CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

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SECTION A. General description of project activity

A.1. Title of the project activity:

Avoided emissions from biomass wastes through use as feed stock in pulp and paper Kunak, Sabah production i.e. Eko Pulp and Paper Project
Version 3.1
02/09/2008

A.2. Description of the project activity:

Malaysia is one of the biggest producer and exporters of crude palm oil derived from oil palm, in the world. In the year 2005, the total area planted with oil palm planted in the country was approximately 4 million hectares,[1] yielding a total of approximately 76 million tonnes of Fresh Fruit Bunches (FFB). From the processing of FFB, three types of biomass is generated i.e. Empty Fruit Bunches (EFB), mesocarp fibre and palm kernel shell (PKS).The processing of these 76 million tonnes of FFB will produced approximately 17 million tonnes of EFB in Malaysia in 2005 alone i.e. EFB contributes about 23% of FFB by weight basis.

EFB is one of the main waste products from palm oil milling and it needs to be managed properly to avoid environmental problems. Earlier the EFB were incinerated, but since the ban on open air burning entered into force in Malaysia this has stop.

At present, EFB is generally managed as a waste product. In the Sabah region most of the EFB are deposited in landfills. A minor part of the EFB is brought back to the palm oil plantations as fertiliser through mulching.

The proposed project activity will utilise the EFB as feed stock for production of pulp and paper. This is a new and ground breaking technology to use a waste product (EFB) as a resource for industrial production of unbleached pulp board. Unbleached pulp board is usually produced virgin pulp (as opposed to recycled material) from wood and non-wood sources.

The use of EFB as a raw material in the proposed project activity will be sourced from the palm oil mills around Kunak and also as fuel for the generation of steam for the Eko Pulp and Paper Project. A total of 180,000 tonnes of EFB per year is required in the proposed project activity.

The proposed project activity will be supplied with energy from a new biomass fired cogeneration plant supplying 2.86 MW power and 35 t steam/hour for the consumption of the proposed project activity. The cogeneration plant is not included in this CDM project activity, but developed as an independent CDM project.

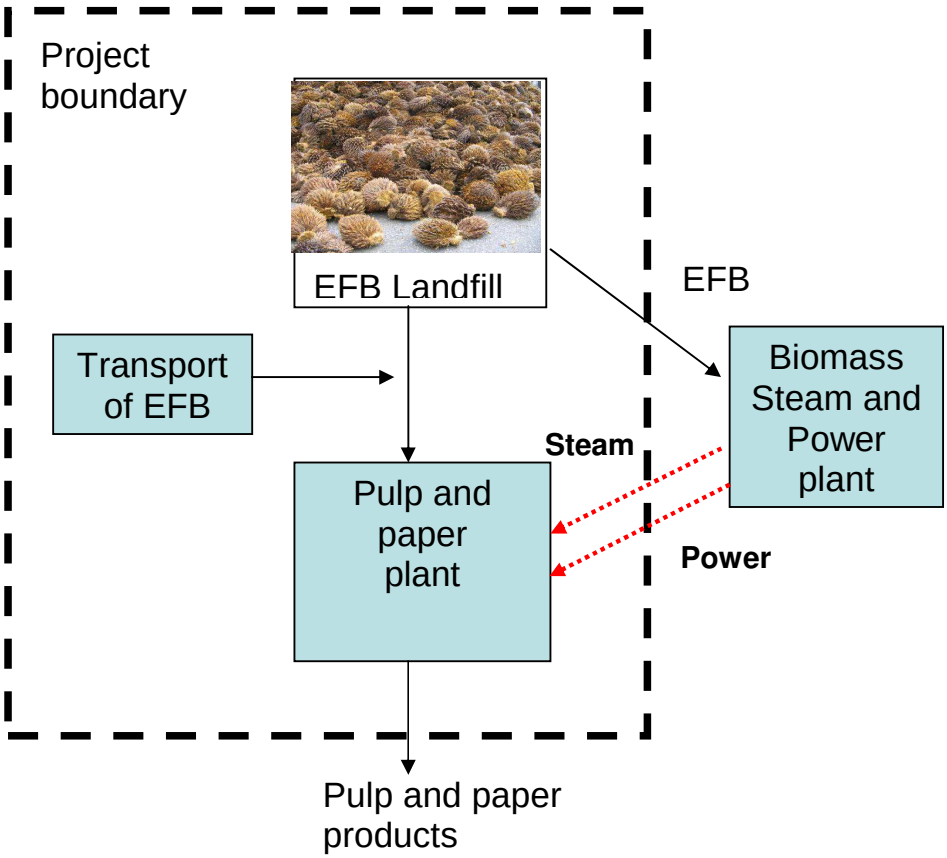
The utilisation of EFB as raw material for pulp and paper production is a totally new concept that has been developed by Eko Pulp and Paper Sdn. Bhd. who will also implement the proposed project activity. The manufacturing plant will be located in Kunak, Tawau, in the State of Sabah, Malaysia.
The project activity will be able to reduce greenhouse gas emissions by reducing methane emissions from biomass waste that is otherwise left to decay in a dedicated landfill in the area. With the proposed project

[1] Overview of the Malaysian Oil Palm Industry. (2005). http://econ.mpob.gov.my/economy/su_review2005.htm [2006, September 21]

activity, these EFB will be utilized as feedstock in the pulp and paper production process and thus avoid the methane generation from landfill;

An overview of the project idea with EFB supply flow from landfill and proposed energy supply is illustrated in the figure below:

Figure A.1: Project boundary of the proposed project



The project will reduce GHG emissions by an average of approximately 81,297 tCO_2/yr over the first 7-year crediting period.

The implementation of this proposed project activity is expected to contribute to the sustainable development of Malaysia in the following ways:

- It is in line with national environmental policies and drives towards waste reuse and recycling whereby EFB as waste in this project is utilised as feedstock to pulp and paper products;
- The use of bio-waste (EFB) will avoid the need to harvest more trees as raw material for pulp and paper production and thus contributes positively towards ecology and forest conservation;
- Reduction of methane emissions as greenhouse gas to the atmosphere is in line with the commitment of Malaysia towards Kyoto Protocol;

- Contribution to the national economy with the increased value of EFB as a waste product. Such contribution is expected to be sustainable and consistent.

The development of this unique EFB technological application can also be considered as an innovative breakthrough in local developed technology. The development of such a first of its kind project is certainly a pioneering effort in Malaysia as well as worldwide. The successful deployment of such technology will, in the long run, benefit the industries and country as a whole.

A.3. Project participants:

Table A.1: 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)	Eko Pulp and Paper Sdn. Bhd. (Private Company)	No
United Kingdom	EnergiMidt Handel A/S (Private company)	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 project activity:

A.4.1. Location of the project activity:

The Eko Pulp and Paper Project is located within the Maju Sawit Estate (previously known as Maju Koko Estate) in Kunak, Tawau, State of Sabah, Malaysia.

A.4.1.1. Host Party(ies):

Malaysia

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

Sabah

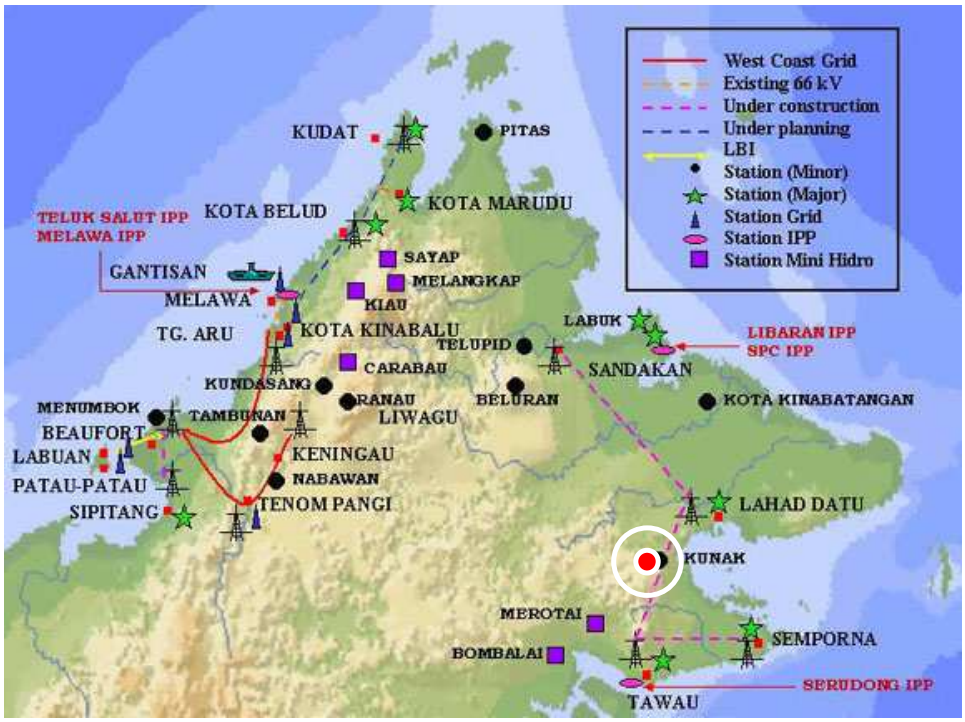
A.4.1.3. City/Town/Community etc:

Kunak, Tawau

A.4.1.4. Detail of physical location, including information allowing the unique identification of this (maximum one page):

The location of the proposed project activity is shown in the map below:

Figure A.2: Location of the proposed project activity



Eko Pulp and Paper Project is located at KM 56, Tawau-Kunak Highway, 91000 Tawau, Sabah, Malaysia.

The project is located adjacent to the TSH Kunak Palm Oil Mill (Kunak Palm Oil Mill). The location is 28km from Kunak town, which is populated with 7,000 inhabitants.

A.4.2. Category(ies) of project activity:

The proposed project activity fall under the following categories:

Sectoral Scope 4 ***: Manufacturing Industry***
and ***Scope 13*** ***:Waste Handling and Disposal***

A.4.3. Technology to be employed by the project activity:

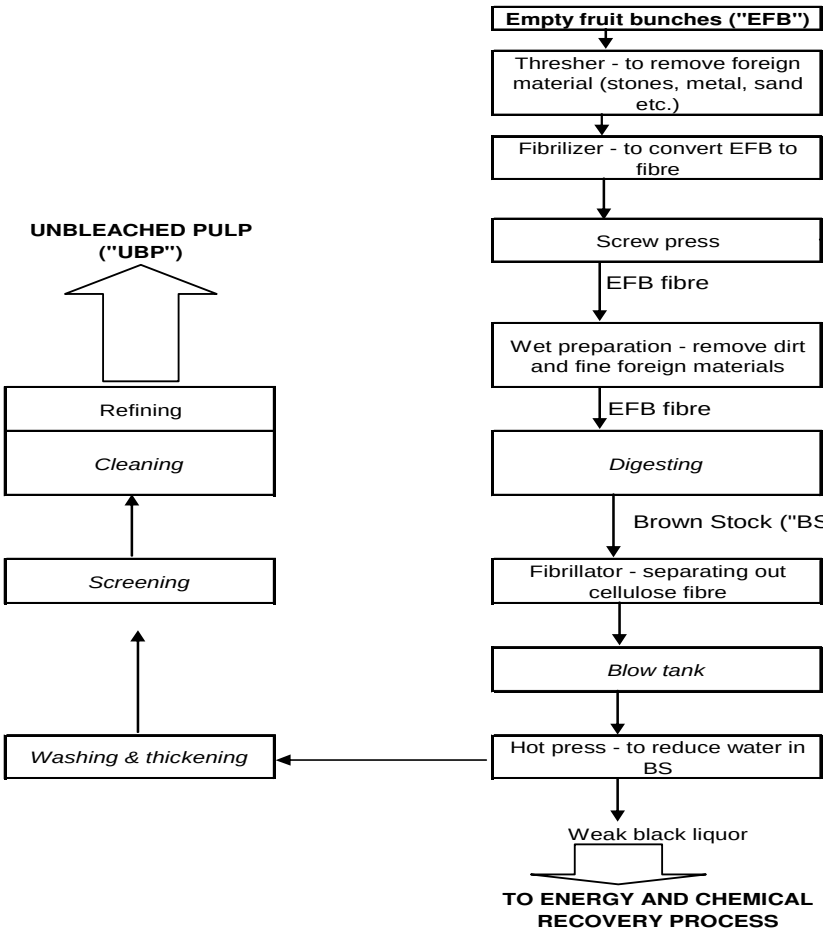
EFB from palm oil production is a promising raw material for pulp and paper production. Since the 1970s, the suitability of oil palm biomass as a raw material for papermaking has been explored using a variety of pulping methods papermaking process (Killmann *et al*. 1996).

- Its fibre content is very high reaching 95% and the amount of fines and non-fibre material low, some 5% or less.
- EFB fibres resemble to some extent many hardwood fibres, being very short. Fibre morphology is favourable for papermaking.
- The chemical composition is fairly favourable with low lignin content and high holocellulose content.

The technology to be employed for the EFB as feedstock in pulp process is based on a semi-chemical process. The chemical pulping method dissolves the bonding lignin by chemical reaction and separates the cellulose fibres with a minimum of degradation. The chemical method can be either a sulphate or a sulphite pulping process. The respective sulphate or sulphite waste liquor (black liquor) in addition with the liquid residue of the subsequent bleaching steps is the major sources of water pollution resulting from paper manufacture. Because of the gentle method of separation, the fibres of the chemical digestion retain most of their characteristic intrinsic strength. The obtained kraft pulp is therefore able to be used to produce high quality paper.

The process is developed to extract EFB fibre through a series of machineries and processes as illustrated below:

Figure A.3: Process flow of pulp production from EFB



From the environmental impact point of view, the proposed project activity and process will adhere to all environmental standards stipulated by the environmental authority of Malaysia. Pollution control systems such as wastewater treatment facility and stack emission control systems etc. will be in place to comply with all the local environmental regulations. In the case of the "black liquor" (the organic rich waste water from the pulp production) this is combusted and approximately 20 t/hr of steam can be recovered.

A detailed Environmental Impact Assessment (EIA) has been completed for the pulp and paper production and approved in 2005 by the Department of Environment Malaysia[2].

[2] http://www.doe.gov.my/index.php?option=com_content&task=view&id=463&Itemid=438&lang=en

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

Table A.2 : Estimated annual emission reductions

Years	Annual estimation of emission reductions in tonnes of CO_2e
Year 1	26,661
Year 2	50,114
Year 3	69,900
Year 4	86,592
Year 5	100,675
Year 6	112,557
Year 7	122,581
Total estimated reductions (tonnes of CO_2e)	7
Total number of crediting years	569,080
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	81,297

A.4.5. Public funding of the project activity:

The proposed project activity will be privately funded and will not involve any public funding from Annex 1 countries.

SECTION B. Application of a baseline and monitoring methodology

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

The proposed project activity falls in general under the following methodology:
AM0057 (version 02.2), (EB 36): "Avoided emissions from biomass wastes through use as feed stock in pulp and paper production or in bio-oil production" (AM0057 (version 02.2)).

The methodology refers to the following tools for specific parts for the calculations:

- "Tool for demonstration and assessment of additionality"(version 05.2), (EB39);
- "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (version 04), (EB41);
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02); and
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"(version 01)

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

This methodology is applicable for project activities using agricultural wastes as feed stock for pulp and paper production or bio-oil production, where the end product is similar in characteristics and quality to existing high products in the market and does not require special use or disposal methods.

The methodology, AM0057 (version 02.2) has a number of applicability criteria discussed in the table below.

Table B.1: Conditions for the use of approved methodology

Conditions	Project Activity
The project activity is the construction of a new pulp and paper production facility or bio-oil production facility that uses agricultural wastes as feedstock.	This is a greenfield pulp and paper project using EFB. EFB is a waste product from palm oil production and thus an agricultural waste
The waste should not be stored in conditions that would lead to anaerobic decomposition and, hence, generation of CH_4.	Storage at the Eko Pulp and Paper Project is limited to a maximum of one week as the properties of the EFB for pulp and paper production will deteriorate if stored for longer than 1 week. There is thus no reason to expect any significant generation of methane.
The pulp and paper or bio oil produced with the agricultural wastes is of similar characteristics and quality to existing high quality products in the market and does not require special use or disposal methods.	The pulp and paper produced is similar to existing products in the market and does not require any special disposal methods.
During the production of pulp and paper, no significant additional process leading to emissions of greenhouse gas compared to the baseline scenario, except for electricity and fossil fuel consumption, is envisaged (an example of this can be the use of substance produced with highly GHG intensive activities).	No additional emissions are generated as the production of pulp from EFB will not require use of larger amounts of chemicals. Chemicals used for "cooking" of the fibre will be recovered through the use of a recovery boiler.
Emission reductions are **only** claimed for avoidance of methane emissions when it can be demonstrated that the agricultural residues are left to decompose anaerobically.	It will be demonstrated in Section B4 of the PDD that the baseline for handling of EFB is disposal in landfills.
In case the biomass is combusted for the purpose of providing heat or electricity to the plant, the biomass fuel is derived from biomass residues, as specified in ACM0006.	Biomass waste is used for producing heat and electricity. The waste is both black liquor from the pulp and paper plant and waste (EFB, fibre and shell) from the palm oil sector. The biomass power plant will be registered as a CDM project of its own.

As discussed in the table above, Eko Pulp and Paper Project clearly falls within the application criteria of AM0057 (version 02.2)

B.3. Description of the sources and gases included in the project boundary

Project boundary

The spatial extent of the project boundary is the site of the proposed project activity where the pulp and paper production plant is established. This includes the facilities for processing the agricultural waste into pulp and paper, on-site electricity generation and/or consumption, onsite fuel use, and the thermal energy generation.

The project boundary also includes the transportation of the EFB to the Eko Pulp and Paper Project because the transport distances have increased compared to the conventional handling of the waste.

Table B.2: Emissions to be include in project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Emissions from decomposition of agricultural waste at the landfill site	CO_2	No	CO_2 emissions from the decomposition are not included in baseline.
		CH_4	Yes	CH_4 emissions from decomposition of the biomass waste is a major component of the baseline.
		N_2O	No	N_2O emissions are not included in baseline. This is conservative.
Project Activity	Transportation of agricultural waste to the project site	CO_2	Yes	CO_2 emissions from transport of biomass to the pulp and paper and paper production plant shall be included as the transport is increased compared to existing handling of biomass waste.
		CH_4	No	Excluded for simplicity. The emissions are expected to be very small.
		N_2O	No	Excluded for simplicity. The emissions are expected to be very small.
	Emissions from the onsite use of fossil fuels	CO_2	Yes	CO_2 emissions from the on site use of fossil fuels can be significant.
		CH_4	No	Excluded for simplicity. The emissions are expected to be very small.
		N_2O	No	Excluded for simplicity. The emissions are expected to be very small.
	Emissions from the onsite use of electricity	CO_2	Yes	CO_2 emissions from the on site use of electricity can be significant.
		CH_4	No	Excluded for simplicity. The emissions are expected to be very small.
		N_2O	No	Excluded for simplicity. The emissions are expected to be very small.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

The identification of the baseline scenario is in accordance to AM0057 (version 02.2) with demonstration and assessment of additionality using steps 1 and 2 prescribed in the latest version of the "Tool for the demonstration and assessment of additionality" (version 05.2) (EB39) ("Tool for the demonstration and assessment of additionality").

AM0057 (version 02.2) prescribes three steps to establish and to identify plausible baseline scenario:

STEP 1. Identify all realistic and credible alternatives to the project activity
STEP 2. Eliminate alternatives that face prohibitive barrier or are economically not attractive
STEP 3. Selection of baseline scenario

The three steps undertaken is demonstrated hereinafter..

STEP 1: Identify all realistic and credible alternatives to the project activity

Pursuant to Step 1 of AM0057 (version 02.2), project proponent shall use Step 1 of the Tool for the demonstration and assessment of additionality to identify all realistic and credible baseline alternatives which reads:

"*Identification of alternatives to the project activity consistent with current laws and regulations"*

In doing so, relevant policies and regulations related to the management of agricultural waste should be taken into account. Such policies or regulations may include local regulation on open burning of the agricultural waste, incentives for use of the agricultural for energy production etc. In addition, the assessment of alternative scenarios should take into account local economic and technological circumstances.

Realistic and credible alternatives should be developed separately regarding:

1. How the **agricultural waste** would have been treated (Please refer to Table B.3A) ; and
2. What is the **alternative feedstock** for the paper production (Please refer to Table B.3B)

As prescribed, Step 1 of the Tools for the demonstration and assessment of additionality consists of two sub-steps namely:

- **Sub-step 1a: Define alternatives to the project activity**
- **Sub-step 1b: Consistency with mandatory laws and regulations**

Both these two sub-steps will be considered and discussed in detail in the section set out below.

STEP 1. Identification of alternatives to the project activity consistent with current laws and regulation

Sub-step 1a: Define alternatives to the project activity

Realistic and credible baseline for agricultural waste management practices for EFB

The following plausible realistic and credible alternatives have been identified as known management practices for EFB that could potentially be implemented by the project proponent:

Table B.3A: Summary results on management practices for EFB.

Realistic and credible alternative for EFB management	Description	Comment	Realistic and credible alternative? (Yes/No)
B1	Use of EFB as material for paper or bio-oil production, not implemented as CDM project	This is a realistic and credible alternative.	Yes
B2	EFB is dumped or left to decay under mainly aerobic conditions, such as stockpiling	Stockpiling is only used for temporary storage of EFB, as it will not provide the necessary capacity for the huge amounts of EFB produced by the palm oil mills. A typical mill of 60 t FFB/hour will produce in the order of 80,000 t to 90,000 t EFB/year. If put in a 2 meter layer the EFB from one years production will cover up to 50,000 m^2/year. This can hardly be called a stock pile. Because of the large volume of EFB, stockpiling is not a conclusive and practical solution. This is not a realistic and credible alternative	No
B3	EFB is dumped or left to decay under clearly anaerobic conditions, such as landfilling	Disposal in a landfill is the option implemented for the palm oil mills delivering EFB to the pulp and paper factory. There is a large density of palm oil mills in the Tawau/Lahad Datu region of Sabah, which produce a huge amount of EFB. The most common and most economically attractive approach in disposing of the EFB is to deposit it in	Yes

Realistic and credible alternative for EFB management	Description	Comment	Realistic and credible alternative? (Yes/No)
		landfills, since open burning and incineration of EFB is not legal any longer in Malaysia. The disposal of the EFB often happens at depressions or ravines in the landscape where it is possible to deposit large amounts of EFB. This leads to deep deposits (more than 5 meters) of biomass waste degrading under anaerobic conditions. The project has signed long term delivery contracts for EFB with three palm oil mills. All these three mills have existing, active landfill sites where EFB is deposited and can be identified during validation. This is a realistic and credible alternative.	
B4	The EFB is burnt in an uncontrolled manner without utilizing it for energy purposes	Open burning is prohibited in Malaysia under the Environmental Quality Act, 1974 and the setting up new EFB incinerators are not approved anymore by the Department of Environment Malaysia. The ban on uncontrolled burning of biomass waste has been enforced quite effectively since it leads to increased air pollution and haze. This is not a realistic and credible alternative.	No
B5	The EFB is used for heat and/or electricity generation or as other source of energy in other projects	Use of EFB for energy purposes, has so far only been implemented as CDM projects. In addition, EFB is also known to be difficult fuel to handle as it has high silica and moisture content. As such, the costs of fuel preparation and the risks in project are big and make project unfeasible. (Please refer to calculation set out in Sub-step 2c of Step 2 below) **("Alternative 3").** The Malaysian government has since 2000	No

[3] Economic Planning Unit, 2006: 9th Malaysia Plan

[4] Government of Malaysia / Danish International Development Assistance. (2005). "Barrier Analysis for the Supply Chain of Palm Oil Processing Biomass (Empty Fruit Bunch) as Renewable Fuel". Renewable Energy and Energy Efficiency Component Project (2002-2006).

Realistic and credible alternative for EFB management	Description	Comment	Realistic and credible alternative? (Yes/No)
		announced a fifth fuel strategy to encourage the use of renewable energy sources. A Small Renewable Energy Programme (SREP) was established based on the 8th Malaysia Plan covering 2001-2005. The SREP had a very limited success and after five years only 2 projects were established with a total capacity of 12 MW[3]. The first biomass fired Combined Heat and Power Plant (CHP Plant) was established at the same site as the Eko Pulp and Paper Project. This CHP Plant was also the first CDM project to get national approval by the Malaysian DNA. In 2006 a few biomass CHP Plants have been established in Sabah, but they have all been CDM projects because of the presence of a number of barriers that prevent the implementation of CHP plants: • High investment costs required to erect an onsite power plant and to pre-treat the biomass waste before it can be used for electricity generation. • Low tariffs offered for the power generated. • Unfavourable conditions in the power purchase agreements offered by the utility company. Many of the above mentioned barriers are substantiated by a study carried out by the Economic Planning Unit of Malaysia with support from the Danish International Development Assistance[4]. This is not a realistic and credible alternative.	

Realistic and credible alternative for EFB management	Description	Comment	Realistic and credible alternative? (Yes/No)
B6	The EFB is used for non-energy purpose e.g. as mulching	Use of EFB for mulching is economically unattractive especially in Sabah where the land is dominated by hilly terrain.[5] Besides that, there are innumerable problems associated with EFB application as mulch[6] such as: • Distance of the field from mill, • Heavy traffic causing damage to field roads • Harvesting paths requiring frequent upgrading, which can be costly, • Field inaccessibility to light vehicles during rainy months, • Mulching field close to worker's quarters can encourage breeding of flies and rhinoceros beetle, • Insufficient vehicles during peak cropping months as vehicles are given priority for FFB evacuation • Settlers are not given benefit to mulch their field in the case of Government land scheme. Mulching is only done by bigger plantation[7].There are still companies that dispose the EFB using landfill method particularly mill with smaller plantations or estates. The EFB used in for this proposed project activity will be sourced from palm oil mills using landfills and the actual landfills can be verified during validation. Thus this is not a realistic and credible alternative.	No

[5] Calculated value of EFB as fertilizer is MYR10.33/ton and the costs of distribution are calculated as MYR9.50 /ton. See Annex 5 for more details

[6] Dr, Chow Mee Chin, MPOB, 2006: "An Assessment Of Potential And Availability Of Palm Biomass For Bioconversion To Bioethanol" page 35-36. Downloaded from www.eib.ptm.org.my

[7] "Palm Oil Biomass for Electricity Generation in Malaysia", Ludin, N., et. al, (http://www.biogen.org.my/bris/Biogen/Tech/(d)Documents/technology(d)7.pdf) accessed 4 January 2008

Outcome of Step 1a

Pursuant to Table B.3A, the realistic and credible alternatives identified for agricultural waste management practice for EFB are :-

- **B1 ("Alternative 1");** and
- **B3 ("Alternative 2")**

Realistic and credible baseline for production of paper

The following plausible alternatives have been identified as known realistic and credible alternative for the production of paper:

Table B.3B: Summary results for the production of paper

Realistic and credible alternative for production of paper	Description	Comments	Realistic and credible alternative? (Yes/No)
P1	The project activity undertaken without CDM	Implementing the proposed project activity without CDM is a possible alternative and will be analysed in the following section.	Yes
P2	Construction of a new pulp and paper plant at the project site using other locally available sources of cellulose	Implementing a project at the site using other local source of cellulose. Eko Pulp and Paper Project is owned by companies linked to the palm oil sector and has no access to other local sources of cellulose than EFB. The area around Kunak is dominated by palm oil industry and there are not available resources nearby. In addition to that, Sabah faces shortage in timber. The Chief Minister for Sabah, Musa Aman, stated "*that there is no doubt that the main challenge to the timber industry in Sabah is the shortage of raw material. This is due to the State Government's effort*	No

[8] http://www.dailyexpress.com.my/news.cfm?NewsID=43189

Realistic and credible alternative for production of paper	Description	Comments	Realistic and credible alternative? (Yes/No)
		towards strict adherence to sustainable forest management and to allow the forest to re-stock to sustainable levels[8]" in a speech to Sabah Timber Industries Association in July 2006. Finally it is not the business concept of the project proponent to go into wood based pulp and paper production. This is not a realistic and credible alternative.	
P3	No installation of a pulp and paper plant at the project site but paper production in other new and/or existing paper plants at other sites using locally available cellulose typically used in the region	This is the most likely baseline alternative to the suggested project. The demand for paper will find ways to be fulfilled. The product produced at the Eko Pulp and Paper Project will most likely replace virgin pulp from wood or non-wood sources produced somewhere in South East Asia. This is a realistic and credible alternative.	Yes

Outcome of Step 1a

Pursuant to Table B.3B, the realistic and credible alternatives identified for production of paper are:

- **P1**; and
- **P3**.

As demonstrated in the step 2 below, there is a clear financial barrier against implementing the proposed project activity without CDM (P1) and the most likely baseline for production of pulp and paper would as such be production in an off site location by other players (P3).

Sub-step 1b: Consistency with mandatory laws and regulations

A realistic and credible scenario in relation to management practice for EFB as set out in Table B.3A includes scenario B4 i.e., uncontrolled burning of biomass residue, which is not in compliance with existing Malaysia Legislation. Open burning of biomass residue is prohibited according to the Malaysian Legislation - There is

only one alternative listed in Table B.3A that is not compliance with existing Malaysia legislation and that is B4 – Environmental Quality Act 1974 (amended 2000).

In accordance to Step1 of the Tools for demonstration and assessment of additionality, i.e. "*Identification of alternatives to the project activity consistent with current laws and regulations"*, the following realistic and credible alternatives are identified:-

Outcome of Step 1b

For **agricultural waste management practice for EFB**:

- **B1** i.e. use of agricultural waste as material for paper production, not implemented as a CDM project ("Alternative 1"); and
- **B3** i.e. the agricultural waste is dumped or left to decay under clearly anaerobic conditions, such as landfill) ("Alternative 2").

For **production of paper**:

- **P1** i.e. the project activity undertaken without CDM ("Alternative 1") and
- **P3** i.e. no installation of a pulp and paper plant at the project site but paper production in other new and/or existing paper plants at other sites using locally available cellulose typically used in the region.

STEP 2: Eliminate alternatives that face prohibitive barriers or are not economically attractive

Pursuant to AM0057 (version 02.2), project proponents shall use Step 2 of the Tool for the demonstration and assessment of additionality to assess which of the above alternatives should be excluded from further consideration.

This step serves to determine which of the remaining alternatives under Step 1 are not economically. and financially attractive. Following the outcome of Step1, an investment comparison analysis has been conducted to determine if Alternative 1, Alternative 2 and Alternative 3 is the most financially attractive in accordance to Step 2 of the Tools for the demonstration and assessment of additionality.

Step 2 of the Tools for the demonstration and assessment of additionality prescribes four sub-steps to identify the most economically and financially attractive alternatives:

Sub-step 2a. Determine appropriate analysis method
Sub –step 2b. Apply analysis method (Option I. simple cost analysis or Option II, investment comparison analysis or Option III, benchmark analysis)
Sub-step 2c. Calculation of comparison of financial indicators (only apply to options II and III).
Sub-step 2d. Sensitivity analysis (only applicable to options II and III)

These four sub-steps have been undertaken hereinafter.

Sub-step 2a. Determine appropriate analysis method

This sub-step serve to identify which of the three options is the most appropriate option to demonstrated financial attractiveness.

Among the three options of the investment analysis suggested in the Tools for the demonstration and assessment of additionality, simple investment analysis (Option I) is not applicable since the project has economic benefits (i.e. source of income from sales of pulp and paper) other than CDM related income.. Thus, the investment comparison analysis (Option II) is used.

Sub-step 2b. – Option II Apply investment comparison analysis

This sub-step requires the identification of a financial indicator most suitable for the project type and decision context.

To determine the financially attractiveness of the three alternatives, project proponent has chosen a financial indicator i.e. Project Net Present Value ("NPV"). Project NPV is the present value of future after tax cash flows minus the investment outlay discounted at cost of capital or required rate of return ("benchmark rate").

The benchmark rate represents the standard return in the market, considering the specific risk of the project type, but not linked to the subjective profitability, expectation or risk profile of a particular project developer, which consistent with the approach prescribed in Sub-step 2b – Option III of Tools for the demonstration and assessment of additionality for identification of relevant benchmark value

For the purposes of investment comparison analysis and notwithstanding the outcome of Step 1, the project proponent has identified two different benchmark rate for each of the identified alternatives namely benchmark rate in the pulp and paper industry and benchmark rate of power producers in the country.

Benchmark rate for pulp and paper

As the proposed project activity is the first of its kind project using EFB in pulp and paper industry, the project proponent have thus chosen the standard return in pulp and paper industry as its benchmark rate.

The benchmark rate of 9.23% is thus adopted in the investment comparison analysis and is derived from the Weighted Average Cost of Capital (WACC) in other pulp and paper companies as below:

Table B.4: ROCE of major pulp and paper companies

Pulp and paper companies	WACC
Stora Enso	9.1%[9]
Pulp and Paper industry in British Columbia	11%[10]
Metso	7.6[11]
Average	**9.23%**

The above benchmark rate of 9.23% will be applied on Alternative 1 and 2 respectively

Benchmark rate for power producers

The benchmark rate (IRR) adopted by the project proponent in the investment comparison analysis on Alternative 3 is the standard return in the market for independent power producers in the country of 12%[12] for any new power purchasing agreement entered into with the country national power producer, Tenaga Nasional Berhad.

The justification for chosing the IPP standard return as benchmark is in accordance with the guideline contained in Sub-step 2b of the latest approved Tools for the demonstration and assessment of additionality which reads

"financial / economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type".

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III).

As Sub-step 2b-Option II was used, this sub-step requires the project proponent to calculate and compare the financial indicator calculated for the proposed CDM project activity for the other alternatives. Thus, Project NPV was calculated for three alternatives i.e. **Alternative 1, Alternative 2 and Alternative 3**.
In undertaking the investment comparison analysis, all relevant costs e.g. investment cost, operating and maintenance costs and revenues (where applicable) have been included.

The result of the analysis is set out in Table B.5

9 Stora Enso – Financial Targets, http://www.storaenso.com/ABOUT-US/STRATEGY/FINANCIAL_TARGETS/PAGES/default.aspx

10 Pulp & Paper Industry Advisory Committee Report.

[11] Metso – http://fp.ncb.ie/equities/MandatumMetso070504.pdf

[12] Para 1, Page 17 of 28 of the report "The IPP Investment Experience in Malaysia" by Jeff Rector

Table B.5: Project NPV of Alternative 1, Alternative 2 and Alternative 3

Realistic and credible alternative	Project NPV (MYR'000)
Alternative 1 Project implemented not as CDM project	(48,491)[13]
Alternative 2 Landfill of EFB	(540)[14]
Alternative 3 Cogeneration plant	(6,641)[15]

As observed from the above results, Alternative 1 cannot be considered as the most financially attractive as Alternative 2 and Alternative 3 has a better Project NPV.

Sub-step 2d. Sensitivity analysis (only applicable to options II and III)

A sensitivity analysis was conducted by altering the following parameters:

- Fixed and variables costs
- Working days, end product production
- Selling price of end product

Those parameters were selected as being the most likely to fluctuate over time. Sensitivity analysis were performed altering each of these parameters and assessing at what value (fluctuation) the project NPV would reach the benchmark (NPV = 0 (zero)).

Table B.6: Sensitivity analysis to identify at what variation NPV equal zero (0) on Alternative 1

Scenario / Parameters	% change	NPV (RM'000)
Original	-	(48,491)
Reduction in fixed & variables cost parameter - (1a)	(314.92)	0
Increase in working days, end product production (paper) from 330 days/p.a - (1b)	198.27	0
Increase in selling price of end product (paper) - (1c)	14.39	0

As demonstrated in table B.6 above, a decrease of 314.92% in the fixed and variable costs would make the NPV equal to zero (0) but since inflationary pressure does exist, this decrease will not occur during the 21 years of duration of the project. On the other hand, an increase of 198.27% in the working days will not occur as this would mean having more than 365 days per annum.

Finally for the selling price of the end product to increase by 14.39% is not likely to be achievable at this moment reason being that the end product is still relatively new in the market and the utility remain untested and it would require sometime for it to gain the acceptance and market share.

[13] Please refer to column D36, Proj NPV – without CERs , Eko Pulp & Paper - NPV 12_09_08.xls file

[14] Please refer to column D36, Proj NPV – Baseline (Landfill), Eko Pulp & Paper – NPV 12_09_08.xls file

[15] Please refer to column D35, Proj NPV – Baseline (Cogen), Eko Pulp & Paper – NPV 12_09_08.xls file

Outcome of Step 2

Results set out in Table B.5 and B.6 are consistent and concludes that Alternative 1 (i.e. the proposed CDM project activity) is unlikely to be the most financially attractive.

STEP 3: Selection of baseline scenario

This step serve to identify which of the remaining credible and plausible alternatives remains in Step 2 shall be the baseline scenario. As mentioned in AM0057 (version 02.2) and conservative assumption, the most likely baseline scenario shall be the alternative that results in the lowest baseline emissions which reads:

"Where more than one credible and plausible alternative remains, project participants shall, as a conservative assumption, use the alternative baseline scenario that results in the lowest baseline emissions as the most likely baseline scenario. The least emission alternative will be identified for each components of the baseline scenario".

Pursuant to the outcome in Step 1 and Step 2, the above requirement shall not apply as there are only one and most plausible baseline scenario for the agricultural waste i.e. Alternative 2 (EFB is dumped or left to decay under clearly anaerobic conditions, such as landfilling or Scenario B3); and

The most plausible baseline scenario for production of paper is no installation of a pulp and paper plant at the project site but paper production in other new and/or existing paper plants at other sites using locally available cellulose typically used in the region (Scenario P3).

With Scenario B3 and Scenario P3 identified as the baseline scenario, it fulfils the requirements of AM0057 (Version 02.2) which reads:

"The methodology is only applicable if:

- *The most plausible baseline scenario for the agricultural waste is identified as the disposal of the waste in a landfill (Scenario B3); and*
- *In case of pulp and paper production, the most plausible baseline scenario for the production of paper is either P2 or P3"*

As further discussed in Step 3 of the methodology, if the identified baseline scenario is B3, the following needs to be demonstrated to ensure that either one of the following condition set out below, is expected to last during the crediting period.

(1) Establish that the identified landfill(s) can be expected to accommodate the agricultural waste to be used for the proposed project activity for the duration of the crediting period, ("Option 1"); or
(2) Establish that is common practice in the region to dispose of the agricultural waste in solid waste management site (landfill), ("Option 2").

Since the identified baseline scenario is B3 as per outcome in Step 1 and Step 2 above, the project proponent have thus chosen Option 1 i.e. to establish that the identified landfill(s) can be expected to accommodate the agricultural waste to be used for the proposed project activity for the duration of the crediting period.

The landfills that will be used to supply EFB to the proposed project activity has been identified and have the following potential for supplying further EFB as follows:

Table B.7: Total availability of EFB from landfills and disposal area

No of landfills	EFB production per year for deposition in landfills	Remaining area in landfill	Years of capacity[16] – taking into account degradation of the EFB
3	204,930	750,000 m2	> 30 year

As observed from Table B.7 above, the landfills identified are able to accommodate the EFB requirement of the proposed project activity, thus it is demonstrated that Option 1 has been fulfilled.

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 CDM project activity (assessment and demonstration of additionality):

Pursuant to AM0057 (version 02.2), project proponent shall assess and demonstrate the additionality of the project using the latest version of the "Tool for demonstration and assessment of additionality" (version 05.2) (EB 39).

The project proponent started in mid 2006 to develop the methodology for the CDM project activity. The first version of the methodology was submitted to the UNFCCC Secretariat in October 2006. The final approval of the methodology came in EB 33 25-27 July 2007.

The initial construction i.e. site pilling started in August 2007 after the methodology was approved. Thus, it is clear from the above, that the project proponent has emphasised and taken into account CDM registration as a key factor in initiating the Eko Pulp and Paper Project.

The Tool for demonstration and assessment of additionality prescribes four steps to establish additionality:

STEP 1. Identification of alternatives to the project activity consistent with current laws and regulations
STEP 2. Investment analysis
STEP 3. Barriers analysis
STEP 4. Common practice analysis

STEP 1: Identification of alternatives to the project activity consistent with current laws and regulations

[16] Assuming 5 meters high in the landfill and 135,172 m^2 landfill needed for 7 years first years of deposition. See Annex 7 for further details of the calculation

As prescribed in the latest tool for the Tools for demonstration and assessment of additionality, Step 1 consists of two sub-steps namely:

Sub-step 1a. Define alternatives to the project activity
Sub-step 1b. Consistency with mandatory laws and regulations

Please refer section B.4 above for the definitions of alternatives to the proposed project activity.

STEP 2: Investment analysis

As prescribed in the latest tool for the Tools for demonstration and assessment of additionality, Step 2 consists of four sub-steps namely:

Sub-step 2a. Identification of the appropriate analysis method;
Sub –step 2b. Apply analysis method (Option I. simple cost analysis or Option II, investment comparison analysis or Option III, benchmark analysis)
Sub-step 2c. Calculation of comparison of financial indicators (only apply to options II and III); and
Sub-step 2d. Sensitivity analysis (only applicable to options II and III)

Please refer to section B.4 above for results of Sub-step 2a, Sub-step 2b, Sub-step 2c and Sub-step 2d.

STEP 3: Barrier analysis

Notwithstanding the outcome in Step 2, this step is included to demonstrate that the proposed project activity i.e. Eko Pulp and Paper Project faces barriers that:-

- Prevent the implementation of the proposed project activity; and
- Do not prevent the implementation of at least one of the alternatives.

As prescribed in the latest tool for the Tools for demonstration and assessment of additionality, Step 3 consists of two sub-steps namely:

Step 3a. Identify barriers that would prevent the proposed project activity from occurring
Step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)
Step 3a. Identify barriers that would prevent the implementation of the proposed project activity

This step establishes the realistic and credible barriers that would prevent the implementation of the proposed project activity from being carried out if the project activity was not registered as a CDM activity.

The list of realistic and credible barriers that would prevent the implementation of Alternative 1 and Alternative 2 are broadly analysed as follows:

- *Investment barriers*

- *Technological barriers*
- *Barriers due to prevailing practice*

Step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)

Following the two (2) alternatives to agricultural waste management of EFB identified in Step 1 and Step 2 above, only Alternative 1 and Alternative 2 are considered as realistic and credible baseline scenario and are subject to barriers analysis Step 3 herein.

Table B.8: Barrier analysis

Barrier	**Realistic and credible alternatives**	
	Alternative 1: Proposed project activity not undertaken as a CDM project activity.	**Alternative 2: Landfill.**
Investment barriers	Using biomass waste (EFB) as a raw material for pulp and paper production is an innovative idea and because the idea is new, investors are more cautious because of the risks involved, making funding for the proposed project activity (not implemented as a CDM project) difficult. This is especially true since there is uncertainty for which applications the pulp and paper can be utilised.	No investment barrier.

Barrier	Realistic and credible alternatives	
	Alternative 1: Proposed project activity not undertaken as a CDM project activity.	**Alternative 2: Landfill.**
Technological barrier	The technological aspects of the proposed project activity (not implemented as a CDM project) are more complicated than the disposal of the biomass waste on a landfill without the capture of landfill gas. The proposed project activity requires among others a thresher, fibrilizer, screw press, digester, blow tank, boiler, and hot press whereas the disposal of the biomass waste on a landfill without the capture of landfill gas simply requires transportation to the landfill. The proposed project activity requires huge investments for its machinery and higher O&M costs compared to the disposal of the biomass waste on a landfill without the capture of landfill gas. The EFB is very bulky and with high moisture content. Therefore it is necessary to press the EFB and shred to obtain a particular size that is acceptable for use in the pulp production. Furthermore the equipment used in the preparation of the fuel will generally experience significant wear and tear which is due to the high presence of silica content in the EFB and hence an increase in the maintenance cost.	No technological barrier.
Barriers due to prevailing practice	The proposed project activity is the first of its kind in Malaysia and in the world. The barrier is both in relation to the existing technology in the palm oil sector, but also to possible buyers in the pulp and paper industry. The market related barriers can be summarised in three categories. **a) Competition from existing market players** Market risks will arise from competition posed by existing market players in the pulp and paper industry which has been long established in the	EFB is dumped or left to decay under clearly anaerobic condition such as landfilling, is the prevailing practice.

Barrier	Realistic and credible alternatives	
	Alternative 1: Proposed project activity not undertaken as a CDM project activity.	**Alternative 2: Landfill.**
	country and in the region. The degree of competition posed by existing paper producers is also aggravated by the sheer size of large manufacturers which benefit from economies of scale and the retention of a group of loyal customers over many years. **b) Uncertain market acceptance** Market risk also emerges from the use of EFB as an unconventional raw material to produce paper. Although the fibre characteristics and chemical content of EFB and the characteristic of the paper after the chemical process is similar to that of wood based raw material like eucalyptus and able to meet the specification of hard wood pulp, there is uncertainty attached to consumers' acceptance of paper made from new forms of raw materials. **c) Uncertain demand level in a niche market** As this proposed project activity is operating predominantly in a niche market, the anticipated demand for the paper made from EFB is less certain compared to the general rising demand level for pulp and paper made from conventional raw material. The marketability of the product is also constrained by the lower awareness level on environmental-friendly products especially in less developed parts of the world.	

As observed from Table B.8 above, there are very significant barriers for the Alternative 1, i.e. the proposed project activity not undertaken as a CDM proposed project activity as compared to Alternative 2, landfilling, which is well known to have no investment or technological barriers.

In addition to the above and to demonstrate that the proposed project activity is indeed additional, the project proponent has included a financial analysis on Eko Pulp and Paper Project i.e. the proposed project activity without and with CDM registration in Table B.9.

Table B.9: Project NPV of the project activity with and without CDM registration

Financial indicator	Proposed project activity without CDM registration (MYR'000)	Proposed project activity with CDM registration (MYR'000)
Project NPV	(48,491)[17]	13,375[18]

As observed from Table B.9, registration of the proposed project activity as a CDM project activity is critical as it will help to alleviate the identified barriers in Table B.8 that would prevent the implementation of the proposed project activity from being carried out if the project activity was not registered as a CDM activity.

STEP 4: Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity

This step serve to provide an analysis of any other activities implemented previously or current underway that are similar to the proposed project activity.

At present, there are no activities similar to the proposed project activity, which uses EFB as feed stock in pulp and paper production in Malaysia or in the world. This is a true breakthrough for a cleaner technology utilising a polluting waste product.

The fact that EFB has never before been used a raw material for pulp and paper production clearly shows that the Eko Pulp and Paper Project goes beyond the business as usual scenario in the pulp and paper production industry.

Sub-step 4b. Discuss any similar options that are occurring

No similar project activity has been implemented due to investment and technological barriers discussed in Table B.8, and thus no further discussion has been included.

Hence, from Sub-step 4a and Sub-step 4b, the Eko Pulp and Paper Project (not registered as a CDM project activity) represents a significant deviation from the common practice in the pulp and paper industry and therefore additional to the business as usual scenario.

[17] Please refer to column D36, Proj NPV – without CERs , Eko Pulp & Paper - NPV 12_09_08.xls file

[18] Please refer to column D38, Proj NPV – with CERs , Eko Pulp & Paper – NPV 12_09_08.xls file

In addition and based on the recommendation in Annex 10 of the 34th meeting of the Meth Panel to the Executive Board, a project that is "first-of-its-kind" is able to demonstrate that is additional by applying the barrier "first-of-its-kind". As per Annex 10, a project activity is assumed to be additional if no similar project has been implemented previously in a certain geographical area.

According to the guidance contained in Annex 10, there are 3 main issues that should be addressed to make the barrier "first-of-its-kind" as listed below:-

1. Provide a definition of the number of similar project activities that may have already been implemented to still regard the project activity as "first-of-its-kind";
2. Provide a definition of the technologies, for which barrier "first-of-its-kind" can be used and a definition of what is regarded as a similar technology or project activity;
3. Provide a definition of the geographical area to be used for the assessment of the number of similar project activities that have already been implemented.

The AM0057 version 02.2 covers two broad technologies i.e pulp and paper from agricultural waste and bio oil from agricultural waste. Since each type of agricultural waste has its own technical issues, hence each type of waste should be seen as a type of technology. This project concerns pulp and paper production from EFB.

Finally the Meth Panel suggested that the host country as the appropriate geographical area by default for the analysis.

The Project is the first-of-its-kind pulp and paper production that uses EFB in Malaysia – and on a global scale. No other projects have been submitted for validation under AM0057 version 02.2 anywhere in the world[19] and the proposed project is as such the first of its kind – not only in the host country Malaysia, but in the whole world. The conclusion is not contingent on the specific definition of the technology as no other projects have been submitted with other types of biomass waste either.

Thus the proposed project is indeed additional based on the first-of-its-kind barrier.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The use of EFB as raw material for pulp and paper production is covered by the methodology AM0057 (version 02.2) "Avoided emissions from biomass wastes through use as feed stock in pulp and paper production or in bio-oil production". This is demonstrated in section B2 of the PDD.

a. Project Emissions

The project emissions will be calculated using formula 1

$$PE_y = PE_{FC,j,y} + PE_{EC,y} + PE_{CO2,TR,y} \quad \textbf{(1)}$$

[19] Search on the cdm.unfccc.int website on September 15, 2008

Where:

PE_y	=	Project emissions in year y (tCO_2e/yr)
$PE_{FC,j,y}$	=	CO_2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO_2e/ yr)
$PE_{EC,y}$	=	Project emissions from electricity consumption by the project activity during the year y (tCO_2e/yr)
$PE_{CO2,TR,y}$	=	Emissions from transport of biomass to the plant, where the distance is longer than in the baseline (tCO_2e/yr)

There is no on site use of fossil fuels as the steam needed for the plant will be produced either by a black liquor recovery boiler or a biomass power and steam plant. The latter will be implemented as a CDM project of its own. There will not be imported any electricity from the power grid. Both $PE_{FC,j,y}$ and $PE_{EC,y}$ will thus be zero. It will be monitored through the operation of the plant that this will remain unchanged through the crediting period.

Transport of biomass

Option 1 for calculation of transport emissions from the pulp and paper methodology has been chosen.
The raw material for the production of pulp and paper will be sourced from palm oil mills in the Lahad Datu,/Tawau region of Sabah. This means that the maximum distance for the transport of EFB will be up to 60 km.

The formula to calculate the emissions from the transport is

$$PET_{AW,y} = N_{AW,y} \cdot AVD_{NW,y} \cdot EF_{km,CO2,y} \quad \textbf{(2)}$$

$PE_{CO2,TR,y}$	=	CO_2 emissions during the year y due to transport of agricultural wastes to the plant in year y (tCO_2e/yr)
$N_{AW,y}$	=	Number of round trips (from and to) truck(s) made for the delivery of agricultural waste during the year y
$AVD_{AW,y}$	=	Average round trip distance (from and to) between the agricultural waste supply sites and the site of the project activity during the year y (km)
$EF_{km,CO2,y}$	=	Average CO_2 emission factor for the trucks measured during the y (t CO_2/km)

The project activity is expected to use 180,000 tons of biomass waste, EFB as fuel annually ($BF_{EFB,k,y}$) and average 20 ton per truck (TL_y), it will be 9,000 trips to bring fuel to the project site. The average distance to the palm oil mills is 60 km, so the round trip will be 120 km. (AVDy = 120 km). With an efficiency of 39 litre diesel per 100 km then the fuel use per km will be 0.39 litre. The emission of CO_2 from one litre of diesel is 2.7 kg CO_2/litre (calculated from IPCC default values for diesel). That leads to an emission factor of 1.053 kg/km ($EF_{km,CO2,y}$= 0.001053 t/km)

$PE_{CO2,TR,y}$ = (180,000 / 20) x 120 x 0.001053 = 1,137 t CO_2/year.

b. Baseline Emissions

$BE_y = BE_{CH4,SWSD,y} – (MD_{reg,y} * GWP_{CH4})$ **(3)**

where:

BE_y	=	Baseline emissions in year, y (tCO_2e/yr)
$BE_{CH4,SWSD,y}$	=	Methane emissions avoided during the year y, calculated according to the latest approved version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (SWDS)
$MD_{reg,y}$	=	Methane that would be destroyed in the absence of the project activity in year y (tCH_4)
GWP_{CH4}	=	Global Warming Potential (GWP) of methane (tCO_2e/tCH_4)

The baseline emissions from degradation of the EFB are calculated using the first order decay model described in formula 4:

$$BE_{CH4,SWDS,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x-1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-kj \cdot (y-x)} \cdot (1-e^{-kj}) \quad \textbf{(4)}$$

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 (f=0)
GWP_{CH4}	=	Global Warming Potential (GWP) of methane, valid for the relevant commitment period = 21
OX	=	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste) = 0
F	=	fraction of methane in the SWDS gas (volume fraction) (default 0.5)
DOC_j	=	Fraction of degradable organic carbon (by weight) in the waste type j
DOC_f	=	Fraction of degradable organic carbon (DOC) that can decompose (IPCC default 0.5)
MCF	=	Methane Correction Factor (fraction – see table below)
$W_{i,x}$	=	Amount of organic waste type j prevented from disposal in the SWDS in the year x (tons)
k_j	=	Decay rate for the waste type j
j	=	Waste type category (index)

x = Year during the crediting period: x runs from the first year of the first crediting period (x=1) to the year y for which avoided emissions are calculated (x=y)

y = Year for which methane emissions are calculated

Since the landfills are unmanaged the f and OX values are 0 for this project.

The GWP for methane is 21 for the first commitment period.

The "*Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 04) (EB41)"* gives values for a number of waste types and for different climatic conditions. The project developer will make an effort to develop specific values for EFB under Malaysian conditions to reduce the uncertainty on the estimates of baseline calculations. These values will latest be presented in the first monitoring report for an ex post recalculation of the baseline.

The MCF is determined from the IPCC 2006 guidelines for National Greenhouse Gas Inventories after the following table:

TableB.10: Methane correction factor default values

Type of site	Methane correction factor (MCF) default values
Managed	1.0
Semi managed	0.5
Unmanaged – deep (>5m waste)	0.8
Unmanaged – shallow (< 5 waste)	0.4

Source: IPCC 2006Guidelines for National Greenhouse Gas Inventories

In the present case the landfills are unmanaged and more than 5 meters deep. Therefore the MCF to be used is 0.8.

For determining the decay constant k the guidance from IPCC 2006 is suggested as described in the Table B.11 below.

Table B.11: IPCC (2006) Default values for the decay factor

Waste type *j*		Boreal and Temperate (MAT<20ºC)		Tropical (MAT>20ºC)	
		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	0.10	0.065	0.17
Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.06	0.185	0.085	0.40

Malaysia clearly qualifies under the tropical, moist and wet conditions. The Mean Annual Temperature (MAT) is around 26 degrees and the Mean Annual Precipitation (MAP) is 2000-4000 mm depending on location, both above the benchmarks of MAT of 20 degrees and MAP of 1000 mm.

The Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (version 04) (EB41) prescribes that EFB should use values for garden waste.

Table B. 12: DOCj factors

Waste type *j*	DOCj (% wet waste)	DOCj (% dry waste)
Wood and wood products	43	50
Pulp, paper and cardboard (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

The Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (version 04) (EB41) prescribes that EFB should use values for garden waste and that the calculation must be undertaken on a dry weight basis.

In summary the values used for the calculations of methane emissions in the baseline:

Table B.13: Input value for calculation of methane emission reduction

Φ	F	OX	F	DOCj	DOCf	MCF	k_j
0.9	0	0	0.5	0.49	0.5	0.8	0.17

Emission reductions from the use of EFB for pulp and paper production can be seen in Table B.16 in Section B.6.3

The landfills where EFB is deposited are not of sanitary landfill standard. In general very few – even municipal landfills – in Malaysia have capture of landfill gas. It is not a legal requirement and the projects that have been implemented in recent years have been CDM projects. Therefore it is not any methane capture and combustion from the EFB landfills.

c. Leakage Emissions

Leakage can conceptually occur in different ways:

- If the implementation of the project leads to a situation where other raw materials for pulp and paper production will be replaced and eventually end up in a landfill and thus give rise to GHG emissions.

- If raw material for the use in the pulp and paper plant is competing with use of the same biomass resource as biomass fuel. The result would be that there would be an increase in fossil fuel use because the biomass used in the project activity is no longer available for energy purposes.

$$LE_y = L_{y,disp} + L_{y,fossil} \quad \textbf{(5)}$$

Where:

LE_y = Leakage in year y (tCO_2e/yr)

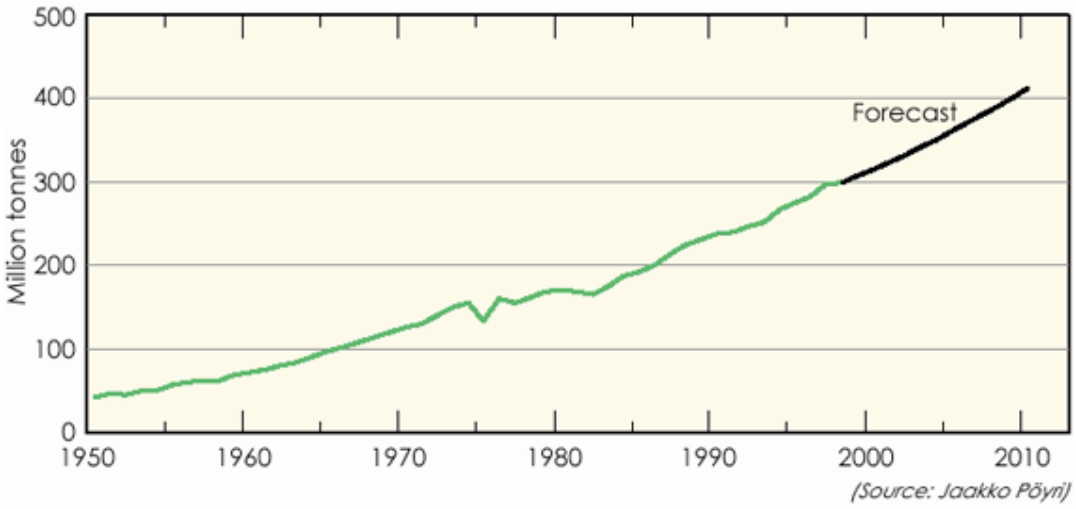
$L_{y,disp}$ = Leakage from possible disposition of recycled paper (tCO_2e/yr)

$L_{y,fossil}$ = Leakage from increased use of fossil fuel due to the replacement of biomass fuel with fossil fuel

Leakage from possible deposition of recycled paper

Pulp and paper is a global commodity and the global demand for pulp and paper is growing. This means that there will be a continued need for new raw materials being utilised for production of pulp and paper. It is not expected though that the decision to build one new pulp plant will affect the global balance between demand and supply – and thus the price of pulp products. There will thus be no leakage effect in the sense of affecting demand patterns.

Figure B 5: Global production of paper (quoted from WEC, 2004)



There is a growing demand for paper as seen from the historical data for the past years and also projected increase in demand in the future. Therefore it is quite unlikely that recycled materials from newspaper and old carton boxes for example will not eventually be used as raw material in paper production to cater to the increasing demand in paper. If there is no excess of recycled paper in the market as raw material for paper production, then leakage is ruled out. Leakage could occur if there is a risk that the project is replacing recycled paper as raw material. If leakage is an issue for the project then a conservative approach should be taken and the possible emissions of dumping of recycled paper should be counted as leakage.

Since there is a global growth in the demand for pulp and paper it is not possible to fulfil this demand alone through recycling of paper. There will be a need for an increasing contribution of new, "virgin", pulp and paper products. At the same time the purely recycled pulp and paper products are the lowest priced in the market. New products trying to enter the market will therefore aim for uses where other virgin pulp is replaced.

There is no risk of such leakage since the product from Eko Pulp and Paper will be unbleached kraft paper (UKP). The total trade in UKP in Asia Pacific was 1.3 million t in 2002. Of this 99% was based on softwood and the remaining 1% from hardwood.[20] This means that the product from the Eko Pulp and Paper production will not compete with recycled paper. There will thus not be any risk of leakage from paper being deposited in a landfill instead of being recycled as a consequence of competition from the suggested proposed project activity.

There will on the contrary be a positive carbon effect from the proposed project activity in the sense that it will avoided cut down of trees for paper production. This positive effect is not quantified and included in the calculations, but it adds to the conservativeness of the total greenhouse gas effects of the proposed project activity.

[20] Jaakko Poyry, 2003: Market Viability for an integrated palm oil pulp and unbleached kraft paper mill in Malaysia. Performed for TSH Resources Berhad in December 2003.

Leakage from increased fossil fuel use

The methodology prescribes that an assessment of the risk of leakage from diversion of the use of biomass from existing use towards the CDM project activity. Two methods are suggested:

L1 Demonstrate that there is an abundant surplus of the agricultural waste in the region of the project activity, which is not utilized. For this purpose, demonstrate that the quantity of available agricultural waste in the region is at least 25% larger than the quantity of agricultural waste that is utilized (e.g. for energy generation or as feedstock), including the project plant.

L2 Demonstrate that supplier of the agricultural waste in the region of the project activity are not able to sell all of their agricultural waste. For this purpose, project participants shall demonstrate that the ultimate supplier of agricultural waste (who supplies the project) and a representative sample of agricultural waste suppliers in the region has a surplus of agricultural waste (e.g. at the end of the period during which the agricultural waste is sold), which they could not sell and not utilized.

Here it is chosen to follow approach L1 because more direct data are available for this approach.

The total processing of FFB in Sabah was in 2005 was 24,993,135 tonnes FFB[21]. The official statistic does not provide a breakdown on districts therefore the breakdown has to be calculated. Table B.14 shows the number of palm oil mills and their aggregated approved capacity for districts in Sabah in 2005[22]. The total approved capacity in 2005 was slightly lower (22,466,600 t FFB) than the actual processed amount of FFB. This is quite normal that the Malaysian Palm Oil Board (MPOB) approved capacity may be marginally lower than the actual processing.

Table B.14: Palm oil processing in Sabah in 2005

District No.	District	No. of palm oil mills	Approved capacity t FFB/year	Estimated production t FFB/year	Is it part of East Sabah? (Yes/No)
1	Kinabatangan	26	4,578,000	5,092,830	No
2	Kunak	8	1,358,000	1,510,717	Yes
3	Semporna	3	512,000	569,578	Yes
4	Labuk/Sugut	16	3,063,800	3,408,347	No
5	Lahad Datu	25	6,440,000	7,164,226	Yes
6	Pantai Barat	1	96,000	106,796	No
7	Pendalaman	1	216,000	240,291	No
8	Sandakan	13	2,628,000	2,923,538	No
9	Tawau	10	2,070,800	2,303,677	Yes
10	Keningau	2	1,264,000	1,406,146	No

[21] MPOB 2006: Malaysian Oil Palm Statistics 2005 p. 39

[22] Chow Mee Chin, 2006: An Assessment Of Potential And Availability Of Palm Biomass For Bioconversion To Bioethanol. Table 8, page 19. Downloaded from www.eib.org.my

District No.	District	No. of palm oil mills	Approved capacity t FFB/year	Estimated production t FFB/year	Is it part of East Sabah? (Yes/No)
11	Tenum	1	96,000	106,796	No
12	Beaufort	1	144,000	160,194	No
	Total	**107**	**22,466,600**	**24,993,135**	
	Total FFB processed in East Sabah			11,548,198	

In TableB.14, the actual amount of FFB processed has been distributed on the districts based on the approved capacity.

The project is located in District No.2 i.e. Kunak. District No.3 i.e. Semporna, District No.5 i.e. Lahad Datu and District No. 9 i.e. Tawau had been chosen in the analysis as these districts are directly bordering District No.2 i.e. Kunak. This means that areas within 100-200 km from the project activity site are included. (See map in Annex 7). Based on Table B.18, the total amount of FFB processed in Districts No. 3, 5 and 9 which are relevant to this analysis is estimated at 11,548,198 ton.

There are no official statistics on the production and use of EFB, so the total available amount of EFB has to be calculated. This is done based on the common assumption that 23 % of the FFB processed will be EFB. Further it is assumed that the annual increase in FFB processed in Sabah will be 3.5% p.a.[23]. Based on the FFB projection and the percentage of EFB in FFB, the annual supply of EFB can be calculated.

The demand for EFB is estimated through the number of potential CDM projects in the region. The CDM projects considered are derived from the UNEP "CDM-pipeline"[24]. The CDM Pipeline contains a list of all CDM projects that have either been uploaded for Global Stakeholder Process under validation or has been submitted for registration at the UNFCCC. The list is updated monthly and provides thus a good overview of the projects under development.

The list of projects located in the relevant part of Sabah and their corresponding data on consumption of EFB have been identified and obtained from the related PDDs. The list is likely to overestimate the amount of EFB consumption, as some of the projects in Table B.19 may not be implemented due to non registration as CDM project activities or other unforeseen circumstances.

In addition, save and except for consumption by CDM projects activities, it is worth to note that there is no known use for EFB in the region.

Table B.15 sets out the balance between the available amount of EFB and the consumption in East Sabah for 2008 – assuming that all CDM project activities will use their required amount of EFB in that year. This is a very conservative assumption as some of the projects will not be fully operational from 1 January 2008.

[23] Anders Evald et al 2005: Renewable Energy Resources (in Malaysia) Recalculated based in table 2.2 p 10

[24] CDM pipeline – downloaded from www.cdmpipeline.org 12/01/2008

Table B.15: EFB in East Sabah – Production and consumption

Details	**t**
Total processed FFB in East Sabah (Projection for 2008)	12,801,429
Total EFB 23 % of FFB (23% x 12,801,429)	**2,944,329**
less: EFB consumption	
Kunak Bio Energy Project	92,015
Kunak Jaya Bio Energy Project	109,067
Eko Pulp and Paper Project – Pulp production plant	180,000
Polar Vertix Biomass Energy Project	9,934
Lahad Datu Edible Oils Sdn Bhd – Bio energy plant	122,500
Felda Sahabat – Bio Energy Plant	246,000
Golden Hope – Merotai – Composting project	99,360
Timura Samling POM – Composting project	48,000
Leluasa Edible Oil Refinery – Biomass steam plant	40,000
Asia POM – Composting project	104,480
Takon POM – Composting project	78,080
Total EFB consumption	**1,129,436**
Excess / (shortfall) of EFB	***1,814,893***
Percentage of excess (shortfall)	***61.6%***

Table B.15 conservatively affirms that there is approximately 62 % of unconsumed EFB in the region after deducting all the volume consumed by the CDM projects activities set out in Table B.15. This percentage exceeded the 25% unconsumed EFB benchmark required as the criteria to rule out leakage. Furthermore, there is still excess EFB to accommodate other minor uses such as mulching without changing the conclusion.

d. Emission Reductions

$$ER_y = BE_y - PE_y - L_y \qquad \textbf{(6)}$$

Where

ER_y	-	Emission reductions of the project activity during the year y (tCO_2e/yr)
BE_y	-	Baseline emissions during the year y (tCO_2e/yr)
PE_y	-	Project emissions during the year y (tCO_2e/yr)
L_y	-	Leakage emission during the year y (t CO_2e/yr)

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

ID No.	A
Data / Parameter:	**Φ – Correction factor for uncertainty**
Data unit:	Fraction
Description:	Model correction factor to account for model uncertainties.
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (version 04), (EB41).
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	The factor is prescribed by the Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (version 04), (EB41).
Any comment:	Not Applicable

ID No.	B
Data / Parameter:	**OX – Oxidation factor**
Data unit:	Fraction
Description:	Oxidation factor reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste.
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (version 04) (EB41).
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 deposited are unmanaged and not covered by any oxidation covering material.
Any comment:	Not Applicable

ID No.	C
Data / Parameter:	**f – Fraction of methane captured and flared**
Data unit:	Fraction
Description:	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 disposal of waste at a solid waste disposal site (version 04) (EB41).
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 deposited are unmanaged and not covered by any oxidation covering material.
Any comment:	Not Applicable

ID No.	D

Data / Parameter:	**F – Fraction of methane in landfill gas**
Data unit:	Fraction
Description:	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 – and since the deposition of the biomass has already stopped it will not be possible to measure the value.
Any comment:	Not Applicable

ID No.	**E**
Data / Parameter:	**MCF** Methane Correction Factor
Data unit:	Fraction
Description:	Methane Correction Factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value for unmanaged landfill of more than 5 meters depth.
Any comment:	Not Applicable

ID No.	**F**
Data / Parameter:	**DOC_f**
Data unit:	Fraction
Description:	Fraction of degradable organic carbon (DOC) that can decompose.
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (version 04) (EB41).
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value according to the tool.
Any comment:	Not Applicable

ID No.	**G**
Data / Parameter:	**DOC_j** per cent of degradable organic carbon (by weight) in the waste type j.
Data unit:	Fraction
Description:	Fraction of degradable organic carbon (by weight) in the waste type j.

Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (version 04) (EB41).
Value applied:	0.49
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is prescribed by the tool as EFB has to use parameters for garden waste. The calculation for avoided methane emissions is done using the dry weight of the EFB.
Any comment:	Not Applicable

ID No.	**H**
Data / Parameter:	**GWP_{CH4}**
Data unit:	t CO_{2e}/t CH_4
Description:	Global Warming Potential (GWP) of methane, valid for the relevant commitment period.
Source of data:	Decisions under UNFCCC and the Kyoto Protocol (a value of 21 is to be applied for the first commitment period of the Kyoto Protocol).
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	21 for the first commitment period. This value shall be updated according to any future COP or MOP decision.
Any comment:	Not Applicable

ID No.	**I**
Data / Parameter:	**k_j - Decay constant for the EFB**
Data unit:	Dimensionless.
Description:	The rate of decay of the EFB is an important parameter in calculating the avoided methane emissions from the dumping of the EFB in the baseline scenario. Credible data from field conditions does not exist.
Source of data:	"Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"; (version 04) (EB41).
Value applied:	0.17
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value is applied based on moderately degrading garden waste in a tropical warm (MAT>20°C) and wet (MAP > 1000mm) climate.
Any comment:	Not Applicable

B.6.3. Ex-ante calculation of emission reductions:

Baseline emissions

Baseline emissions stems from the avoided methane emissions from the deposition of EFB used in pulp and paper production in landfills. The EFB used as raw material for the production of pulp and paper in the industrial plant would have been deposited in a landfill in the absence of the project.

The calculation of the baseline emissions have been undertaken with the use of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (version 04), (EB41)". The calculation of baseline emission using the First Order Decay model (formula 4) and the parameters used are summarised in table B.14 above.

The results of the baseline emission calculation for 180,000 tonnes of EFB used in the pulp and paper production are shown in table B.16 below.

Table B.16: Emission reductions from use of EFB in pulp and paper production

Avoided methane estimate	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Year 1	30,887	26,058	21,984	18,547	15,648	13,202	11,138
Year 2	-	30,887	26,058	21,984	18,547	15,648	13,202
Year 3	-	-	30,887	26,058	21,984	18,547	15,648
Year 4	-	-	-	30,887	26,058	21,984	18,547
Year 5	-	-	-	-	30,887	26,058	21,984
Year6	-	-	-	-	-	30,887	26,058
Year 7	-	-	-	-	-	-	30,887
Calculated	30,887	56,945	78,929	97,477	113,125	126,326	137,464
Conservativeness adjusted	27,798	51,251	71,037	87,729	101,812	113,694	123,718

The total baseline emissions are 577,039 t CO_2e in seven (7) years.

Project emissions

Project emissions stems from transport of EFB to the pulp and paper plant and are calculated using (formula 2) above. The annual project emissions are calculated to 1,137 t CO_2e per year or 11,372 t CO_2e in ten years.

Leakage

As demonstrated above there will be no leakage in this project

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

Table B.17: Summary of the ex-ante estimation of emission reductions

Year	Total Baseline Emissions, E_{BL} (t CO_2e)	Total Project Emissions, E_{PA} (t CO_2e)	Total Leakage Emissions, E_{LE} (t CO_2e)	Emission Reductions, ER (t CO_2e)
Year 1	27,798	1,137	0	26,661
Year 2	51,251	1,137	0	50,114
Year 3	71,037	1,137	0	69,900
Year 4	87,729	1,137	0	86,592
Year 5	101,812	1,137	0	100,675
Year 6	113,694	1,137	0	112,557
Year 7	123,718	1,137	0	122,581
TOTAL	577,039	7,961	0	569,077
Average	82,434	1,137	0	81,297

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

B.7.1. Data and parameters monitored:

ID No.	**1**
Data / Parameter:	**$BF_{PJ,k,y}$ as stated in AM0057 (version 02.2)** **or** **W_x as stated in Annex 10, "Tools to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (Ver 04)**
Data unit:	Ton
Description:	Quantity of biomass used for pulp and paper production during the year y as a result of the project activity.
Source of data to be used:	Project Developer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	180,000 t EFB/year (wet weight) converted into 72,000 t EFB/year (dry weight).
Description of	The EFB coming into the Eko Pulp and Paper Project will be weighed as part

measurement methods and procedures to be applied:	of the commercial operation of the proposed project activity.
QA/QC procedures to be applied:	The weighing equipment will be calibrated according to procedures to be established in operations manual for the proposed project activity. Measurements using mass meters at the proposed project site should be verified with an annual mass balance of the pulp and paper plant that is based on purchased quantity and stock changes.
Any comment:	Not Applicable

ID No.	**2**
Data / Parameter:	**-**
Data unit:	Tons
Description:	Quantity of EFB that are utilized (used for energy generation) in the defined geographical region.
Source of data:	Survey or statistics.
Value applied:	1,129,436 t EFB/year.
Description of measurement methods and procedures actually applied :	Annually collection of data from small scale renewable energy projects and CDM projects using EFB as fuel or feedstock in the districts of Lahad Datu, Kunak, Tawau and Semporna. If possible data on amount of used EFB is collected directly. Where only power production data are available estimates of the fuel use are calculated by default values from PDDs or generic information.
QA/QC procedures:	Compare with data from the previous year and ascertain that the methodology and data are comparable.
Any comment:	Element in evaluation of the leakage based on approach L_1.

ID No.	**3**
Data / Parameter:	**-**
Data unit:	Tons
Description:	Quantity of available EFB in the region.
Source of data:	Calculations are based on annual production statistics from MPOB for the districts of Lahad Datu, Kunak, Tawau and Semporna.
Value applied:	2,944,329 t EFB
Description of measurement methods and procedures actually applied :	Annually calculations of the amounts of EFB are based on the default relation between FFB and EFB of 23%.
QA/QC procedures:	Compare with data from the previous year and ascertain that the methodology and data are comparable.
Any comment:	Element in evaluation of the leakage based on approach L_1.

ID No.	**4**

Data / Parameter:	$N_{AW,y}$
Data unit:	-
Description:	Number of truck trips for the transportation of biomass.
Source of data:	The weighing of incoming trucks is used to measure the annual number of trucks arriving at the plant.
Value applied:	9,000.
Description of measurement methods and procedures actually applied :	Continuously.
QA/QC procedures:	Check consistency of the number of truck trips with the quantity of biomass combusted with other information from other sources (e.g. maps).
Any comment:	Not Applicable

ID No.	**5**
Data / Parameter:	$TL_{AW,y}$
Data unit:	Tons
Description:	Average load of the trucks used for the transportation of biomass
Source of data:	Data from the weighing of incoming trucks are used to calculate the average weight of the truck loads arriving at the plant.
Value applied:	20 t/truck.
Description of measurement methods and procedures actually applied :	Determined by averaging the weights of each truck carrying biomass to the project plant. Continuously, aggregated annually.
QA/QC procedures:	Check consistency of the number of truck trips with the quantity of biomass combusted, e.g. by the relation with previous years.
Any comment:	Not Applicable

ID No.	**6**
Data / Parameter:	$AVD_{AW,y}$
Data unit:	Km.
Description:	Average round trip distance (from and to) between biomass fuel supply sites and the project sites.
Source of data:	The distance to each biomass supplier is checked through measuring. Invoices from the different biomass suppliers are used to give the amount of biomass from each supplier. The value applied is the expected average distance.
Value applied:	120 km.
Description of measurement methods and procedures actually applied :	The average distance can then be calculated as the weighted average of distance to the mills. The sampling will be continuous.
QA/QC procedures:	Check consistency of distance records provided by the truckers by comparing recorded distances with other information from other sources (e.g. maps).

Any comment:	Not Applicable

ID No.	**7**
Data / Parameter:	$\mathbf{EF_{km,CO2,y}}$
Data unit:	tCO_2/km.
Description:	Average CO_2 emission factor for the trucks during the year y.
Source of data:	Sample measurement of the fuel type, fuel consumption and distance travelled for all truck types will be conducted. CO_2 emissions from fuel consumption will be calculated based on IPCC default values.
Value applied:	0.001053 tCO_2/km.
Description of measurement methods and procedures actually applied :	Annual monitoring.
QA/QC procedures:	The results will be cross-checked with emission factors referred to in the literature.
Any comment:	Not Applicable

ID No.	**8**
Data / Parameter:	
Data unit:	Tons
Description:	Tons of paper collected and recycled in the country
Source of data:	Authoritative market survey.
Value applied:	
Description of measurement methods and procedures actually applied :	Annually – using the most updated information available.
QA/QC procedures:	Compare with data from the previous year and ascertain that the methodology and data are comparable.
Any comment:	Use for evaluation of possible leakage by replacing recycled paper – option $L_{y,\ disp.}$

ID No.	**9**
Data / Parameter:	**Moisture content of the biomass residues**
Data unit:	% Water content.
Description:	Moisture content of each biomass residue type *k*, in this case, EFB
Source of data to be used:	On-site measurements.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	**Biomass** / **Moisture Content %**: EFB / 60
Description of measurement methods and procedures to be	Measurements are undertaken for representative samples of the incoming biomass waste, mean values calculated at least annually.

applied:	
QA/QC procedures to be applied:	Comparison with other measurements and with default values from literature.
Any comment:	Not Applicable

Table B.18: Data prescribed in the monitoring plan of the AM0057 (version 02.2) but not relevant for this project activity.

Data / Parameter	Description	Source	Remarks
$PE_{FC,j,y}$	Project emission from fossil fuel combustion in project activity	AM0057 (version 02.2)	Value applied for this parameter is "0" since there is no on site use of fossil fuels as the steam needed for the plant will be produced either by a black liquor recovery boiler or a biomass power and steam plant.
$PE_{EC,y}$	Project emission from electricity consumption in project activity	AM0057 (version 02.2)	Value applied for this parameter is "0" since there will not be imported any electricity from the power grid. All power needed for the plant will be produced by the biomass power and steam plant.
-	Demonstration that the biomass residues type k from a specific source would continue not to be collected or utilized, e.g. by an assessment whether a market has emerged for that type of agricultural waste (if yes, leakage is assumed not be ruled out) or by showing that it would still not be feasible to utilized the biomass residues for any purposes.	AM0057 (version 02.2)	Page 13/25 of Methodology AM0057 (version 02.2) prescribes this scenario as L2, "Demonstrates that suppliers of the agriculture waste in the region of the project activity are not able to sell all their agricultural waste". For this project activity, scenario L1 is used "Demonstrate that there is an abundant surplus of agriculture waste in the region of the project activity, which is not utilised." Therefore, this parameter is not monitored.

B.7.2. Description of the monitoring plan:

This monitoring plan will set out a number of monitoring tasks in order to ensure that all aspects of projected greenhouse gas (GHG) emission reductions for the proposed project are controlled and reported.

This requires an on going monitoring of the project to ensure performance according to its design and that claimed Certified Emission Reductions (CERs) are actually achieved.

The monitoring plan of the proposed project is a guidance document that provides the set of procedures for

preparing key project indicators, tracking and monitoring the impacts of the proposed project. The monitoring plan will be used throughout the defined crediting period for the proposed project to determine and provide documentation of GHG emission impacts from the proposed project activity. This monitoring plan fulfils the requirement set out by the Kyoto Protocol that emission reductions projects under the CDM have real, measurable and long-term benefits and that the reductions in emissions are additional to any that would occur in the absence of the certified project activity.

Key definitions
The monitoring plan will use the following definitions of monitoring and verification.

Monitoring: The systematic surveillance of the project's performance by measuring and recording of performance-related indicators relevant in the context of GHG emission reductions.

Verification: The periodic ex-post auditing of monitoring results, the assessment of achieved emission reductions and of the project's continued conformance with all relevant project criteria by a selected Designated Operational Entity (DOE).

The monitoring plan provides the requirements and instructions for:

1. Establishing and maintaining the appropriate monitoring systems for usage of EFB in the pulp and Paper process.
2. Quality control of the measurements;
3. Procedures for the periodic calculation of GHG emission reductions;
4. Assigning monitoring responsibilities to personnel;
5. Data storage and filing system;
6. Preparing for the requirements of an independent, third party auditor or verifier.

The process engineer is in charge of the implementation of this monitoring plan and summarizing the results. The Plant Manager of Eko Pulp and Paper Project will check the results to ensure the quality and accuracy of the data monitored .The monthly summary will be prepared by the Plant Manager and calculate the emission reductions of the proposed project activity and develop reports with the support from their CDM consultant.

Quality assurance and quality control

The quality assurance and quality control procedures for recording, maintaining and archiving data shall be improved as part of this CDM project activity. This is an on-going process that will be ensured through the CDM in terms of the need for verification of the emissions on an annual basis according to this PDD.

Data management system

This provides information on record keeping of the data collected during monitoring. Record keeping is the most important exercise in relation to the monitoring process. Without accurate and efficient record keeping, project emission reductions cannot be verified.

Below follows an outline of how project related records would be managed;

1. Overall responsibility for monitoring of GHG emissions reduction will rest with the CDM responsible person of the project activity. Procedures for tracking information from the primary source to the end-data

calculations in paper document format will be continuously enhanced.

2. It is the responsibility of the project proponent to provide additional necessary data and information for validation and verification requirements of respective DOE.

3. Physical documentation such as paper-based maps, diagrams and environmental assessment will be collated in a central place, together with this monitoring plan. All paper-based information will be stored by the project proponent and kept at least one copy.

4. All data for all monitored parameters will be archived electronically and be kept for two years after the end of crediting period.

Verification of monitoring results

The verification of monitoring results of the project activity is a mandatory process required for all CDM project activities. The main objective of the verification is to independently verify that the project activity has achieved the emission reductions as reported and projected in the PDD. It is expected that the verification will be done annually.

Responsibilities of key person of the project activity i.e. Eko Pulp and Paper Project

1. *Plant Manager*

   Overall management of the implementation of the monitoring plan and quality control of data and records. To calculate emission reductions based on monthly summary.

2. *Process Engineer*

   Overall in charge of implementation of the monitoring plan and summarizing the results.

3. *QA Executive*

   To check the results of all data monitored and to ensure the quality and accuracy of the data monitored.

4. *Production Supervisor*

   To ensure the data of the EFB collection and transportation will be recorded by the weighbridge attendant of the Eko Pulp and Paper Project, The summary of EFB consumption by the Eko Pulp and Paper Project will be calculated by the Production Supervisor monthly.

5. *Maintenance Engineer*

   Overall in charge of recording any down time and maintenance work to the Eko Pulp and Paper Project.

6. *Engineering Department*

   In charge of the calibration of all monitoring meters and fossil fuel consumption within the power plant (if any is used as back up) including boilers, fuel preparatory machines.

7. *Accounts and Admin Executive*

Cross checking the monitoring records with receipt and procurement records.

The figure below outlines the operational and management structure that Eko Pulp and Paper Sdn. Bhd. will implement to monitor emission reductions and any leakage effects generated by the project activity.

Monitoring reports will be forwarded to and reviewed by the general manager on a monthly basis in order to ensure the Eko Pulp and Paper Project follows the requirements of the monitoring plan.

Figure B.2: Organisation Chart for Eko Pulp and Paper Project

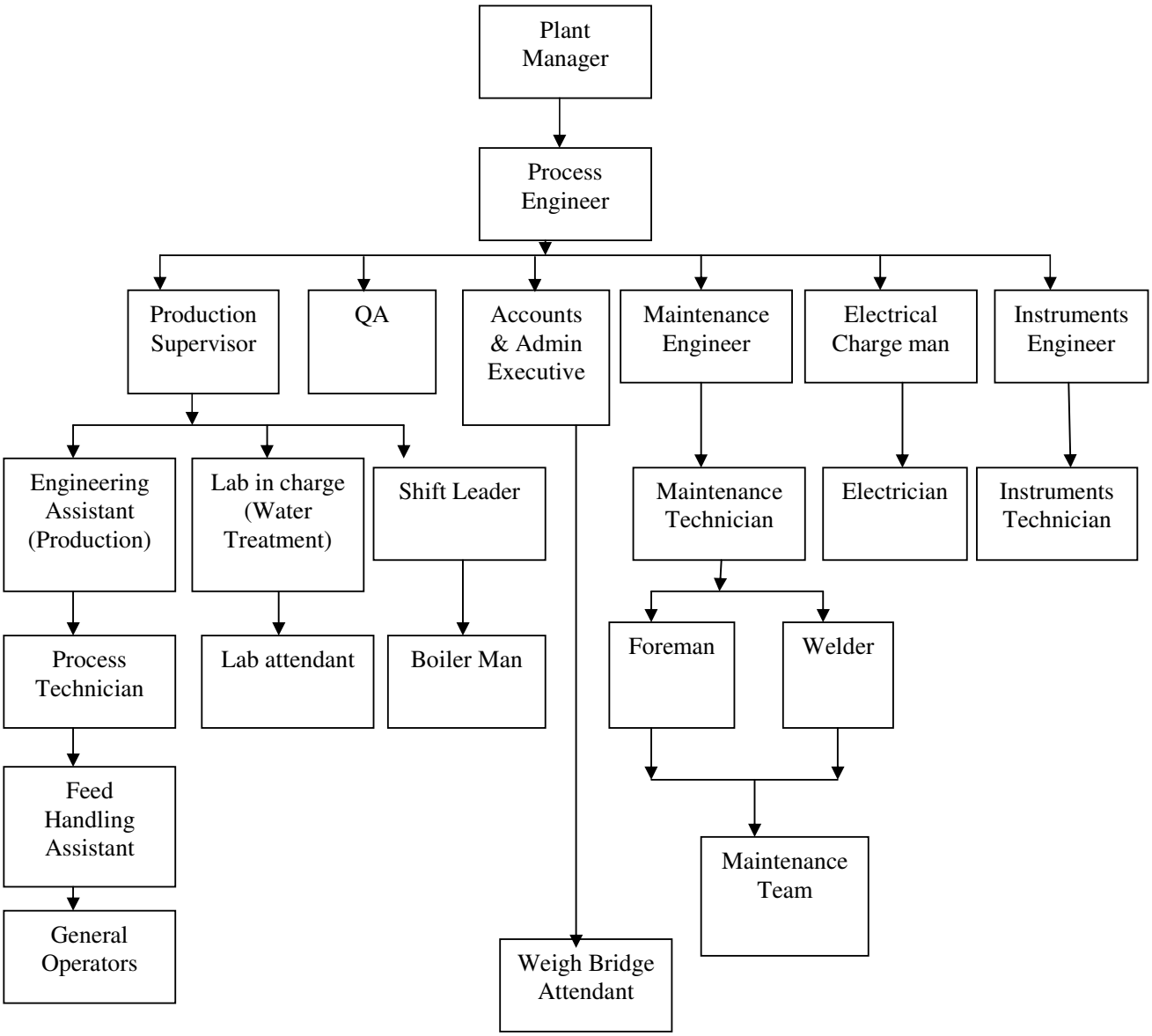


Table B.20: Monitoring plan by parameter and person in-charge

ID No.	DATA / PARAMETERS	UNIT	MONITORING BY	QA/QC CROSS CHECK BY	COMMENT
1	**Wx** Quantity of biomass used for pulp and paper production during the year y.	Ton	Plant Supervisor	Accounts and Admin Assistant	Compare weighing bridge data with total mass balance of the production pf pulp and paper.
2	**Quantity of biomass residue** that utilized in the defined geographical region.	tons	Plant Engineer	Plant Manager	Need information from survey or statistics for rule out leakage.
3	**Quantity of available biomass residues** in the region.	tons	Plant Engineer	Plant Manager	Survey or statistics data.
4	$\mathbf{N_{AW,y}}$ Number of truck trips for biomass transportation.	Number	Plant Supervisor	Plant Manager	Check the consistency of the number of truck trips with the quantity of biomass combusted.
5	$\mathbf{TL_{AW,y}}$ Average truck load of the trucks used for transportation of biomass	tons	Plant Supervisor	Plant Manager	Check the consistency of the truck loads with the quantity of biomass combusted.
6	$\mathbf{AVD_{AW,y}}$ Average round trip distance (from and to).	km	Plant Supervisor	Plant Manager	Check consistency of distance records provided by the trucks by comparing recorded distances with other information from other sources.
7	$\mathbf{EF_{km,CO2,y}}$ Average CO_2 emission factor for the trucks.	tCO_2/km	Plant Engineer	Plant Manager	Calculated based on IPCC default values.
8	$\mathbf{L_{dep}}$ Percentage of recycled paper as part of raw material for the type of pulp and paper produced at the project activity.	%	Plant Engineer	Plant Manager	Compare with data from the previous year and ascertain that the methodology and data are comparable.
9	**Moisture content of the biomass residues**	% Water content.	Plant Supervisor	Plant Manager	Comparison with other measurements and with default values from literature.

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

The application of the methodology to the project activity was completed on 3 March 2008.
The entities responsible for the application of the baseline and monitoring methodology to the project activity are:

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YTL-SV Carbon Sdn. Bhd.
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Phone: +601 9262 7970

This entity is not 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:

01/08/2007

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

21 years 0 months

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

The project activity will use a renewable crediting period of 7 years

C.2.1. Renewable crediting period

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

01/01/2009 The crediting period only starts after the project has been registered.

C.2.1.2. Length of the first crediting period:

7 years 0 months

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

The project proponent has conducted a full Environmental Impact Assessment (EIA) as documented in the report: *Detailed Environmental Impact Assessment Proposed Integrated Pulp and Paper Mill at KM 56, Tawau-Kunak Road, Tawau, Sabah"*[25]. Chapter 5 of the report have discussed in detail the potential environmental impacts of the project within the following headings "Impacts under construction" and "Impacts during operation": Air pollution, Water pollution, Noise Impacts, Ecological Impacts, Socio-Economical Impacts, Environmental health Impacts, Risk Assessment and Waste Management.

For each area, the potential impacts and the mitigation measures have been discussed and described. Chapter 6 of the report then summarises the "Residual Impacts and Recommendations". The Residual Impact represents the impacts remaining after the expected mitigation measures. The evaluation of the residual impacts are summarised as follows:

The potential environmental impacts due to the proposed pulp and paper mill project have shown that the likely residual impacts associated with all its activities during the construction stage as well as operation stage to be within acceptable levels and would not have serious long-term effects on the surrounding environment.

The only potential residual impacts foreseen are on the issues of:-

- *Air pollution;*
- *Risk impacts;*
- *Health impacts; and*
- *Socio-economics*.

On air pollution it is stated:

The operation of the pulp and paper mill will have some minor long term impacts to the degradation of air quality due to dust emission and gaseous emissions, e.g. SOx, NOx,

[25] Chemsain Konsultant 2005: Detailed Environmental Impact Assessment *Proposed Integrated Pulp and Paper Mill at KM 56, Tawau-Kunak Road, Tawau, Sabah*

The resulting pollutant concentration in ambient air arising from emissions from the proposed mill remains below the Malaysian Ambient Air Standards for the criteria air pollutants total suspended particulate and NO2. Pollutants which are not subjected to the ambient air standards, i.e. HCl are below the normal levels.

On risk impact it is stated:

Even though the risk assessment found the risk to be minimal, the risk will be present for the duration of the operation of the mill and its facilities. Thus, the stringent and proper system of operation of the mill, from the processing stage of the raw EFB from the sources to the digester right up to the final production of the pulp and paper as the end products by competent, must be well-maintained and operated by a team of skilled and properly-trained personnel, overseen by an experienced team of managers and supervisors.

On health impacts and socio-economics it is concluded:

Sufficient personal protection equipment and a stringent work order is important to ensure that this potential long term impact is reduced significantly.

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

The following is a summary of the conclusions from the above mentioned EIA:

"*From the results of the assessment in Chapter 5, there are no significant adverse residual impacts arising from the implementation of the proposed Project. For all the areas of concern which were discussed, i.e. air pollution, water pollution, risk impacts and waste management, the impacts are assessed to be significant and must be taken into consideration when the project is finally implemented".*

This EIA has demonstrated that, with proper incorporation of the recommended environmental protection measures by the project proponent, the proposed project activity can be implemented with acceptable environmental risks and impacts.[26]..

The EIA of the proposed project was approved by the DOE on 19 December 2005 in a letter to Eko Pulp and Paper Sdn. Bhd.

[26] Chemsain Konsultant 2005: Detail ed Environmental Impact Assessment *Proposed Integrated Pulp and Paper Mill at KM 56, Tawau-Kunak Road, Tawau, Sabah* Executive Summary p 10

SECTION E. Stakeholders' comments

>>

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

A stakeholder meeting was held for the project on 25th October 2007 involving management and staff of Eko Pulp and Paper Project and 15 external stakeholders. They represent local DOE, villagers and residents. The following activities were undertaken in sending out invitation letter in order to invite participants to the meeting:

1) Invitations were sent by mail to a number of local authorities and environmental non-governmental organisations (NGOs). The invitations were followed by phone calls to confirm participation; and
2) Invitations were delivered by hand to the nearest neighbours and to the staff quarters of the nearby mill workers.

The following is a list of attendees in the meeting:

Department/Organisation	*Representatives*
Department of Environment	2
Villagers/Residents	8
Planters	3
Tawau Town Board Representatives	2
TSH staffs	5
TOTAL	20

Mr. Goh Kun Teck on behalf of Eko Pulp and Paper Project welcomed the participants to the stakeholders meeting. This was follow by two presentations by Mr. Soeren Varming from SV Carbon Sdn Bhd and Mr. Wong Yim Yok.

Mr. Soeren Varming first introduced the stakeholders to climate change and CDM as one of the mechanism to address the greenhouse gas emissions.

Mr. Wong Yim Yok explained to the stakeholders on the general overview of the project activity and its sustainable development issues.

After the presentations the audiences was asked for their comments.

E.2. Summary of the comments received:

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

The project proponent is taking all due consideration to comply with the national and local environment regulation and will thus be in compliance with the law and should not bring any disturbance to neighbours or the environment.

Name/from	Question	Response
1. Encik Elias Representative from Kg. Check Point	What are the job opportunities that will be created by the pulp and paper mill? Will local residents be employed for this project activity?	Local residents will be given priority when employing for the pulp and paper plant. Eko Pulp and Paper Project will only employ outsiders if local residents do that have the skills required. The plant is expected to employ approximately 118 employees initially. Besides direct job opportunities, there will be jobs created in supporting services like food provision, transportation and maintenance.
2. Encik Yaras bin Yusup, DOE	What is the status of the project in terms of getting EIA approval?	Detailed EIA was done and approved in Nov 2005.
	Could you please briefly run through each steps of the	Mr. Wong ran through each steps of the pulp making process as requested. The

Name/from	Question	Response
	pulp making process and let us know whether there will be any water pollution?.	water discharged from washing the pulp undergoes a waste water treatment and comply with Standard B, Environmental Quality (Sewage and Industrial Effluents) Regulations, 1979, P.U (A) 12. In the approval, Chemical Oxygen Demand (COD) of not more than 300 is allowed.
	I would like to remind you to apply for a contravention license.	Eko Pulp and Paper Project will try to improve the process for Standard B but will apply for contravention license when required.
	Where will Eko Pulp and Paper Project discharge treated water to?	Treated water will be discharged to Pang Burong River.
	There are 3 other mills discharging to Pang Burong River and they are problematic. I stress that Eko Pulp and Paper Project has to comply with the regulations[27]. If Eko Pulp and Paper Project comply with the regulation, then it will not be a problem. What will be the volume of waste water discharged to Pang Burong River.	Approximately 3,109m^3 of waste water will be expected to be discharged to Pang Burong River daily.
	Will there be air pollution?	The main pollution is from the recovery boiler that burns the black liquor to get cooking soda, but the emission will be within the DOE limit.
	Will there be a chimney?	Yes, there will be a chimney but it will abide to the regulation set by DOE
	During the pulp making process, will there be any smell emitted?	The smell emitted is not strong because Eko Pulp and Paper Project do not add sulfide and/or sulphate into the process which the smell normally comes from.
3. Encik Ali Abdullah Fata	Where is the water source of	Eko Pulp and Paper Project will source

[27] The regulation referred to is the effluent standard for waste water

Name/from	Question	Response
DOE	Eko Pulp and Paper Project?	water from Sg Kalumpang which is about 10 kilometres away.
	How much water will be used daily?	About 8,800 m3 water will be used daily which is approved.
	Could you tell me more about the recovery of soda from black liquor?	The black liquor with solid content of 53% is burnt to get steam and soda ash.
	What type of boiler is Eko Pulp and Paper Project using?	The boiler in the Eko Pulp and Paper Project is not an ordinary boiler. The boiler is specifically designed for production of pulp and paper because we need to collect the soda ash – sodium carbonate.
	What is the level of noise pollution from the plant operation?	The noise from the plant operation is expected not to bother villager as the mill is at least 4-5km away from Kg. Checkpoint and 10-12km away from Kg. Pangkalan Batu.
4. Mr. Robert Chin Tawau Town Council	What is a pulp?	Pulp is an intermediate material in the paper making process.
	What happens to the processed pulp? What do you do after cutting it? Where do you dispose the waste (additional paper cut)?	We do not convert our paper into A4 sizes or folio. We have our paper in rolls. We only produce paper according to customers' specification. The wasted paper broke will be reprocessed by pulping and putting it into the paper machine. There will be no material wastage.
	How many people will be employed in the pulp and paper factory?	There will be approximately 118 employees initially of which less than 10% is management level and the remaining 90% is mainly made up of operation, general management, sectional management, operator, foreman and general labourer.
	Will you be employing locals?	Yes, priority will be given to locals. The long term plan for Eko Pulp and Paper Project is to train more locals.

Name/from	Question	Response
	Will there be smoke emitted to the atmosphere? It is a problem when black smoke flies around.	Black smoke looks bad but it also means that there is incomplete combustion. It is not our interest to have black smoke. There is a need to adjust if during commissioning has black smoke. DOE standard requires smoke emitted from chimney to be 400 parts per nm^3. A sampling will be done every 6 months to ensure we adhere to it.

Conclusion

The meeting was adjourned at 12.30pm.

General observation
Participants did not raise any objections to the project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding was obtained from Annex 1 Countries.

Annex 3

BASELINE INFORMATION

See calculations in Section B6.

Annex 4

MONITORING INFORMATION

See the monitoring plan in Section B7.

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Annex 5

COST –BENEFIT ANALYSIS OF USING EFB FOR MULCHING

EFB has a low content of nutrients and can in principle be used as fertiliser in palm plantations. The table below gives an estimate of the nutrient content in kg/ton fresh EFB

Table A.5.1: Nutrient content of EFB

Nutrient	Nitrogen (N)	Phosphorous (P)	Potassium (K)	Magnesium (Mg)	Calcium (Ca)
Percentage of dry matter	0.44	0.144	2.24	0.36	0.36

The table is based on a paper from MPOB[28] and the fertiliser value of EFB (as of December 2002) is calculated to be between 5.39 RM/ton to MYR11.47 /ton (depending on the variation in the nutrient content in the EFB). The average value is MYR8.43 /ton.

The use of EFB for mulching would not allow the full replacement of inorganic fertiliser. It is thus necessary to supplement with inorganic fertiliser. The MPOB[29] paper gives the following break down of costs:

Table A.5.2: Comparison of normal fertiliser use with EFB

	Normal estate fertilizer use	EFB + supplement
	MYR/ha	MYR/ha
Fertiliser cost	355.20	126.80
EFB @ MYR 5/ton	-	185.00
Application cost	35.00	196.50
	390.20	508.30

The paper only finds it attractive to use EFB for mulching if a 15% increase in yield can be included in the calculation, but the paper also cautions:

"*In reality, it is very much doubtful whether it is possible to achieve an even distribution of EFB in the field consistently. Besides that, the EFB generated by the mill can only cover a small area of the plantation due to the high transport cost involved in making it available to all the palms. During high crop periods, the tendency is to give priority to the FFB rather than the EFB with the result that EFB evacuation and not mulching gets the priority. These are points to ponder when undue importance is given to the benefits of EFB mulching*".

In another paper on effects of mechanisation of palm oil mills the cost of distributing EFB to the fields has been calculated for the year 1999[30] to between 6 MYR/ton and MYR11.55 /ton giving an average cost of MYR8.78 /ton.

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[28] Ravi Menon et al 2003: Empty Fruit Bunches Evaluation: Mulch in Plantation *vs.* Fuel for Electricity Generation. Palm Oil Industry Economic Journal Volume 3(2). Table 4 and Table 5

[29] Ravi Menon et al 2003: Same paper as above – from table 10

[30] Teo Leng 2002: Mechanisation in oil palm plantations: Achievement and challenges. Malaysian Soil Science and Technology Volume 11(2)

The same paper concludes on mulching:

"*In view of rising cost in application and the difficulty to fully mechanise the field operation EPA*[31] *has embarked on composting*"

In the calculation of the cost and benefits of mulching in the comparison of alternatives the average saving in fertiliser (in 2002 prices) reported by Ravi Menon et al has been used. As cost of distribution the cost from Teo Leng (in 1999 prices) has been used.

In order to compare the costs the prices has been recalculated to 2007 prices using the actual inflation rate in Malaysia[32].

Table A5.3: Annual inflation rate in Malaysia

Year	2000	2001	2002	2003	2004	2005	2006	2007
Inflation	1.6%	1.4%	1.8%	1.2%	1.4%	3.0%	3.6%	2.5%

Based on the use of the updating on the values to 2007 the cost and benefits of numbers per ton of EFB are as follows

Distribution costs of per ton EFB: **MYR10.33 /ton**
Saving in fertiliser per ton EFB: **MYR 9.46 /ton**

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[31] EPA Management is a plantation company that manages 28 estates in the state of Johor

[32] Bank Negara Malaysia Annual Report

Annex 6:

DETAILS OF LEAKAGE ASSESSMENT FOR PALM OIL WASTE IN EASTERN SABAH

Methodology

The leakage assessment is based on approach L3 where a 25% excess of the biomass waste has to be demonstrated.

First, the total amount of available biomass waste in the relevant part of Sabah i.e. the East Sabah – will be calculated based on the total FFB processing capacity. The expected growth in FFB production will be taken into account for the future availability of biomass waste.

To estimate demand for EFB the requirement for biomass waste by CDM projects under development will be calculated.

Total amount of palm oil waste in East Sabah

Table A.6.1: Palm oil processing in Sabah in 2005

District No.	District	No. of palm oil mills	Approved capacity t FFB/year	Estimated production t FFB/year	Is it part of East Sabah? (Yes/No)
1	Kinabatangan	26	4,578,000	5,092,830	No
2	Kunak	8	1,358,000	1,510,717	Yes
3	Semporna	3	512,000	569,578	Yes
4	Labuk/Sugut	16	3,063,800	3,408,347	No
5	Lahad Datu	25	6,440,000	7,164,226	Yes
6	Pantai Barat	1	96,000	106,796	No
7	Pendalaman	1	216,000	240,291	No
8	Sandakan	13	2,628,000	2,923,538	No
9	Tawau	10	2,070,800	2,303,677	Yes
10	Keningau	2	1,264,000	1,406,146	No
11	Tenum	1	96,000	106,796	No
12	Beaufort	1	144,000	160,194	No
	Total	**107**	**22,466,600**	**24,993,135**	
	Total FFB processed in East Sabah			11,548,198	

In Table A.6.1, the actual amount of FFB processed has been distributed on the districts based on the approved capacity.

The project is located in District No.2 i.e. Kunak. District No.3 i.e. Semporna, District No.5 i.e. Lahad Datu and District No. 9 i.e. Tawau had been chosen in the analysis as these districts are directly bordering District No.2

i.e. Kunak. This means that areas within 100-200 km from the project activity site are included. (See map in Annex 7). Based on Table B.18, the total amount of FFB processed in Districts No. 3, 5 and 9 which are relevant to this analysis is estimated at 11,548,198 ton.

There are no official statistics on the production and use of EFB, so the total available amount of EFB has to be calculated. This is done based on the common assumption that 23 % of the FFB processed will be EFB. Further it is assumed that the annual increase in FFB processed in Sabah will be 3.5% p.a.[33]. Based on the FFB projection and the percentage of EFB in FFB, the annual supply of EFB can be calculated.

The demand for EFB is estimated through the number of potential CDM projects in the region. The CDM projects considered are derived from the UNEP "CDM-pipeline"[34]. The CDM Pipeline contains a list of all CDM projects that have either been uploaded for Global Stakeholder Process under validation or has been submitted for registration at the UNFCCC. The list is updated monthly and provides thus a good overview of the projects under development.

The list of projects located in the relevant part of Sabah and their corresponding data on consumption of EFB have been identified and obtained from the related PDDs. The list is likely to overestimate the amount of EFB consumption, as some of the projects in Table A.6.2 may not be implemented due to non registration as CDM project activities or other unforeseen circumstances.

In addition, save and except for consumption by CDM projects activities, it is worth to note that there is no known use for EFB in the region.

Table A.6.2 sets out the balance between the available amount of EFB and the consumption in East Sabah for 2008 – assuming that all CDM project activities will use their required amount of EFB in that year. This is a very conservative assumption as some of the projects will not be fully operational from 1 January 2008.

Table A.6.2: EFB in East Sabah – Production and consumption

Details	**t**
Total processed FFB in East Sabah (Projection for 2008)	12,801,429
Total EFB 23 % of FFB (23% x 12,801,429)	**2,944,329**
less: EFB consumption	
Kunak Bio Energy Project	92,015
Kunak Jaya Bio Energy Plant	109,067
Eko Pulp and Paper Project – Pulp production plant	180,000
Polar Vertix Biomass Energy Project	9,934
Lahad Datu Edible Oils Sdn Bhd – Bio energy plant	122,500
Felda Sahabat – Bio Energy Plant	246,000
Golden Hope – Merotai – Composting project	99,360

[33] Anders Evald et al 2005: Renewable Energy Resources (in Malaysia) Recalculated based in table 2.2 p 10

[34] CDM pipeline – downloaded from www.cdmpipeline.org 12/01/2008

Details	t
Timura Samling POM – Composting project	48,000
Lelusasa Edible Oil Refinery – Biomass steam plant	40,000
Asia POM – Composting project	104,480
Takon POM – Composting project	78,080
Total EFB consumption	**1,129,436**
Excess / (shortfall) of EFB	***1,814,893***
Percentage of excess (shortfall)	***61.6%***

Table A.6.2 conservatively affirms that there is approximately 62 % of unconsumed EFB in the region after deducting all the volume consumed by the CDM projects activities set out in Table A.6.2. This percentage exceeded the 25% unconsumed EFB benchmark required as the criteria to rule out leakage. Furthermore, there is still excess EFB to accommodate other minor uses such as mulching without changing the conclusion.

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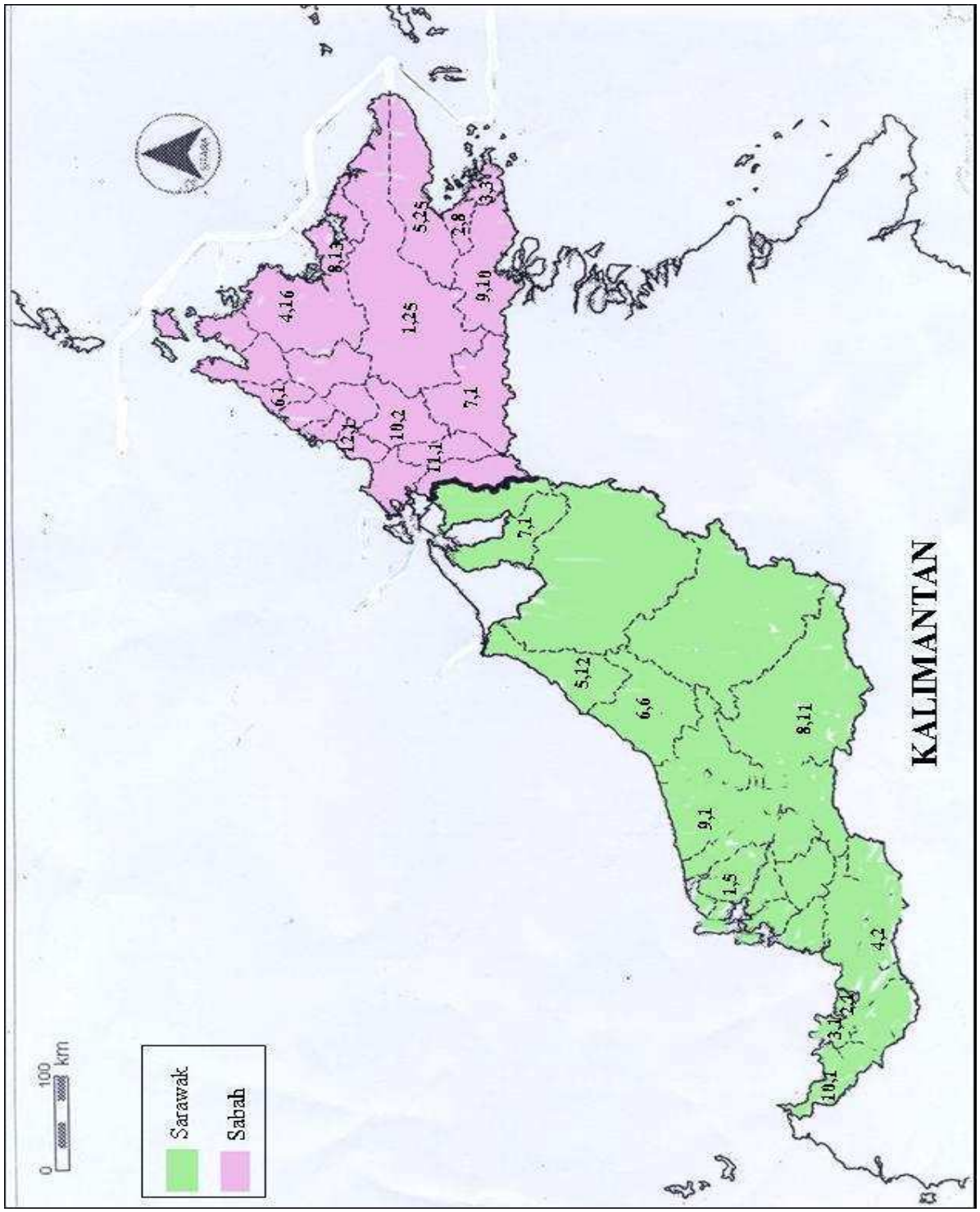

First no. indicates district (Refer Table 1 for name of district)
Second no. indicates no. of mills in the district (2005)

Source: Chow Mee Chin, 2006: *An Assessment Of Potential And Availability Of Palm Biomass For Bioconversion To Bioethanol. Downloaded from* www.eib.org.my

Annex 7

REMAINING LIFETIME OF LANDFILLS

Pursuant to the approved methodology AM0057 (Version 02.2), If the identified scenario is B3, then either of the following needs to be demonstrated to ensure that the condition is expected to last during the crediting period:

- Establish that the identified landfill(s) can be expected to accommodate the agricultural waste to be used for the project activity for the duration of the crediting period – Option 1; or
- Establish that it is common practice in the region to dispose of the agricultural waste in solid waste management site (landfill) – Option 2.

The project proponent has chosen Option 1 to demonstrate that the identified landfills would be able to accommodate the EFB for the 7 years of the crediting period.

In order to establish the landfill capacity needed two factors needs to be taken into account:

- The amount of EFB used in the project – and thus not landfilled. In this case 180,000 t EFB/year

- The degradation of the EFB in the landfill during the crediting period.

In order to calculate the amount of EFB that would have been remaining in the landfill after the 7 year period the assumptions from the First Order Decay (FOD) model has been used. The FOD calculates the annual degradation of the EFB.

The parameter in the FOD model describing the decay rate is the kj factor. In the IPCC 2006 the kj factor is described as follows: "*The half-life value, t1/2 is the time taken for the DOCm in waste to decay to half its initial mass. In the FOD model and in the equations in this Volume, the reaction constant k is used. The relationship between k and t1/2 is:* "

This means that the half-life value for EFB can be calculated based on the kj value of 0.17 prescribed by the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" (version 04), (EB41)

$k = ln(2)/t1/2$.

$ln(2)/kj = t1/2 = ln (2)/0.17 = 4.1$ years

The same model is used as for the calculations of methane emissions from landfill – just focusing on the organic matter only. This means that all the factors regarding the pathway of the degradation of the organic matter has been left out and only the organic matter and the decay rate has been left back.

$$Biomass\_\deg radation = \sum_{x-1}^{y} \sum_{j} W_{j,x} \cdot e^{-kj\cdot(y-x)} \cdot (1 - e^{-kj})$$

The amount of biomass deposited per year would be 180,000 t EFB per year – in the project supplied to the pulp and paper plant - and the Kj factor 0.17.

The table below shows the degradation over a 7 year period and a calculation of the remaining biomass in the landfill after 7 years to match the first crediting period for the project.

Degraded organic material	Year 1	year2	year3	year4	year5	year6	year7	Degraded	Remaining	
Deposited year 1	28,140	23,741	20,029	16,898	14,256	12,028	10,147	125,240	54,760	m3
Deposited year 2		28,140	23,741	20,029	16,898	14,256	12,028	115,093	64,907	m3
Deposited year 3			28,140	23,741	20,029	16,898	14,256	103,065	76,935	m3
Deposited year 4				28,140	23,741	20,029	16,898	88,809	91,191	m3
Deposited year 5					28,140	23,741	20,029	71,911	108,089	m3
Deposited year 6						28,140	23,741	51,881	128,119	m3
Deposited year 7							28,140	28,140	151,860	m3
						Total EFB remaining			675,860	m3
						Area assuming 5 m high			135,172	m2
						Available landfill area			750,000	
						Years remaining in landfill			39	

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