system are used for compost pile for odor control such as ammonium.
According to sample exams, the ratio of carbon to nitrogen of the compost made of EFB is high (around 70%), but by adding POME, POME sludge and animal waste properly to it, the composting can keep high temperature for fermentation.
By maintaining high temperature fermentation for a long time, the quality of compost improves and around 70% of the total amount of POME will be eliminated.

No system with the technology with characteristics referred to above can be seen in Malaysia.
This system is automatic, but one monitor is necessary for operation. The monitor needs experienced hands to meet the requirements of operating the computer control of this new system, which increases the difficulty in introducing the system.

In terms of cost for installment, it is too expensive without CDM credits

Therefore the proposed project without CDM credit faces technological barriers.

Step 4: Common practice analysis

<u>Sub-step 4a. Analyze other activities similar to the proposed project activity</u>:
In Malaysia, composting systems utilizing palm waste have just started recently, and since most of them use outdoor composting system, which is inexpensive and easy, the compost pile becomes anaerobic on rainy days and working environment is bad. On the other hand, there is a case for building the same type of composting system indoors as this proposed project.

<u>Sub-step 4b. Discuss any similar options that are occurring</u>:
In the case of the same type of indoor-type composting system as this proposed project. As a rotary propelled tuner would be used in that case, the compost pile would be 1-1.5m thick and it would need a spacious area for establishing the system, which would increase the composting cost. Therefore this type of composting system can be introduced only when CDM credit is expected or there is a regular buyer of the compost.

The logic showed above can lead to the conclusion that the project activity is additional.

B.6 Emission reductions:

B.6.1. Explanation of methodological choices:

The justification of the applicable methodology has been discussed in section **B.2**.
The project uses approved small-scale methodology AMS Ⅲ. F. version 5: Avoidance of methane production from decay of biomass through composting.

The GHG emissions and their sources are based on the following methodology:

Project Activity Emissions:

Project activity emissions consist of:

(a) CO2 emissions due to incremental distances between

(i) The collection points of EFB and the composting site as compared to the baseline, The composting site is within the palm oil mill compound and there is no significant increment in distances and emissions compared to the baseline.

(ii) The collection point of POME and POME slurry, the composting site as compared to baseline POME treatment site,
The POME is transferred through the pipelines from the collection points to the composting site in the project as compared to baseline POME treatment lagoons. POME slurry is also transported through the pipelines from decanters within the palm oil mill compound to the project boundary.

(iii) The pumps for the pipelines and the conveyor system for EFB are powered by the biomass power generator system (boilers and steam turbines) by firing the biomass residues such as mesocarp fibers (Fiber) and palm kernel shells (PKS), which is considered as carbon neutral.

(iv) The EFB will be shredded into small pieces before it can be used for co-composting using an electrical shredding machine in the palm oil mill compound. The electric power is supplied by the biomass power generator system, which is also considered as carbon neutral.

(b) CO2 emissions on account of fossil diesel fuel based energy used by the project activity facilities, which will include but not limited to energy used for vehicles.
Emission factors for diesel fuel for vehicles will be calculated as described in category AMS I.D.

$$PE_y = PE_{y,transp} + PE_{y,power}$$

Where:
PEy project activity emissions in the year “y” (tones of CO2 equivalent)
PEy,trans emissions from incremental transportation in the year “y” (tones of CO2 equivalent)
PEy,power emissions from electricity or diesel consumption in the year “y” (tones of CO2 equivalent)

$$PE_{y,transp} = (Q_y/CT_y) * DAF_w * EF_{co2} + (Q_{y,comp}/CT_{y,comp}) * DAF_{comp} * EF_{co2}$$

Where:
Qy quantity of EFB for composting in the year “y” (tones/yr)
Cty average truck capacity for EFB transportation (tones/truck)

DAFw average incremental distance for EFB transportation (km/truck)
EFco2 CO_2 emission factor from fuel use due to transportation ($KgCO_2$/km, IPCC default values or local values may be used)
Qy,comp quantity of final compost product produced in the year "y" (tones/yr)
CTy,comp average truck capacity for final compost product production (tones/truck)
DAFcomp average distance for final compost product transportation (km/truck)

The compost product will be used in the palm plantation as an organic fertilizer and partly replace EFB for mulching and chemical fertilizers.

In the baseline, the whole EFB and chemical fertilizers are transported on small vehicles such as tractors and trucks to palm plantations, which results in the emissions from combustion of diesel fuel oil.
In the project activity, the compost product will be reduced to about half the volume and weight compared to the whole EFB for composting.
Further, the nutrient value is increased so that the amount of chemical fertilizers could be reduced at an estimated rate of 5 to 10%.
Emissions from trucks in the project activity for incremental wastes collections and compost delivering activities will be much reduced as compared to the baseline scenarios, but not counted as a conservative.

Therefore,

PEy,transp = 0 (tCO_2e/yr)

So that,

PEy = PEy,power

Where:
PEy,power emissions from diesel oil consumption of vehicles in the year "y" (tonnes ofCO_2 equivalent)

$$PE_{y,power} = NO_{vehicle,y} * F_{cons} * CV_{fuel} * D_{fuel} * GWP_{fuel}$$

Where:
NOvehicle,y No. of vehicles
Fcons fuel consumption per km of vehicle (ltr/km)
Cvfuel net calorific value of fuel (diesel oil: 43.33 (GJ/t): IPCC default value)
Dfuel density of fuel (diesel oil: value of 0.85 kg/ltr)
GWPfuel Global Warming Potential of fuel (74.1 ($kgCO_2e$/GJ) :IPCC default value)

Baseline

The baseline scenario is the situation where, in the absence of the project activity, EFB 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 the degradable organic carbon of the EFB with POME sludge and POME co-composted in the project activity.
The yearly Methane Generation Potential for the EFB is calculated using the first order decay model as described in category AMS Ⅲ.G.

$$BE_y = BE_{ch4,swds,y} - MD_{y,reg} * GWP\_CH4 + MEP_{y,ww} * GWP\_CH4$$

Where:

BEy The baseline emissions in the year "y"(tCO2e)

BEch4,swds,y yearly methane generation potential of EFB as an organic solid waste composted by the project during the years "x" the beginning of the project activity (x=1) up to the year "y" estimated as described in AMS Ⅲ.G.(tCO2e) No counted for a fired ash as a solid waste for co-composting as a conservative.

MDy,reg amount of methane that would have to be captured and combusted in the year "y" to comply with the prevailing regulations

MEPy,ww methane emission potential in the year "y" of POME and POME sludge originating in the baseline scenario.

GWP_CH4 GWP for CH4 (value of 21 is used)

If none of methane to be captured and combusted in the baseline scenario complies with the prevailing regulations. Then,

$$MD_{y,reg} = 0 \ (tCO2e/yr)$$

Therefore,

$$BE_y = BE_{ch4,swds,y} + MEP_{y,ww} * GWP\_CH4$$

<u>Yearly Methane Generation Potential of EFB as solid waste is estimated as described in category AMS Ⅲ.G.</u>

The estimation of methane emission potential of a solid waste disposal site (BEch4, swds, y, in tCO2e) will be undertaken using the Methodological tool " ***Tool to determine methane emissions avoided from dumping waste at a solid disposal site***", found on the CDM website.

The amount of methane produced in the year "y" (BEch4, swds, y) is calculated as follows:

$$BE_{ch4,swds,y} = \phi \cdot (1-f) \cdot GWP_{ch4} \cdot (1-OX) \cdot 16/12 \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot (1-e^{-k_j})$$

Where:

Φ Model correction factor to account for model uncertainties (0.9)

f Fraction of methane captured at the SWDS and flared, combusted, or used in another manner

GWPch4 Global Warming Potential (GWP) of methane

<u>Methane emission potential of co-composted POME slurry and POME are estimated as described in category AMS Ⅲ.H. respectively:</u>

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

Where:

Qy,ww volume of the POME slurry (**Qy,ww,sl**) and POME (**Qy,ww,po**) co-composted in the year "y" (m^3)

CODy,ww,untreated chemical oxygen demand of the POME slurry(**CODy,ww,sl**) and POME (**CODy,ww,po**) in the year "y" (tones/m^3)

Bo, ww methane producing capacity for the POME slurry and/or POME (IPCC default value for domestic waste water of 0.21 kg CH4/kg.COD)

MCFww,treatment methane correction factor for the POME treatment system in the baseline scenario (value of 1.0, MCF higher value as per table Ⅲ.H.1)

Leakage

The composting technology and machinery for the project activity are not to be transferred from another activity or no existing equipment is to be transferred to another activity. That way, no leakage could take place.

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

Data / Parameter:	**ϕ**
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	Oonk et el. (1994) have validated several landfill gas models based on 17 realized landfill gas projects. The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the models.

Data / Parameter:	**f**
Data unit:	-
Description:	The fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data used:	Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	The landfill sites where the EFB had been dumped are unmanaged and not covered by any oxidation covering material.
Any comment:	

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: EFB)
Source of data used:	A site visit of the solid waste disposal site in order to assess the type of cover of the solid waste disposal site. The IPCC 2006 Guidelines for National Greenhouse Gas Inventories is applied for the choice of the value.
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	The dumpsite is not managed and thus not covered with oxidizing materials.
Any comment:	

Data / Parameter:	**F**
Data unit:	-
Description:	The fraction of methane in the SWDS gas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	The IPCC default value is generally accepted as a reasonable number.
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade or degrades very slowly under anaerobic conditions. A default value of 0.5 is recommended by IPCC.

Data / Parameter:	**DOCf**
Data unit:	-
Description:	The fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value of 0.5 is applied as a conservative.
Any comment:	

Data / Parameter:	**MCF**
Data unit:	-
Description:	Methane correction factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories

Value applied:	0.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	The IPCC default value is generally accepted as a reasonable number. Default value for unmanaged-shallow solid waste disposal sites less than 5 meters will be 0.4 as a conservative figure.
Any comment:	

Data / Parameter:	**DOCj (% dry waste)**
Data unit:	-
Description:	The fraction of degradable organic carbon (by dry weight) in the waste :EFB
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value applied:	50% (dry weight)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Applying the following values for the different waste types j: (see table below) In case of empty fruit bunches, as their characteristics are similar to wood in term of cellulose, hemi-cellulose, and lignin content, the parameters correspondent of
Any comment:	

Waste type j	**DOCj (%wet waste)**	**DOCj (% dry waste)**
Wood and wood products	43	50
Pulp, paper and card board (other than sludge)	40	44
Food, food waste, beverages and tobacco (other than sludge)	15	38
Textiles	24	30
Garden, yard and park waste	20	49
Glass, plastic, metal, other inert waste	0	0

Data / Parameter:	**k**
Data Unit:	-
Description:	Decay rate for EFB
Source of data used:	IPCC 2006 Guidelines for National GHG Inventories (adapted from Volume 5, Table 3.3)
Value applied:	0.035
Justification of the choice of data or description of measurement methods and procedures actually applied :	(see table below)

Waste type j	**Boreal and Temperate (MAT<20°C)**		**Tropical (MAT>20°C)**	
	Dry (MAP/PET<1)	**Wet (MAP/PET>1)**	**Dry (MAP<1000mm)**	**Wet (MAP>1000mm)**

	Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07
		Wood, wood products and straw	0.02	0.03	0.025	0.035
	Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.05	0.1	0.065	0.17
	Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.06	0.185	0.085	0.4
	NB:MAT – mean annual temperature, MAP- mean annual precipitation If a waste type, prevented from disposal by the proposed CDM project activity, can not clearly be attributed to one of the waste types in the table above, project participants should choose among the waste types that have similar characteristics of that waste type where the values of DOCj and kj result in a conservative estimate (lowest emissions),or request a revision of / deviation from this methodology.					
Any comment	Malaysia clearly qualifies as tropical, moist and wet. The mean annual temperature is around 26 degrees centigrade and the mean annual precipitation is 2000-4000 mm depending on location, both above the benchmarks of MAT of 20 degrees ℃ and MAP of 1000 mm. In the case of empty fruit bunches, as their characteristics are similar to wood in term of cellulose, hemi-cellulose, and lignin content, the parameters correspondent of wood should be used.					

B.6.3 Ex-ante calculation of emission reductions:

As described in section B.6.1, the emission reductions are calculated according to methodology AMS Ⅲ.F. “Avoidance of methane production from decay of biomass through composting”. The ex-ante calculation of reductions is conducted through the following steps:

Baseline emissions

The following types of baseline emissions will be included under this methodology.

(a) Methane (CH4) emissions from POME sludge and POME mixed with each other in anaerobic lagoons or open ponds and/or tanks;
(b) Methane (CH4) emissions from decay of bioorganic solid wastes (EFB) in disposal sites;
(c) CO2 emissions from transporting organic wastewater (POME sludge and POME) and organic solid waste such as EFB;
(d) CO2 emissions from fossil fuels used for energy requirements and
(e) CO2 emissions from grid electricity consumption.

Baseline Assumptions:

1. COD concentration of POME slurry discharged from the palm oil mill is assumed to be at an average of 63 (kgCOD/m^3) and after anaerobic/aerobic POME treatment the BOD concentration would be less than 100 mg/L.
2. COD concentration of POME from the tertiary anaerobic lagoon is assumed an average of 2 (kgCOD/m^3) , and after anaerobic/aerobic POME treatment the BOD concentration would be less than 100 mg/L.
3. The amount of the leachate is assumed to be as little as 0.1% of the POME. It will flow back to the effluent pond and be mixed with POME there, and then return to the composting bay. Nothing is counted as a conservative.
4. The average amount of FFB processed by the Sebrang palm oil mill is estimated to be based on the capacity of 90 tons per hour. The palm oil mill is scheduled to be generally operated for 16 hours a day and 300days annually.
5. The amount of POME generated is 0.6 m^3/ton-FFB.
6. The average amount of EFB generated is 0.23 tons / ton-FFB.
7. All electricity for requirement within the boundary will be supplied by the biomass power generation units by firing fiber and a part of palm kernel shells within the palm oil mill compound, which is considered as carbon neutral.

The baseline scenario is the situation where, in the absence of the project activity, EFB and other organic matters are left to decay within the project boundary and methane is emitted to the atmosphere.
And the baseline emissions will also include methane emissions generated from POME slurry and POME co-composted in the project activity.

BEy = BEch4,swds,y + MEPy,ww ＊GWP_CH4

The yearly Methane Generation Potential for EFB and POME slurry as well as POME for co-composting is calculated by using the first order decay model as described in category AMS Ⅲ.G.

The POME sludge from the decanter system is used without exception for co-composting in the project activity. The POME slurry is estimated as 145kg per hour in operation. And the POME discharged from the anaerobic lagoons is estimated to be 0.6 ton per ton of FFB, the fraction of which is used as much as 70% of the POME for co-composting.

Ex-ante estimation of baseline emissions is shown in Table B 6.1

	BEch4,swds,y (From decay of EFB) (tCO2e/y)	MEPy,ww (From POME and POME sludge) (tCO2e/y)	BEy (tCO2e/y)
2009	1,164	35,480	36,644
2010	2,288	35,480	37,768
2011	3,374	35,480	38,854
2012	4,422	35,480	39,902
2013	5,434	35,480	40,914

2014	6,411	35,480	41,891
2015	7,355	35,480	42,835
Total (tCO_2e/y)	30,449	248,360	278,809

Project activity emissions

The following types of project emissions will be included under this methodology:

(a) CO_2 emissions due to incremental distances between the collection points of biomass (EFB) and the composting site as compared to the baseline solid waste disposal site;
(b) CO_2 emissions due to incremental distances between the collection points of wastewater and composting site as compared to the baseline solid waste disposal site;
(c) CO_2 emissions due to incremental distances between composting site and land application sites;
(d) CO_2 emissions from fossil fuels used for vehicles in the project site;

Project activity assumptions:

1. The composting site is within the palm oil mill compound and there is no significant increment in distance and emissions as compared to the baseline scenario;
2. The compost product will be used for the palm plantation and partly replace EFB for mulching and chemical fertilizers;
3. In the baseline, the whole EFB and chemical fertilizers are transported on small vehicles tractors and trucks to the plantation, which result in emissions from combustion of diesel oil.
   In the project scenario, the compost product will be transported in the same manner. The compost product will be about half the volume and weight compared to the whole EFB for compost production. And the nutrient value is increased so that the amount of chemical fertilizer could be decreased.
4. Project activity emissions from trucks for incremental wastes collection and compost product delivering activities will be much reduced, but not counted as a conservative.
5. All electricity for requirement within the project boundary will be supplied by the biomass power generation units by firing fiber and palm kernel shells within the palm oil mill compound, which is considered as carbon neutral.

Therefore,

$PE_{y,transp}$ = 0 (tCO_2e/yr)

So that,

$PE_y = PE_{y,power}$

Where:

$PE_{y,power}$ emissions from diesel oil consumption of mechanical turners in the year "y" (tCO_2e/yr)

Ex-ante estimation of project emissions is shown in the Table 6.2

	Estimation of annual project emissions PEy (tCO_2e/y)
2009	76
2010	76
2011	76
2012	76
2013	76
2014	76
2015	76
Total (tCO_2e/y)	532

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

The emission reductions achieved by the project activity will be calculated by the following formula as the difference between the baseline emission and the sum of the project emissions:

ERy = BEy - (PEy + Leakage)

Where:
ERy Emission reductions in the year "y" (tCO_2e)

Leakage

The composting technology and machinery for the project activity are not transferred from another activity or no existing equipment is transferred to another activity. Then, no leakage is considered to take place.

Therefore
ERy = BEy - PEy

In case of the project activity based on the "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories", measured are limited to those that result in emission reductions of less than or equal to 60 kt CO_2e annually.

Ex-ante estimation of emission reductions is shown in the Table 6.3

	PEy Estimated project activity emissions (tCO2e/y)	BEch4,swds,y Estimated baseline emissions (tCO2e/y)	LEy Estimated leakage (tCO1e/y)	ERy Estimated overall emission reductions (tCO2e/y)
2009	76	36,644	0	36,568
2010	76	37,768	0	37,692
2011	76	38,854	0	38,778
2012	76	39,902	0	39,826
2013	76	40,914	0	40,838
2014	76	41,891	0	41,815
2015	76	42,835	0	42,759
Total (tCO2e/y)	532	278,809	0	278,277

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

B.7.1 Data and parameters monitored:

In order to accurately estimate the Emission Reduction (**ERs**) by avoided methane during the project activity, all relevant data shall be recorded for estimation of the project emissions (**PEy**) and the baseline emissions (**BEy**).
The following are the most relevant data to be recorded:

(1) The actual quantities and sources of organic wastes for co-composting that are fed into the project boundary will be monitored.
(2) The actual quantities and organic contents involved in the POME with sludge (slurry) for co-composting that is fed into the project activity will be monitored.
(3) On-site use of fuel for mechanical turners will be monitored through the survey of diesel oil purchased.
(4) Electricity consumption will be monitored monthly based on the plant metering system, but this is supplied by the biomass power generator firing the palm oil residues such as fibers and palm kernel shells, which is carbon neutral.
(5) Supplementary information used to ensure effective monitoring of carbon emissions is the annual amount of organic waste (EFB) contracted from other suppliers.

All data to be monitored by the project activity are summarized in Annex 4.

B.7.2 Description of the monitoring plan:

The monitoring plan will be implemented according to a quality assurance and quality control based on the recommendations of "IPCC Good Practice Guidance and Uncertainty Management in National Green House Gas Inventories, Chapter 8: Quality Assurance and Quality Control" and ISO 14064-part2.

Section B7.1 describes the various factors to be monitored over the crediting period. Furthermore, the following shall be documented as parts of the monitoring procedures:

(1) The operation of the co-composting plant shall be documented in a quality control program, monitoring the conditions and procedures that ensure the aerobic condition of the materials in the stockpiles during the composting process (moisture, temperature, C/N ratio).
(2) Soil application of the compost in the plantation shall be monitored by the delivery of the compost produced by the project activity, and undertaking an in-situ verification of the proper soil application of the compost product in a representative sample in order to ensure the aerobic conditions used as a fertilizer at the plantation.
(3) Land irrigation of the POME derived from the aerobic ponds shall also be monitored by undertaking a representative sampling to ensure the quality of the POME meeting the regulations.

Remarks: The archived data shall be kept for 2 years after the terminal of the 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)

Please refer to section B.2. for the baseline methodology and B.7 for the monitoring methodology respectively.
Date of completion is 07,03, 2008

The name of the responsible entity is as follows:

Organization: Daiwa Institute of Research
Street/P.O.Box: 14-5, Fuyuki,
City: Koto-ku, Tokyo
Postfix/ZIP: 135-0041
Country: Japan
TEL/FAX: +81-3-5620-4218/+81-3-5620-4276
E-Mail: ken.tammoto@rc.dir.co.jp
Title: Deputy General Manager
Salutation: Mr
Last Name: Tammoto
First Name: Ken
Note: Daiwa Institute of Research is a CDM consultant.

Organization: Borneo Samudera Sdn. Bhd.
Street/P.O.Box: Jalan Kelapa Sawit, Off KM 4, Jalan Tualan
Building:
City: 88300 Kota Kinabalu,
Postfix/ZIP:
Country: Sabah, Malaysia
TEL/FAX: 088-235829/088-246433/088-235811, Ex 43
E-Mail: jaceanry@yahoo.com
Title: Acting Controller of Processing & Engineering
Salutation: Mr.

Last Name: HJ.Ayub Middle Name: Bin First Name: HJ.Ceanry

Note: Borneo Samudera Sdn. Bhd. is 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:

01/01/2009

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

21 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:

01/01/2009

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

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

The Malaysian Authorities does 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.

The project can be expected to impart environmental improvement as follows:

- In this project, as POME is utilized as a mixture for humidification in making compost, which will contribute to the control of eutrophication and odor treatment of the river into which POME is discharged.
- Composting will serve to decrease of the consumption amount of chemical fertilizer, which will decrease the environmental impact given to posterity.

Since the new system is an indoor type, it will contribute to the improvement of working environment.

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

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

We obtained comments on this project from concerned persons through interviews and by holding a stakeholders' meeting.

1. Interview

- DOE(Department of Environment)-SABAH
- NRE (Ministry of Natural Resources and Environment)
- MALDI-HQ
- MPOB-HQ (Malaysia Palm Oil Board)
- PTA(Pusat Tenaga Malaysia）

2. Stakeholders' meeting

We held stakeholders' meeting between us (DIR,COTRAD) and concerned persons of Sawit Kinabalu Bhd.HQ, on 22 January 2008, and obtained comments.

E.2. Summary of the comments received:

We received no negative comments on this project from any concerned person.
Almost all comments were in support our project and cooperative as follows.

Interview

1. Sebrang Mill（Project site） Sep. 12 2007

Participants:

Mill Manager、Assist. Engineer：Mr.Mohamad Zamri Mokrin
Assist. Engineer：Mr.Victor Glance
Laboratory Researcher：Mr. Me Mathew Madin

Comments:

- We are currently treating waste water through seven lagoons including aerobic and unaerobic ones, and we are looking forward to seeing how much the new system of this project can decrease the density of COD.

2.NRE (Ministry of Natural Resources and Environment; DNA Sep. 14 2007

Participants:

Deputy Undersecretary：Mr. Azhar Noraini
Principal Assist. Secretary：Mr. Shahril Faizal Abdul Jani

Comments:

- We have especially been emphasizing technology transfer in CDM projects recently, and we want you to do your best in implementing CDM as a project in which we can expect technology transfer in substance.

3. DOE (Department of Environment) Sabah Nov. 13 2007

Participant:

Principal Assistant Director：Mr. Amirul Aripin、 Comments:

- It is very good that a leading company such as Sawit Kinabalu Bhd. implements a CDM project, for it can have spillover effects on social environment.

4.MARDI HQ（Malaysian Agricultural Research and Development Institute）Nov. 14 2007

Participant:

Agro Industry Environment Management Program, Principal Research Officer：Dr. Suhaimi Masduki

Comments:

- The Japanese technology is excellent in mixing, suction system and air circulation system, etc., and it is desirable for you to cooperate with a local manufacturer of Malaysia by offering the license of the technology.

5.PTM（Pusat Tenaga Malaysia）Nov. 15 2007

Participants:

Chief Technical Advisor, Biogen project:Dr. Sanjayan

Programme Manager：Ms.Yuzlina, Ms.Radin Diana

Comments:

- Power generation using EFB is rather difficult because the cost for collection and transport of EFB is high and GHG will be discharged in transporting EFB.
- If EFB is used for business, it is necessary to have contracts with plantation managers so that EFB can be kept on board for the future. This time, however, the project site has its own plantation, so there is no problem.

6. MPOB（Malaysia Palm Oil Board）HQ Jan. 22 2008

Participant:

Energy & Environment Unit Engineering & Processing Division：Dr.Chow Mee Chin

Comments:

- The system used in this project is so wonderful that we recommend you to place it on exhibition in the National Seminar of biomass, which is to be held next summer in June or July, along with the result of the sample exams of the FS, which is being carried out now.
- The local people have an inclination not to believe anything unless they make sure of it with their own eyes. So to show them what the Japanese technology is like is very important. And we would like to cooperate with you in that case.

Stakeholders' Meeting Jan. 23 2008

Participants:

Controller of Estate：Mohd. Adzlie Teo

Controller of Finance ：Mary Ku

Acting Controller of Processing & Engineering HJ. Ceanry Bin Hj. Ayub

Corporate Affairs & New Business Manager Ismail Salkilan

Controller of Human Resource Development & Administration James

Comments

- We want you to further consider whether the project can utilize all the POME.

- Since we are very interested in the project, we want you to give us a detailed estimation of the equipment cost later.
- The rate of bank loan in Malaysia is around 6.5%, and it will rise to 7% ～8.5% depending on the credit rating of the company. Although the minimum requirement of the profit to investment of our company is considered to be 10%, I want to choose by competition in the case that the profits exceed the rate of bank loan.
- If compost is sold, we can make a profit, but if the compost is fertilized in our own plantation, it is hard to consider it a profit. I want to evaluate the business solely through profitability by CER.
- The reduction of the use of chemical fertilizer by making use of compost is calculated conservatively.
- We assume the funds are raised by our company, but if there is a good source of funds in Japan, we want you to propose the project including it.

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

Not applicable

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project Owner:

Organization:	Borneo Samudera Sdn. Bhd.
Street/P.O.Box:	88300
Building:	-
City:	Kota Kinabalu
State/Region:	Sabah
Postfix/ZIP:	-
Country:	Malaysia
Telephone:	-
FAX:	-
E-Mail:	-
URL:	-
Represented by:	-
Title:	-
Salutation:	-
Last Name:	-
Middle Name:	-
First Name:	-
Department:	-
Mobile:	-
Personal E-Mail:	-

Project Participant:

Organization:	Daiwa Institute of Research
Street/P.O.Box:	14-5
Building:	-
City:	Fuyuki, Koto-ku
State/Region:	Tokyo
Postfix/ZIP:	135-0041
Country:	Japan
Telephone:	+81-3-5620-4110
FAX:	+81-3-5620-4276
E-Mail:	-
URL:	-
Represented by:	-
Title:	Deputy General Manager
Salutation:	Mr
Last Name:	Tammoto
Middle Name:	-
First Name:	Ken
Department:	Industry Consulting Department
Mobile:	-
Personal E-Mail:	Ken.tammoto@rc.dir.co.jp

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the project activity.

Annex 3

BASELINE INFORMATION

Key assumption figures and source of values are used in the Baseline Estimation as follows:

Estimates from 2009 to 2029

Quantity for estimation of the baseline scenario.: (Qy), (Qy,ww,po), (Qy,ww,sl)

		Mill Cap.	Operation days/y	FFB	EFB		EstimatedTotal POME/sludge	
No.	Year	(MT/hr)	days as per 16hrs/day	MT/y	FFB∗23%=Qy (with moisture of 60%) MT/y	FFB∗23% (without moisture) MT/y	POME =Qy,ww,po (FFB∗0.6) m³/y	POME sludge =Qy,ww,sl (145lr/hr*16hr/d)
1	2009	90	300	302,400	69,552	27,821	181,440	696
2	2010	90	300	302,400	69,552	27,821	181,440	696
3	2011	90	300	302,400	69,552	27,821	181,440	696
4	2012	90	300	302,400	69,552	27,821	181,440	696
5	2013	90	300	302,400	69,552	27,821	181,440	696
6	2014	90	300	302,400	69,552	27,821	181,440	696
7	2015	90	300	302,400	69,552	27,821	181,440	696
8	2016	90	300	302,400	69,552	27,821	181,440	696
9	2017	90	300	302,400	69,552	27,821	181,440	696
10	2018	90	300	302,400	69,552	27,821	181,440	696
11	2019	90	300	302,400	69,552	27,821	181,440	696
12	2020	90	300	302,400	69,552	27,821	181,440	696
13	2021	90	300	302,400	69,552	27,821	181,440	696
14	2022	90	300	302,400	69,552	27,821	181,440	696
15	2023	90	300	302,400	69,552	27,821	181,440	696
16	2024	90	300	302,400	69,552	27,821	181,440	696
17	2025	90	300	302,400	69,552	27,821	181,440	696
18	2026	90	300	302,400	69,552	27,821	181,440	696
19	2027	90	300	302,400	69,552	27,821	181,440	696
20	2028	90	300	302,400	69,552	27,821	181,440	696
21	2029	90	300	302,400	69,552	27,821	181,440	696

Annex 4

MONITORING INFORMATION

Assumption and Source of Values used for estimating the Baseline Emissions

No.	Parameters	Value	Unit	Source	Justification
1	Mill Operation	4,800	hr/y		Only used in the PDD for estimation of EFB, POME and POME sludge as well as compost.
2	Qy : Quantity of EFB generated	0.23	t/tFFB		Only used in the PDD for estimation of EFB from palm oil mill
3	moisture of EFB	60 to 65	wt%		Only used in the PDD for estimation of EFB from palm oil mill and compost production
4	Qy,ww.po: Quantity of POME generated	0.6	m^3/tFFB		Only used in the PDD for estimation of POME from palm oil mill to be fed to the project activity. The actual lab measurement value from respective mill is used.
5	CODy,ww, po	2	kgCOD/m^3		Only used in the PDD for estimation of reduction emissions from POME treated in the secondary or tertiary anaerobic ponds. POME is sprayed on the composting piles. The actual lab measurement value from respective mill is used.
6	Qy,ww,sl: Quantity of POME sludge generated	145	Kg/hr		Only used in the PDD for estimation of POME slurry treated by the decanters based on the actual operation of the mill
7	CODy,ww,sl	63	kgCOD/m^3		Only used in the PDD for estimation of the reduction in emissions by having POME sludge treated by the decanters. The actual lab measurement value from respective mill is used.

The amount of waste (EFB) co-composted with POME and POME sludge in the project activity in the year will be measured and recorded, as well as its composition through representative samplings respectively, to provide information for estimating the baseline emissions.

The total waste such as EFB to be fed to the project activity and the compost processed each year, and the average truck capacity will be measured to provide information for estimating the project activity emissions through transportation, which might be less than the baseline emissions.
The power consumption will be measured and registered. The monitoring will also record the distance the waste is transported in the baseline and the project scenario includes transport of the compost to the soil application sites.

The operation of the composting facilities will be documented in a quality control program, monitoring the conditions and procedures that ensure the aerobic condition of the composting piles during the composting process.

Soil application of the compost in agriculture or related activities will be monitored by documenting the sales or delivery of the compost produced by the project activity, and an in situ verification of the proper soil application of the compost in a representative sample of the users will be undertaken in order to ensure the aerobic conditions of the decay process.

The project participants will demonstrate annually that the amount of wastes composted in the project activity facilities would have been disposed in a solid waste disposal site without methane recovery in the absence of the project activity.

The following relevant parameters in the Table will be surely monitored and recorded during the crediting
period:

Project emissions parameters for monitoring(1)

ID number	Data Variable	Source of data	Data unit	Measured(M) calculated (C) estimated(E)	Recording frequecy	Pro-portion of data monitored	How will data be archived? (electronic /paper)	Comment
1.MWhc	Electricity consumption	Electricity meter	MWh/yr	M	Continuous	100%	Paper & Electronic	
2.Qy	Total quantity of EFB supplied to the composting plant in the year x	Belt weigher	Tonnes/yr	M	Continuous	100%	Paper & Electronic	The quantity of organic waste prevented from disposal in the year x (tons/y)
3.Wefb	Moisture of EFB	Mill laboratory	%	M	Monthly	100%	Paper & Electronic	
4,Qy,ww,sl	Quantity of POME sludge fed to the project	Flow meter	m³/hr	M	Continuous	100%	Paper & Electronic	
5.CODy,ww,sl	COD of POME sludge	Chemical Laboratory	kg/m³	M	Monthly	100%	Paper & Electronic	This is a monthly COD value used to calculate the yearly average of COD entering the project.
6.Qy,ww,po	Quantity of POME fed to the project	Flow meter	m³/hr	M	Continuous	100%	Paper & Electronic	
7.CODy,ww,po	COD of POME	Chemical Laboratory	kg/m³	M	Monthly	100%	Paper & Electronic	This is a monthly COD value used to calculate the yearly average of COD entering the project.
8.Qy,ww,lea	Quantity of Leachate	Flow meter	m³/hr	M	Daily	100%	Paper & Electronic	
9.CODy,ww,lea	COD of Leachate	Chemical Laboratory	kg/m³	M	Monthly	100%	Paper & Electronic	This is a monthly COD value used to calculate the yearly average of COD entering the effluen pond.
10.Qy,compost	Quantity of compost produced in the year x	Weighbridge	Tonnes/yr	M	Annually	100%	Paper & Electronic	The produced compost will be trucked off from site. All trucks leaving site will be weighed.

Project emissions parameters for monitoring (2)

ID number	Data Variable	Source of data	Data unit	Measured(M) calculated (C) estimated(E)	Recording frequecy	Pro-portion of data monitored	How will data be achieved? (electronic /paper)	Comment
2-1.Qy.mulch	Total quantity of EFB for Mulching	Weighbridge	Tonnes/yr	M	Annually	100%		
11.NOvehicles	No. of vehicles	Expert estimate	Number	M	Annually	100%		
12.km	Additional distance travelled	Travel record	km	M	Annually	100%		
13.VFcons	Vehicle fuel consumption in ltr.Per kilometre	Fuel consumption record	ltr./km	M	Annually	100%		
14.CVfuel	Calorific value of fuel	IPCC or other reference data	MJ/kg or other unit	M,C,E	Annually or Ex-ante	100%		
15.Dfuel	Density of fuel	IPCC or other reference data	kg/ltr.	M,C,E	Annually or Ex-ante	100%		
16.EFfuel	Emission factor of fuel	Project participants	tCO2/MJ	M,C,E	Annually or Ex-ante	100%		