CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-SSC-PoA-DD) Version 01

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NOTE:

(i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.

(ii) At the time of requesting registration this form must be accompanied by a CDM-SSC-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-SSC-CPA-DD (using a real case).

SECTION A. General description of small-scale programme of activities (PoA)

A.1 Title of the small-scale programme of activities (PoA):

Co-composting and Composting Program of Activities for Palm Oil Mills in Indonesia
Version: 03
17/01/2012

A.2. Description of the small-scale programme of activities (PoA):

Background and Introduction

Palm Oil and Global Food Production

The world demand for vegetable oils is rapidly expanding. Roughly 80 million new people each year will require an estimated 6 million metric tons of vegetable oils annually and there is predicted to be a twofold increase in demand for vegetable oils over the next forty years.[1] Palm oil as the world's largest consumed vegetable oil is a globally important crop in terms of satisfying the world's increasing demand for food[2]. There are a number of factors that make palm oil globally important in its contribution as a food oil compared to other potential crops, most importantly high yields of oil per hectare and low production costs[3]. Aside from vegetable oil, Crude Palm Oil (**CPO**) is also found in a variety of other products[4] which means total consumption of CPO and its derivative products will continue to increase into the future for a number of reasons.

Palm Oil and Indonesia

CPO production is of national importance to Indonesia's economy as the world's largest producer of CPO.[5] The bulk of the predicted future global increase in CPO production will most likely be accommodated by Indonesia.[6]

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[1] The demand for edible vegetable oils is expected to double from present consumption of around 120 to 240 M t yr- 1 by 2050, based on projected per capita consumption and population growth. Amongst the major vegetable oils, palm oil has the lowest production costs, and is therefore expected to make a large contribution to growth in demand for edible vegetable oil with an increase in the planted area of up to 12 M ha (or about 300,000 ha yr- 1) over the next 40 years. http://www.commodityonline.com/news/Rise-of-sustainability-bullish- for-palm-oil-31308-3-1.html. Also see *Sustainable Oil Palm Development on Degraded Land in Kalimantan Thomas Fairhurst (Agronomist, Tropical Crop Consultants Limited, United Kingdom) And David McLaughlin (WWF, United States of America) March 2009*.

[2] Starting in 2007, palm oil surpassed soybean oil as the largest and mostly widely produced vegetable oil. In 2008, the global production of oils and fats stood at around 160 million tons. Palm oil and palm kernel oil jointly contribute about 48 million tons, or roughly 30% of global supply. See *Food, fuel, or forests? charting a responsible U.S. role in global palm oil expansion global palm oil National Wildlife Federation 2010*.

[3] Well managed palm plantations can yield as much as 5-7 tons per hectare per year, which is up to ten times that of other vegetable oils. *The World Bank Group's Draft Framework for Engagement in the Palm Oil Sector, International Finance Corporation, August, 2010*.

[4] CPO can be used to make the following; Food sectors (cooking oil, instant noodles, shortening, pastries and bakeries and processed food (chocolate, ice cream, margarine); Biodiesel; and Oleo chemicals.

[5] To date in Indonesia more than 6.8 million hectares are used for palm oil plantations and it is estimated that around 3.3 million family members are depending on this industry in Indonesia. In 2008, Indonesia became the biggest CPO producer in the world replacing Malaysia. http://www.afbe.biz/main/wp-content/uploads/afbeconfpapers2010.pdf pg 14

Palm Oil and the Environment

Despite the potential of oil palm as a sustainable oil, the reality is that the palm industry and its common commercial practices are far from sustainable and the palm industry has and does contribute to a large amount of environmental damage ranging from deforestation, to global CO2 emissions from methane associated with open air palm oil mill effluent and empty fruit bunch disposal. The negative effects of the Palm industry have been well documented by a number of NGO reports.[7]

Palm Oil Industry in the context of this PoA

Due to the reality that CPO production is certain to increase significantly over the coming years, and that this increase will take place in Indonesia, it is both globally as well as nationally significant to Indonesia as the world's largest producer of CPO that the palm industry adopts more sustainable and environmentally friendly practices - from the development of plantations, to field agronomy practices, to the mill where CPO is produced.

The goal of this proposed PoA is to facilitate commercial crude palm mill and plantation owners and managers to adopt and implement more sustainable practices at their Crude Palm Oil Mills (**Mills**), and in the field and to act as a vehicle to make these practices become the baseline practice for the commercial palm industry in Indonesia.

1. General operating and implementing framework of PoA

The "Co-composting and Composting Program of Activities for Palm Oil Mills in Indonesia", later on referred to as the "**Co-composting PoA Indonesia"**, will include small-scale project activities that conduct aerobic decomposition of:

(i) solid empty fruit branches (EFB); and/or

(ii) liquid Palm Oil Mill Effluent (POME).

POME and EFB which are the major organic waste streams generated from Mills during the process of extracting Crude Palm Oil from Fresh Fruit Branches (FFB). The output of the composting / co-composting process[8] will be organic compost which can be recycled back onto the Mill's palm plantation or onto other neighboring plantations.

The aerobic co-composting process will avoid methane emissions from:

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[6] FAS Jakarta estimates that Indonesian CPO exports in 2010/11 will increase from 16.7 million MT to 18.55 million MT. The Government of Indonesia (GOI) has targeted production levels to reach 40 million metric tons (MT) by 2020. This target is double current levels of palm oil production and would increase areas of production from current levels of approximately eight million hectares to at approximately 15 million hectares. *USDA Foreign Agricultural Service Gain Report ID1008 3/18/2010, Indonesia, Oil Seeds and Products Annual ,Oil seeds and Products 2010*.

[7] For example see *Food Fuel or Forests, Charting a Responsible US Role in Global Palm Oil Expansion, National Wildlife Federation, 2010; and Reuters, Indonesia Palm Oil Vs the Environment, Smart Gets Mixed Score in Green Audit, Sunanda Creagh & Fitria Wulandari, Jakarta Aug 2010.*

[8] Please note, in this PoA-DD a reference to co-composting also includes composting. This is justified as the inputs, outputs, process and equipment for composting and co-composting are the same – the only difference is co-composting will utilise the POME waste stream in addition to the solid biomass waste, where in composting POME is not used. Composting and Co-composting use the same technology.

(i) Outdoor open air anaerobic digestion of POME[9]. This POME treatment in the baseline situation is the common practice of POME treatment in Indonesia utilizes a series of outdoor open air ponds and therefore emits significant levels of methane into the atmosphere[10]; and/or

(ii) Potentially from empty fruit bunches (EFB) depending on the baseline disposal practice at the Mill. In the event that they are disposed of and left to decay in unmanaged solid waste disposal sites or dumped which is a common practice at Mills in Indonesia methane will be being emitted in the baseline which will be avoided by the composting and thus methane emissions from EFB dumping will also be claimed.

The PoA will consist of CDM Programme activities (CPAs) that each represents one composting project located at the Mill.

2. Policy/measure or stated goal of the PoA

The objective of this Co-composting PoA Indonesia is to assist Crude Palm Oil Production in Indonesia to become more sustainable by facilitating the introduction of sustainable waste management practices into commercial crude palm oil mills (Mills) in Indonesia in order to reduce the greenhouse gas emissions (**GHGs**) and other pollution from the major organic waste streams generated by Mills in the process of producing Crude Palm Oil (**CPO**) from Fresh Fruit Branches (**FFB**).

The specific waste management practice which will be facilitated is environmentally sound co-composting of a portion or all of a Mill's empty fruit branches (**EFB**) and Palm Oil Mil Effluent (**POME**) to produce organic compost which can be recycled and reapplied to the plantation. The composting facility may also take a portion or all of the Mill's "other organic" waste such as palm messocarp, palm fronds, boiler ash and palm kernel. However these "other organic" waste, (categorized as garden, yard and park waste)[11], streams if present would only be minor inputs and the vast majority of the co-compost inputs will be formed by EFB and POME. The precise organic waste inputs that are used and their amounts will be specified in each individual CPA.

This program will also promote the introduction of other sustainable management practices into the Palm Oil Production industry by facilitating the recycling of the major organic waste streams of a Mill via conversion into organic compost and reapplication of this organic compost to the plantation.

To reach this goal the coordinating entity will provide the following services across the country.

- Capacity building across Indonesia that seek to educate mill and plantation owners and managers in relation to:
  - The economic, environmental and community benefits to the palm industry that can be gained from introducing CDM and co-composting and moving away from traditional waste EFB and

[9] In the event that POME is not used (in composting) then emission reductions for avoidance of methane from POME will not be claimed.

[10] A recent paper that sets out the standard waste disposal methods for Crude Palm Oil mills is: *Sustainability Of Palm Oil Production And Opportunities For Finnish Technology And Know-How Transfer, Virgilio Panapanaan, Tuomas Helin, Marjukka Kujanpää, Risto Soukka, Jussi Heinimö, Lassi Linnanen 2009*, see specifically, section 5.3,page 36, fig 5.1 and pages 65.

[11] IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5).

POME waste management practices and to adopt co-composting of EFB and POME to produce organic compost;

- The benefits to long-term soil and palm health from re-application to the field of organic compost. The improved soil health could lead to more effective fertilizer uptake and hence improvements in yield. .
- How co-composting EFB and/or POME and recycling these waste streams back onto their plantation can significantly reduce GHG emissions, make their operations more environmentally sustainable.

- Provision of low barrier access for Mill Owners to CDM services and carbon revenue in order to provide the financial incentive necessary to depart from the existing status quo waste practices. To this end the coordinating entity will coordinate the inclusion of the CPA in the PoA, provide monitoring and verification services to all CPAs which require such assistance, and support the effective commercialization of CERs.

- Advice and analysis on optimum process and methods to co-compost EFB and POME waste to ensure consistent high nutrient compost output and to minimise environmental effects.

- Program for training local technicians – how to implement monitoring systems and conduct proper emission reduction monitoring in accordance with CDM requirements.

- Technology transfer: The Coordinating entity can facilitate access to state of the art co-composting systems to interested mill owners. Financial assistance through carbon finance can be provided by the Coordinating entity.

The contribution of the Co-composting PoA Indonesia to sustainable development is significant assessed by using the sustainable development criteria of Indonesia[12]. Indonesia's sustainable development criteria and indicators for assessing a proposed CDM project are categorised into four groups: environmental, economic, social and technological sustainability.

Environmental sustainability: (The scope of evaluation is the area having direct ecological impacts from the project).

- Co-composting PoA Indonesia facilitates the use of Mill waste (EFB and POME) to create high-value organic compost that can be reapplied to the Palm Plantation. This reduces local waste production and conserves natural resources by turning unwanted waste into a valuable resource (organic compost).

- Each CPA which involves the implementation and operation of Co-composting activity of Palm Mill waste have a number of positive local environmental effects including:

  - Reducing or avoiding completely the negative environmental effects associated with baseline treatment of POME in open air lagoons including:

[12] Website of the Indonesian DNA (the Indonesian National Commission for Clean Development Mechanism) setting out Indonesia's Sustainable Development Criteria and Indicators http://dna-cdm.menlh.go.id/en/susdev/ (accessed 18 December, 2010).

- Avoiding methane emissions thus reducing GHG emissions;
- Avoiding negative odour associated with POME lagoons;
- Reducing or avoiding altogether the discharge of treated POME into natural waterways, therefore improving water quality of local streams for biota and community use.

- Avoiding negative environmental effects in relation to the dumping or disposal of EFB in the baseline situation by fully utilizing a Mills waste EFB for the production of organic compost;
- Improving soil health by application of high nutrient organic compost onto plantations – increasing organic matter in soil, improving moisture retention, providing a source of microorganisms and nutrients and a potential optimisation of inorganic fertilizer uptake.
- Improving local health by eliminating all of the existing anaerobic POME ponds and some or all of the aerobic POME ponds which are a source of odour;
- No additional resources (e.g. water) will be used for the composting process, as the humidity required will be provided by the POME.

Economic sustainability

- Each CPA will contribute to employment by providing opportunity of new jobs for local community starting from construction to commissioning and later on in operation and maintenance of the plant;
- Each CPA will turn waste products (EFB and POME) into organic compost which:
  - Potentially the improved soil health could lead to more effective fertilizer uptake and hence improvements in yield.
  - Improves palm health and contributes to improved yield through improved soil health, thus supporting a strong and sustainable Indonesian Palm Industry.

Social sustainability

- Each CPA will act as a clean technology demonstration project and will encourage other Palm Mill operators as well as other agri-processing industries to come up with similar projects.
- Provision of staff training to improve their technical skills in terms of monitoring parameters for emission reduction calculation during crediting period.
- The PoA facilitates the voluntary adoption and uptake of Palm Mill Waste treatment processes which are more environmentally friendly and sustainable than that legally required.

Technology sustainability

- Supports the uptake and adoption of industry best practice techniques and technology for palm waste processing via co-composting technology from abroad thereby facilitating early adoption of such practices to displace current practice and become the baseline industry practice in Indonesia.

- Each CPA will provide an opportunity for local people to acquire know-how for construction, optimal maintenance and operation of state-of-the-art co-composting plant, equipment and systems.

- Each CPA will contribute to provide an opportunity for technology transfer.

3. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.

The Co-composting PoA Indonesia is a voluntary action being coordinated and managed by PT.Carbon Agro Indo (hereafter referred to as the **Coordinating Entity**). There are no mandatory laws or regulations in Indonesia that require the treatment of palm oil mill wastes through composting or co-composting.

A.3. Coordinating/managing entity and participants of SSC-POA:

Following is information concerning the managing entity and project participant of the PoA:

1. Coordinating or managing entity of the PoA as the entity which communicates with the Board PT.Carbon Agro Indo will be the Coordinating/Managing Entity for the CDM programme of activities under the Programme of Activities (**PoA**) and communicate with the CDM Executive Board.

2. Project participants being registered in relation to the PoA. Project participants may or may not be involved in one of the CPAs related to the PoA

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)
Indonesia (Host)	PT.Carbon Agro Indo	No

A.4. Technical description of the small-scale programme of activities:

A.4.1. Location of the programme of activities:

The PoA covers the geographical region of Indonesia

A.4.1.1. Host Party(ies):

Republic of Indonesia

A.4.1.2. Physical/ Geographical boundary:

Definition of the boundary for the PoA in terms of a geographical area (e.g., municipality, region within a country, country or several countries) within which all small-scale CDM programme activities (SSC-CPAs) included in the PoA will be implemented, taking into consideration the requirement that all

applicable national and/or sectoral policies and regulations of each host country within that chosen boundary;

The proposed PoA will be developed within one country only, Indonesia. A map indicating the location of the PoA is provided below.

Figure 1: The map of Indonesia

A.4.2. Description of a typical small-scale CDM programme activity (CPA):

Each CPA comprises the construction and operation of a composting facility (**Facility**) conducted by a project owner The Facility will utilize as feedstock all or a portion of the organic EFB and POME waste from a Mill or Mills proximate to the Facility which is being generated by the Mill during the process of extraction of CPO from FFB. As set out above, the Facility may also take a portion or all of the Mill's "other organic" waste such as palm messocarp, palm fronds, boiler ash and palm kernel. However these "other organic" waste streams if present would only be minor inputs and the vast majority of the co-compost inputs will be formed by EFB and POME. The precise organic waste inputs that are used and their amounts will be specified in each individual CPA. The Facility will aerobically compost these inputs into organic compost (**Project Activity**). The Project Activity will replace the conventional method of waste management at the mill by aerobically "composting" all or a portion of the mills main organic waste streams of EFB and POME to produce a useful organic compost that can be re applied to the Mill's or a neighbouring plantation.

The Composting Process

Composting is a process of controlled biological decomposition of organic materials in an aerobic process and therefore requires the presence of oxygen, which is an important factor in the process. In essence composting utilizes natural micro-organisms (bacteria and fungi) present in the environment

which will soften and break down the EFB fibers to allow them to absorb more of the liquid POME while naturally losing their water content.

In order to recycle the input waste EFB and POME to the plantations these waste streams need modifying to reduce their bulk and in doing so preserve the nutrients known to be present, by binding them into the biomass of the composting organisms that when returned to the plantations can be effectively utilised by the oil palms. The composting process does exactly this and the result is concentrated nutritionally rich compost material that can be efficiently recycled to the plantation and become a source of nutrients.

The effectiveness of the composting process is determined by the environmental conditions present within the compost in particular the constant presence of oxygen. By making more air available to the compost mass the full spectrum of micro-organisms involved in composting will be maximised, thereby improving the efficiency of the system by trapping more of the nutrients within the biomass of the organisms.

Another key condition to ensure effective composting conditions is to ensure the compost takes place on a hard standing impermeable surface (such as concrete) and has in place an effective system for capturing any leachate from the system or for ensuring that any leachate is diluted to environmentally appropriate levels prior to being discharged into the surrounding environment. This prevents the leaching of nutrients into the soil and surrounding environment and also ensures that the composting activity itself is environmentally sound.

Why Co-compost?
Co-composting as undertaken in this PoA involves the joint composting of solid (EFB) and liquid (POME) wastes. Co-composting of EFB and POME is the optimal solution because:

- From a waste management perspective co-composting enables the useful recycling of the two major waste streams from the Mill and eliminates the negative adverse environmental effects associated with the current EFB disposal and POME treatment systems;
- POME itself is highly nutritious and co-composting enables the nutrients from this liquid to be captured by the compost and unifies all nutrients in one product thereby creating a more nutritionally rich product than composting of EFB alone.

In some CPAs POME may not be utilized, and in this case composting will involve the same process as set out above to compost the palm mill solid waste streams, with the exception that POME is not utilised.

A.4.2.1. Technology or measures to be employed by the SSC-CPA:

This Co-composting PoA Indonesia will apply a single measure and technology[13] – Composting of organic waste streams from Palm Oil Mills. Detailed technical characteristics will differ across CPAs depending on the type of co-composting facility adopted and the existing facilities at the Mill. However, despite superficial differences in different variations, each CPA will:

- produce the same kind of output – i.e organic compost for reapplication as fertilizer to land;
- Involve the same conversion process – aerobic composting (see above for more detail of the composting process); and

[13] As defined by the Standard for Application of Multiple CDM Methodologies for a Program of Activities version 0.1, EB63, Annex 4, page 1.

- Involve the same kinds of equipment – although some equipment will differ, they are always performing similar activities to ensure the same outcome and are therefore of the same kind (eg turning / moving equipment, pre treatment equipment, aeration equipment, etc).

Therefore this PoA applies a single technology.

A typical Facility under this PoA will comprise the following steps:

Step 1. Raw material feedstock holding

This will include both facilities for the storage of liquid POME and / or solid EFB and other solid palm organic waste. Depending on the type of Facility and relationship between the Facility and the Mill, storage of raw materials may utilise existing structures in the Mill (for example EFB Hoppers and existing POME cooling / fat ponds) for the storage of these raw materials, or may comprise separate custom built storage facilities.

Step 2. Raw material pre-treatment

Each Facility will require a process and area for the pre-treatment of organic inputs. At a minimum this will include the shredding of EFB, but may also include pre-treatment of POME, mixing of POME with solid POME sludge, and other pre-treatment of EFB as well as the preparation of composting additives / inoculants which in some processes may be added. Again depending on the processes in place at the Mill and the relationship between the Mill and the Facility, some or all pre-treatment may take place at the Mill (for example some mills already utilize an EFB pressing and shredding process in order to extract remaining oil content in the EFB before disposal, and in such a case the Facility could make use of already existing pre-treatment process in the Mill.

Step 3. Compost batch preparation

The method of preparation of a compost batch will differ between different facilities and systems however the principle is the same – to create a “mixture” of EFB and other solid organic inputs and together add to this an initial amount of liquid (POME) in the correct proportions to begin the composting process. This will involve the physical movement of the raw materials (via front end loader, dump truck, conveyor, bunker filler or other method) and applying of liquid (POME) onto the solid material inputs to create a “batch” ready for composting.

Step 4. Composting

Composting is the controlled process of accelerated organic decomposition of the components of the compost under aerobic conditions. The detailed composting process and time for composting a batch will differ between variations, however again the general process and principle is always the same – to consistently maintain the environment within the compost in the optimum aerobic conditions by monitoring and regulating the air (oxygen), temperature and moisture level in the compost to allow a consistent aerobic decomposition process and consistent high quality compost output. This may be achieved through regular mechanical turning of the compost pile, shifting of the compost from bunker to bunker (or vessel to vessel), by injecting or blowing air via blower fans and through monitoring of oxygen and temperature levels inside the compost pile. Periodically more liquid (POME) may also be sprayed or applied to the compost batch throughout the composting process.

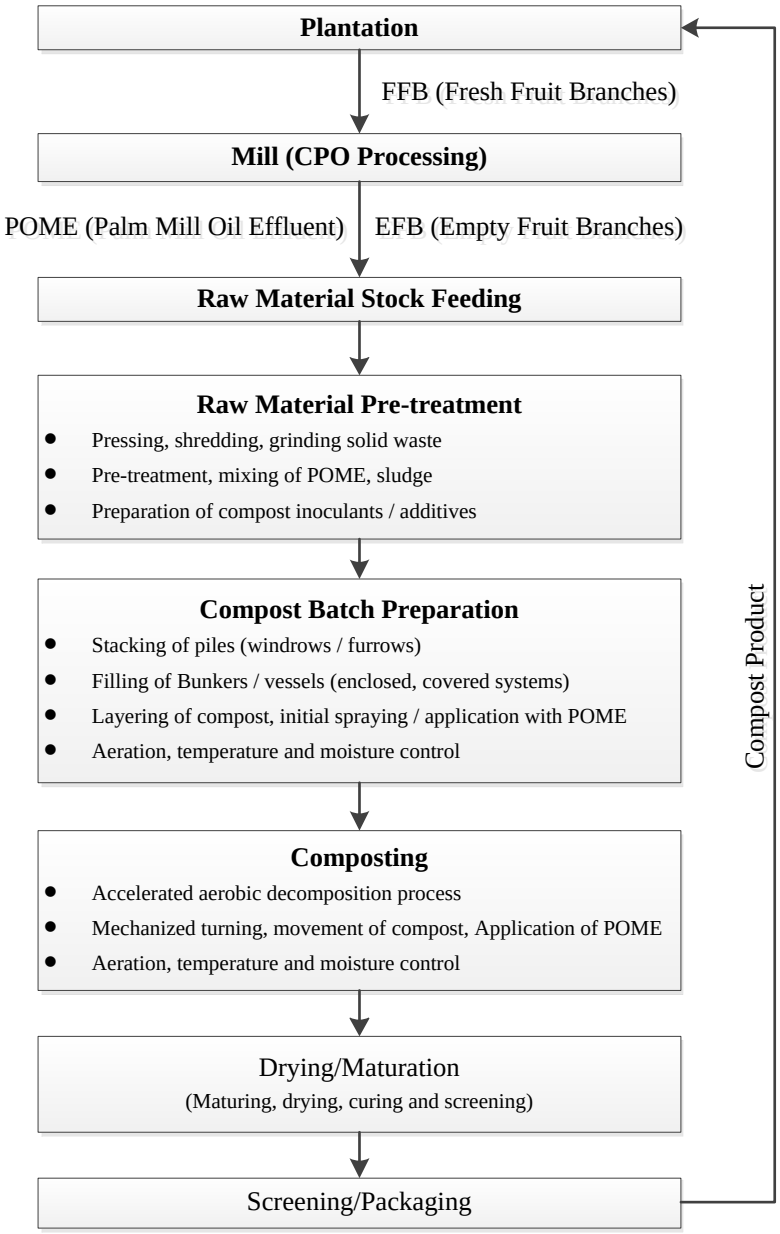
Step 5. Drying/Maturation

Depending on the compost process variation and Facility as well as the end users requirement the compost may spend a certain amount of time "drying" or curing after the formal composting process – for example, evaporating additional moisture from compost will reduce the weight and therefore transportation costs, and longer "curing" can improve the compost's C/N ratio which may be necessary depending on the end user of the compost and their requirements.

Step 6. Screening and Packaging

Some (but not all) Facilities may have post screening and packaging facilities depending again on the relationship between the Mill, facility and resultant plantation which will receive the output compost. Some facilities in contrast may simply re apply the compost to field as it is produced and therefore not have a need for such facilities.

The process involved in co-composting facilities is summarized in the figure below:



The output compost generated by the co-composting processes will be a consistent nutritionally rich organic compost and will improve the soil-conditioning value in the plantations by increasing the latter's organic matter content. It will generally be applied in palm oil plantations proximate to the Facility.

As set out above, several different variations of composting technology exist under the umbrella of "composting" technology. In general, Co-composting Technology can be divided into two different types of systems: Firstly more simple "open air" systems where the composting batch and process takes place outside in the open air (a so-called "non-reactor system"); and secondly "enclosed systems" (or in vessel systems) whereby the compost batch is placed inside a totally or partially enclosed environment ("enclosed reactor system", or "in-vessel reactor system").

Within each of these two main types there are again slight variations and techniques of co-composting and facility such as :

1. Non-Reactor Systems:
   a. Windrow Composting
   b. Static pile Composting
   c. Advanced Furrow composting

2. Enclosed Reactor Systems:
   a. Channel, Cell and Windrow Composting
   b. Aerated Pile Composting with Automatic Turning Machines
   c. Aerated bunker composting systems
   d. Tunnel Composting
   e. Rotating Drum Composting
   f. Vertical Flow Composting

Each of these variations and others that may be developed in coming years are eligible for CPAs to be included in this PoA, provided they meet the eligibility requirements outlined below.

A.4.2.2. Eligibility criteria for inclusion of a SSC-CPA in the PoA:

A description of criteria for enrolling CPAs in the PoA is set out below has been developed in accordance with the " *Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities" ver 0.1*[14] (**PoA Standard**): For a CPA to be eligible for inclusion in the Co-composting PoA in Indonesia shall satisfy the following criteria

1. **Boundary**:
   (i) **Physical Boundary**: The entire boundary of the CPA project activity must be physically located within the territory of the Republic of Indonesia as set out in section A.4.1.2 of this PoA-DD.
   (ii) **Time Induced Boundary**: No CPA shall commence before the Start Date of the PoA, as set out in section B.1. of this PoA-DD. In addition, no CPA shall commence later than 28 years after the start date of the PoA-DD as set out in section B.1. of this PoA-DD.

2. **Double counting**: To avoid double counting of emission reductions each CPA must:
   (i) Provide specific geographic GPS coordinates for the Project Activity to enable unique identification of the Project activity.

3. **Cooperation Agreement**: Each CPA owner must enter into a cooperation agreement with the Coordinating entity which includes at a minimum the matters set out in section A.4.4.1(iv), ie that:
   i. The CPA Owner is aware and voluntarily agrees that the CPA will be subscribed to the present PoA under the conditions as required by the approved PoA and the contractual arrangement between the CPA Owner and the Coordinating Entity.
   ii. Certifies the CPA has not been and will not be registered as a single CDM project activity

[14] EB 65, Annex 3.

nor as a CPA under another PoA, nor any voluntary scheme and warrants on an ongoing basis that they will not seek to have the project activity which forms the basis of the proposed CPA registered as a CDM project or registered under any other scheme that earns carbon credits for the emission reductions achieved while the project is included in a CPA or proposed CPA under the present PoA.

iii. The CPA Owner will certify in writing that the proposed CPA is not a debundled part of a bigger project.

iv. CPA Owner cedes all rights to independently claim and own emission reductions under the Clean Development Mechanism of the UNFCCC or any voluntary scheme other than through the managing entity of the present PoA as agreed.

4. **No Pre-existing Co-composting or Composting at Site**: Each CPA shall be implemented at a Palm Oil Mill site where no composting or co-composting activity was taking place before the Project Activity.

5. **Technology and compliance with Methodology**: Each CPA must be a newly developed, co-composting or composting facility using composting technology that
   (i) Uses Palm Oil Mill Organic waste as inputs and via an aerobic composting process within the parameters set out in section A.4.2.1 of the PoA-DD produces organic compost for reapplication to land as organic fertilizer
   (ii) Meets the requirements of approved methodology AMS-III.F version 10, including applicability criteria, its relevant assessment tools and guidelines,
   (iii) In addition in order ensure the environmental integrity of each co-composting facility that is brought under this PoA and to ensure that the co-composting facility does not become a source of environmental pollution itself, each facility must:
      i. Locate the main composting facility upon an impermeable composting pad / floor of concrete or some other impermeable material (This ensures leaching from the compost does not take place directly into the soil below and improves the composting process);
      ii. Incorporates a system / process to adequately deal with any run-off or leachate from the compost itself and / or ensure any liquid discharge would be diluted or treated to environmentally acceptable levels before entering the surrounding environment.

6. **Start date**: Each CPA Owner must be able to provide documentary evidence to verify the start date of the CPA.

7. **Additionality**[15]: Each CPA must be able to demonstrate that the Project Activity which forms the CPA would not have occurred anyway due to an investment barrier by following and applying all steps of the additionally assessment as set out in sections E.5.1 and E.5.2 of this PoA-DD.

8. **PoA Specific Requirements:**

[15] As this PoA involves small scale CPAs, the additionality eligibility criteria have been developed to satisfy the requirements of the "*PoA Standard ver 0.1"*, para 9, EB65, Annex 3 which provides that "*PoAs that will include one or more small scale projects as CPAs shall include eligibility criteria derived from the relevant requirements of Attachment A of Appendix B of the "Simplified modalities and procedures for small scale project activities*"

(i) **Environmental Impact Analysis (EIA)**: Each CPA which involves the implementation of a Compost Facility with a compost output capacity

i. Greater than or equal to 100 tons per day shall provide a copy of their EIA which has been submitted to, and approved by the Indonesian Ministry of the Environment[16].
ii. less than 100 tons per day, shall provide a copy of the Environmental Management and Monitoring Plan (EMMP) that was submitted and approved by the responsible Indonesian authorities.

(ii) **Compliance with Relevant National Standards:** Each CPA Project Activity must comply with the relevant Indonesian National or Regional Environmental Standard (i.e. licenses and or permits that might be required other than EIA and EMMP).

(iii) **Stakeholder Consultation:** Each CPA must be able to demonstrate with appropriate documentary evidence that Stakeholder Consultation has been undertaken in accordance with the requirements of CDM rules and procedures.

9. **Debundling**: To ensure A CPA is not a debundled component of a large scale activity, the Project Activity under each CPA must not:

(i) have the same activity implementer as the proposed small scale CPA or a coordinating or managing entity, which also manages a large scale PoA of the same technology/measure which is within 1 km of the boundary of the proposed small-scale CPA, at the closest point[17].

10. **SSC Threshold Criteria**: Each CPA shall not reduce more than 60 kt CO_2e annually.

11. **Use of Development or Assistance Funds:** Each CPA must certify in writing whether any Development Aid or Assistance funds have been used for funding the construction and operation of the Project Activity which forms the PoA. If any Development Aid or Assistance funds have been used, then before inclusion in the PoA, the CPA owner must provide evidence to confirm that such funds do not result in a diversion of any official development assistance funds.

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a SSC-CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

The following information presents the demonstration of additionality of the PoA as a whole while information regarding the additionality of each CPA will be presented in section E.5:

(i) The proposed PoA is a voluntary coordinated action

The proposed PoA is a voluntary and coordinated action to assist Crude Palm Oil Production in Indonesia to become more sustainable by facilitating the introduction of sustainable waste management practices into commercial Mills in Indonesia in order to reduce the GHGs and other pollution from the

[16] As per section C3of the PoA-DD, only Composting Facilities with an output capacity greater than or equal to 100 tons per day are required to prepare an EIA

[17] Per Guidelines on Assessment of Debundling for SSC Project Activities, EB54, Annex 13, pg 3, para 8.

major organic waste streams generated by Mills in the process of producing CPO. The specific practice to be introduced to Mills is environmentally sound co-composting of the major organic waste streams of Mills (EFB and POME) and to encourage the recycling of these waste streams back onto palm plantations as organic compost.

The Coordinating Entity under the PoA will undertake this, by undertaking capacity building activities with Palm Mill and Plantation owners, by offering low barrier access to carbon development services via the PoA, carbon finance and compost advice services to assist mill owners in obtaining best practice in co-composting and reapplication to field. The outcome of the PoA is to encourage and facilitate the introduction of sustainable waste management into Mills and recycling of compost onto plantations to become a standard practice in the commercial crude palm oil production sector in Indonesia.

There are no mandatory laws or regulations in Indonesia requiring the composting of any organic waste generated by palm oil mills, requiring the recycling of these waste organic materials onto plantations nor recourse to carbon finance for the development of such composting projects.

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;

In the absence of the proposed PoA, the voluntary coordinated actions outlined above will not be implemented, nor are they likely to become the common practice soon in the commercial palm oil production industry in Indonesia[18]. The construction of new composting facilities requires substantial investment in capacity development, equipment, land preparation and civil works. It requires the Mill to change standard existing waste management practices which have been in place for a long time, which are legal, comply with all existing regulations and which require minimum additional effort for the Mill management to continue[19].

The current proposition to a busy commercial Mill manager and owner to adopt co-composting as its waste management process at its Mill is not an attractive one. Without the PoA, the Mill management and owners are being asked to undertake a significant capital works project which will cost a significant amount of money as well as require significant time and effort in order to ensure that it is successful and consistent quality compost is produced. As well as the cost, Mill management will be required to oversee the process to ensure it is implemented correctly, train staff in new waste management processes and create a new Mill waste management Standard Operating Procedure in order to integrate the new practice into the Mill.

All this time and effort will be required to be spent on Mill "waste management" a process which from the Mill's perspective does not itself directly lead to a higher extraction of CPO from FFB, which is the key performance criteria of the Mill and determinant of profit from the Mill. Yes the co-composting will

[18] See *Greenhouse gas reduction potential due to smart palm oil mill residue treatment Heinz Stichnothe, Frank Schuchardt vTI- Institute of Agricultural Technology and Biosystems Engineering*

[19] Disposal of EFB in unmanaged dumpsites will only involve transportation and human resource costs, and POME can continue to be treated using available aerobic and anaerobic lagoons. Continuation of this practice will result in minimal ongoing costs for the project host, and will not require any additional capital investment. In such cases methane gas would continue to be emitted from both the solid waste disposal sites and the anaerobic lagoons. See Pollution control technologies for the treatment of palm oil mill effluent (POME) through end-of-pipe processes, *Ta Yeong Wu , Abdul Wahab Mohammad*[b]*., Jamaliah Md. Jahim , Nurina Anuar, Journal for Environmental Management 91 (2010) 1467 to 1490.*

improve the Mill's environmental performance and reduce its GHG emissions significantly, however the Mill's current waste management practices already comply with existing environmental legal requirements, and the current proposition is to ask the Mill owner to spend significant time and money on a project that will not directly increase Mill profitability in order to lift its environmental performance to a standard above what is required by current legal requirements. This is a difficult proposition to sell to very busy focused Mill management and Mill owners.

The only measurable financial benefit that could potentially be generated by a co-composting plant for a palm oil company is potential cost savings from the reduced use of inorganic chemical fertilizer which may result from re application to the plantation of organic compost produced as output from the co-composting process. Even this benefit is difficult to accurately predict as there is uncertainty as to the extent of ability of organic compost to act as a true replacement for the Nitrogen (N), Phosphorus (P), Potassium (K) and Magnesium (Mg)[20] provided by industrial inorganic fertilizers. A number of different complex factors such as the nutrient composition of the compost, soil type of the plantation, age of the palms, and the plantation all interact to determine the actual result[21]. Other benefits such as improved soil and palm health and resistance to disease through the addition of organic matter and micro nutrients into the soil from application of compost are difficult to directly quantify in terms of increased FFB yield and reduced palm mortality and therefore are normally considered co-benefits.

In contrast, in the case of Mill that has been in operation before project activity implementation, the continuation of the baseline situation requires no further investment on the part of the Mill owner and does not require the busy Mill management to adopt any new practices. In a new Greenfield's Mill, traditional POME waste management practices of EFB dumping and treating POME through a series of open air lagoons, is an easy, cheap and proven solution.

As a result, in the absence of capacity development with key actors, provision of composting advice services, access to streamlined and low cost CDM services as well as the additional carbon finance which allows the Mill to either earn revenue from CERs or to receive a subsidized or "no cost" solution due to carbon finance to be provided under this PoA, very few Mill Owners and management will have enough of an incentive to undertake the investment in both money, time and energy into setting up co-composting plants and recycling compost back onto the plantation. As such, in the absence of the PoA, co-composting and recycling of compost back onto plantations although an environmentally superior and sustainable practice will remain in the foreseeable future a marginal practice implemented on a few "special case" Mills due to current operating realities and practices and a lack of financial incentive to overcome these.

Therefore, without the proposed PoA, the proposed voluntary measures would not be implemented and therefore additionality of the PoA as a whole is established.

As per paragraph 73 of the 47th EB meeting report "additionality is to be demonstrated either at the PoA level or at CPA level". The project participants choose to demonstrate the additionality at CPA level by showing that the SSC-CPAs cannot be implemented in the absence of this PoA because of financial barriers as can be seen in section E.5.2 of this SSC-PoA-DD.

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[20] N, P, K and Mg are the four main nutrients required by a Palm Oil Palm in sufficient quantities in order for it to grow and yield sufficient levels of fresh fruit bunches and are the main nutrients which are supplied by the application of inorganic chemical fertilizers.

[21] See "*Protect the environment and make profit from the waste in palm oil industrysection" Frank Schuchardt, Klaus Wulfert, Tjahono Herawan, section 2.2,page 5,*

Due to the diversity and variance between co-composting projects and individual Mill operators' locations and circumstances in Indonesia, assessing additionality at the CPA level is more appropriate than demonstrating the additionality at PoA level. In fact, the demonstration of financial barriers in each specific CPA will ensure that every CPA included at any point in time in the PoA would not have occurred in the absence of receiving the benefits from generating carbon credits and that the Project owner required the additional incentive of carbon finance in order to implement the co-composting facility at their mill.

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;

Not applicable, the proposed PoA itself is a stated goal that is not required by any mandatory policies/regulations in Indonesia.

(iv) If mandatory a policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

Not applicable

A.4.4. Operational, management and monitoring plan for the programme of activities (PoA):

A.4.4.1. Operational and management plan:

The Coordinating Entity has developed and implemented a management system which expressly deals with all the requirements as set out in EB63 Annexure 3 para 9, and has submitted this Management Plan to the DOE during validation (Management Plan). The proposed PoA involves a range of operational activities in order to implement and manage each CPA by the managing entity PT. Carbon Agro Indo and CPA owner within the PoA.

Entity	Management Responsibilities
Coordinating Entity	● Under take new capacity building and business development activities with key parties in Indonesia ● CDM development services ● Carbon financing services and sale of CERs for CPA owners ● Maintain existing relationship with the project owner: ➢ conduct training for data monitoring as required; ➢ assist with monitoring system establishment and calibration as required; ➢ compost advice and analysis as required to optimize composting facility, process and output compost quality ● Periodic collect monitoring data ● Prepare monitoring reports for emission reduction verification
CPA Owner	● Implement and operate the Project activity ● Undertake ongoing monitoring

In addition to the above management tasks, and the Management Plan, the Coordinating Entity will implement the following operational elements to ensure proper management and oversight of the proposed PoA.

(i) A record keeping system for each CPA under the PoA,

In order to unambiguously identify each composting facility participating in the SSC PoA a serial numbering system will be implemented to uniquely identify each facility through numbers for the CPA and each composting facility. This serial numbering system will be used to record baseline and monitoring data on a continuous basis using a spreadsheet database. In this way the PoA coordinating entity will be able to track the emission reduction of each composting facility over the full duration of the crediting period and access the most up to date data at any point in time.

Each CPA will follow the record keeping and monitoring requirements stipulated in AMS-III.F version 10.
In summary, the Coordinating Entity will record and document CPA detail information as follows:

a) Name of the CPA and its project capacity
b) The name, address, and project owner details of each participating CPA
c) The geographical coordinates of each CPA (GPS coordinates of the physical location of the composting facility)
d) The record of technical specification of each composting plant participating in the CPA
e) Copy of each Co-composting Facility's Standard Operating Procedure (SOP) which documents quality control program and monitoring procedures to ensure the aerobic condition of the waste and compost during the composting process (eg temperature, moisture and oxygen during the different composting stages);
f) Copy of output Receiving Plantation's[22] Standard Operating procedure to transport output compost and reapplication to the field.
g) Ongoing recording and monitoring of the relevant parameters as set out AMS-III.F ver. 10
h) In the case that the project activity involved the replacement of equipment, a SOP to ensure independent monitoring of the scrapping of replaced equipment which meets the requirements of AMS-III.F ver 10

The Coordinating Entity will be responsible:

1. To ensure an adequate and accurate monitoring system which will meet the monitoring requirements as set out in AMS-III.F version 10 is installed at each CPA at each Co-composting Facility and in relation to the monitoring of the reapplication of compost to field as required. This will be done either by the Coordinating Entity assisting with the installation, calibration and establishment of the monitoring standard operating procedures at each site, or by going onto each site to inspect the monitoring system and procedures that have been put in place by the CPA Owner to ensure they meet the monitoring requirements.

[22] Receiving Plantation is the plantation which will receive and reapply the output compost from the Co-composting Facility. In most cases it will be the Plantation which undertakes and manages the reapplication of compost to the plantation and will also be responsible for the trucking of the compost from the Facility to the field. In such a case where is it is not directly done or managed by the plantation, or done in coordination between the Mill / CPA owner and the Plantation, the PoA will record a copy of the Standard Operating Procedure for transportation of output compost and re-application to the field by which ever entity is responsible for this.

2. For the ongoing management of records and data associated with each CPA. The Spreadsheet database will be updated manually using the data supplied by the participating composting facilities. It will form the basis for the verification of CPAs and be available for inspection by the DOE at any point in time.

(ii) A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA,

The database described above will be used to perform a double accounting check. Every new CPA will be compared to the already existing database and the list of project activities that are under validation or registered at the UNFCCC. In addition as set out below, before the inclusion of any CPA the CPA owners will be made aware of the double accounting principle and will be required to certify in writing that the proposed CPA is not currently registered under the Clean Development Mechanism of the UNFCCC or any voluntary scheme nor is currently in the CDM pipeline going through the process of validation or registration. Finally this certification provided by the CPA owner will include an ongoing warranty, which warrants on an ongoing basis that they will not seek to have the project activity which forms the basis of the proposed CPA registered as a CDM project or registered under any other scheme that earns carbon credits for the emission reductions achieved while the project is included in a CPA or proposed CPA under the Proposed PoA.

(iii) The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

The de-bundling check will be performed pursuant to the *Guidelines on Assessment of De-bundling for SSC Project Activities* issued on the EB's 54th meeting. The database described above will be used to perform the de-bundling check. Every new CPA will be compared to the already existing database and the list of project activities under-validation or registered at the UNFCCC. In addition as set out below, before the inclusion of any CPA the CPA owners will be made aware of the de-bundling rules and will be required to certify in writing that the proposed CPA is not a debundled part of a bigger project.

(iv) The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA;

In order to avoid double counting and to ensure that the operators of the CPA are aware of and have agreed that their activity is being subscribed to the PoA the implementing entity of a CPA shall enter into a contractual arrangement with the coordinating entity including respective provisions that:

a) The CPA Owner is aware and voluntarily agrees that the CPA will be subscribed to the present PoA under the conditions as required by the approved PoA and the contractual arrangement between the CPA Owner and the Coordinating Entity.
b) Certifies the CPA has not been and will not be registered as a single CDM project activity nor as a CPA under another PoA, nor any voluntary scheme and warrants on an ongoing basis that they will not seek to have the project activity which forms the basis of the proposed CPA registered as a CDM project or registered under any other scheme that earns carbon credits for the emission reductions achieved while the project is included in a CPA or proposed CPA under the present PoA.
c) The CPA Owner will certify in writing that the proposed CPA is not a debundled part of a bigger project.
d) Owner cedes all rights to independently claim and own emission reductions under the Clean Development Mechanism of the UNFCCC or any voluntary scheme other than through the

managing entity of the present PoA as agreed.

Using the unique identification for each participating composting facility, the PoA coordinating entity will confirm that a facility has not already been registered or entered validation as a CDM project activity or as a CPA of another PoA. Should such a case occur then the coordinating entity will not proceed with inclusion of the corresponding CPA in the PoA.

A.4.4.2. Monitoring plan:

The relevant parameters included in section E.7.1 shall be monitored and recorded for each of the CPAs independently. Monitoring reports will be prepared separately for each of the CPAs for the purpose of verification and request for issuance of CERs. A database for all the CPAs shall be maintained by the Coordinating Entity. Each CPA shall have its own monitoring period and the same shall be specified in the database. The following information forms the monitoring plan considered by the coordinating entity:

(i) Description of the proposed statistically sound sampling method/procedure to be used by DOEs for verification of the amount of reductions of anthropogenic emissions by sources or removals by sinks of greenhouse gases achieved by CPAs under the PoA.

In accordance with EB 55 annex 38, footnote number 2, *'The Board will develop a guideline containing criteria for determining statistically sound verification techniques and methods. Project developers are requested to take note that programmes which may be registered as a single CDM project activity prior to the adoption of this guideline will be required to comply with such criteria at the point of verification.'*. The DOE may consider the latest guidance available from the CDM Executive Board to carry out verification following a sampling approach. In this case, the DOE would undertake a detailed verification (including site visit) for only a sample number of CPAs. The sample size will be calculated as per the sampling guidance issued by the CDM EB.

In case, there are discrepancies between the emission reductions (ERs) reported in the monitoring reports and the ERs verified by the DOE (on the basis of detailed review), for those sample CPAs that are subject to detailed review, an adjustment factor (as described below) shall be worked out and the same shall be applied to adjust the ERs reported in the monitoring reports of other CPAs for which the DoE did not carry out a detailed review (including site visit). Request for issuance of CERs should be made for the adjusted ERs.

$$ER_{i,adjusted} = ER_{i,reported} \times F_{adj}$$

$$F_{adj} = (\sum ER_{j,verified} / \sum ER_{j,reported}$$

Where:

$ER_{i,\ adjusted}$	Adjusted ERs from CPA i, which is not subject to detailed review
$ER_{i,\ reported}$	ERs reported in the monitoring report for CPA i, which is not subject to detailed review
$ER_{j,\ verified}$	ERs verified by the DOE for CPA j, which is subject to detailed review

$ER_{j,\,reported}$ ERs reported in the monitoring report of CPA j, which is subject to detailed review

i Number of CPAs, which are not subject to detailed review

j Number of CPAs which are subject to detailed review

(ii) In case the coordinating/managing entity opts for a verification method that does not use sampling but verifies each CPA (whether in groups or not, with different or identical verification periods) a transparent system is to be defined and described that ensures that no double accounting occurs and that the status of verification can be determined anytime for each CPA

The Coordinating Entity intends to implement sampling method/procedure to be used by DOEs for verification of the amount of CERs because one of the great benefits of the PoA modalities is to reduce the transaction costs of CDM through sampling procedures. Such sampling procedures are particularly important for this PoA in order to reduce the transaction costs for Project Owner. This is of importance to this PoA which may comprise a large number of co-composting facilities where the facilities may be located spread all across the Indonesian Archipelago.

However, coordinating entity wants to keep the option to verify individually some CPAs in case the sampling method/procedure described in sub-section (i) above is not applicable in the time of verification. Therefore, coordinating entity shall provide a transparent system to ensure no double accounting occurs and the DOE may conduct verification at any time for each or any CPA.

A.4.5. Public funding of the programme of activities (PoA):

The Co-Composting PoA Indonesia does not receive any public funding. Any public funding that may be provided to individual CPAs to be included under this PoA will be described in the corresponding SSC CPA-DD.

SECTION B. Duration of the programme of activities (PoA)

B.1. Starting date of the programme of activities (PoA):

08/06/2011

B.2. Length of the programme of activities (PoA):

28 years

SECTION C. Environmental Analysis

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C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

1. Environmental Analysis is done at PoA level ☐
2. Environmental Analysis is done at SSC-CPA level X

The PoA consists of construction and operation of co-composting facilities in Crude Palm Oil Mills in Indonesia. Due to the site specificity of each Mill and the variations in Co-composting technology and facilities, the environmental analysis will be conducted at SSC-CPA level (see Section C3).

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

The analysis of environmental impacts, including transboundary impacts, will be conducted at CPA level however at a high level the major environmental effects of co-composting projects of Crude Palm Oil Mill Waste include

Co- Composting projects are well-known to have a lot of positive impacts including:

- Reducing methane and CO2 emissions associated with outdoor anaerobic POME ponds and EFB dumping / burning.
- Reducing odour problems from outdoor POME pond treatment systems.
- Reducing or avoiding altogether the pollution of local waterways and its effect on local biota and surrounding communities from the discharge of treated POME into waterways.
- Reducing the use of chemical fertilizer by application of output compost onto plantations.
- Production of high quality organic fertilizer from waste that improves soil health through providing nutrients, micro nutrients and organic soil content.
- Create local jobs.

On the negative side, if not managed properly, a poorly designed, constructed and managed co-composting system can become a source of odour, run off, and methane emissions if the compost process is not kept aerobic.

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

Under existing National Environmental Management policies in place at the date of registration of the PoA, Only CPAs which implement Compost Facilities with output capacity equal or greater to 100 tons per day of compost require an Environmental Impact Assessments (EIA)[23]. For CPAs which implement Compost Facilities less than 100 tons per day output capacity only an Environmental Management and Monitoring Plan (EMMP) will need to be developed, as necessary, and submitted to the responsible authorities.

SECTION D. Stakeholders' comments

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

[23] Indonesian Ministry of Environment Regulation No 11, 2006.

1. Local stakeholder consultation is done at PoA level ☐
2. Local stakeholder consultation is done at SSC-CPA level X

Note: If local stakeholder comments are invited at the PoA level, include information on how comments by local stakeholders were invited, a summary of the comments received and how due account was taken of any comments received, as applicable.

Local and focalized impacts of each composting project justify inviting comments from local stakeholders at the CPA level. Appropriate local Stakeholder consultation will be undertaken for each individual CPA which is brought under the PoA and each SSC-CPA-DD will provide a summary of comments received and describe how due account was taken of any comments received, as applicable.

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

Not applicable. Comments from local stakeholders will be invited at CPA level.

D.3. Summary of the comments received:

Not applicable. Comments from local stakeholders will be invited at CPA level.

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

Not applicable. Comments from local stakeholders will be invited at CPA level.

SECTION E. Application of a baseline and monitoring methodology

This section shall demonstrate the application of the baseline and monitoring methodology to a typical SSC-CPA. The information defines the PoA specific elements that shall be included in preparing the PoA specific form used to define and include a SSC-CPA in this PoA (PoA specific CDM-SSC-CPA-DD).

E.1. Title and reference of the approved SSC baseline and monitoring methodology applied to a SSC-CPA included in the PoA:

NOTE: The approved SSC baseline and monitoring methodology should be approved for use in a PoA by the Board.

AMS-III.F version 10, ‘Avoidance of methane emissions through composting’.

E.2. Justification of the choice of the methodology and why it is applicable to a SSC-CPA:

NOTE: In the case of CPAs which individually do not exceed the SSC threshold, SSC methodologies may be used once they have first been reviewed and, as needed, revised to account for leakage in the context of a SSC-CPA.

Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2e annually.

Applicability criteria AMS-III.F ver10	Methodology AMS-III.F version 10 is applicable to each CPA under the proposed PoA because:
1. This methodology comprises measures to avoid the emissions of methane to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site (SWDS) ….. or in a wastewater treatment system (WWTS). In the project activity, controlled aerobic treatment by composting of biomass is introduced.	1. Each CPA will avoid methane emissions to the atmosphere from either or both of: ● The waste water (**POME**) treatment system at Crude Mills that would otherwise involve the treatment of POME in outdoor anaerobic and aerobic lagoons; and/or ● Depending on the baseline practice for EFB disposal at the Mill, potentially from organic matter (EFB) that would have otherwise been left to decay anaerobically in a solid waste disposal site; Through controlled aerobic treatment of these two waste streams (EFB and POME) by co-composting and proper application to soil of the output compost as organic fertilizer.
2. The project activity does not recover or combust landfill gas from the disposal site (unlike AMS-III.G .Landfill methane recovery.), and does not undertake controlled combustion of the waste that is not treated biologically in a first step (unlike AMS-III.E . Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment.). Project activities that recover biogas from wastewater treatment shall use methodology AMS-III.H .Methane recovery in wastewater treatment. Project activities involving co-digestion of organic matters shall apply methodology AMS-III.AO .Methane recovery through controlled anaerobic digestion.	2. No CPA will involve: ● recovery or combustion of landfill gas; ● undertaking controlled combustion of the waste; ● recovery of biogas or methane; ● anaerobic digestion.
3. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually	3. A CPA will not reduce more than 60 kt CO_2e annually.
4. This methodology is applicable to the composting of the organic fraction of municipal solid waste and biomass waste from agricultural or agro-industrial activities including manure.	4. CPAs may include composting of biomass waste from Mills (classified as agro-industrial activities).
5. This methodology includes construction and expansion of treatment facilities as well as activities	5. CPAs may not include construction and expansion of existing treatment facilities as well

that increase capacity utilization at an existing facility. For project activities that increase capacity utilization at existing facilities, project participant(s) shall demonstrate that special efforts are made to increase the capacity utilization, that the existing facility meets all applicable laws and regulations and that the existing facility is not included in a separate CDM project activity. The special efforts should be identified and described.	as activities that increase capacity utilization at an existing facility.
6. This methodology is also applicable for co-composting wastewater and solid biomass waste, where wastewater would otherwise have been treated in an anaerobic wastewater treatment system without biogas recovery. The wastewater in the project scenario is used as a source of moisture and/or nutrients to the biological treatment process e.g. composting of empty fruit bunches (EFB), a residue from palm oil production, with the addition of palm oil mill effluent (POME) which is the wastewater co-produced from palm oil production.	6. CPAs may include the co-composting of solid biomass waste (EFB) and waste water (POME) and from Mills where: ● Otherwise the wastewater (POME) would have been treated in outdoor anaerobic lagoons without biogas recovery. The waste water (POME) will be co-composted with EFB and used as a source of moisture and nutrients.
7. In case of co-composting, if it can not be demonstrated that the organic matter would otherwise been left to decay anaerobically, baseline emissions related to such organic matter shall be accounted for as zero, whereas project emissions shall be calculated according to the procedures presented in this methodology for all co-composted substrates.	7. As set out above, each CPA will involve the co-composting of EFB and POME wastewater or composting of Solid Biomass Waste from Mills to produce organic compost. In any CPA where it cannot be demonstrated that the solid organic matter (EFB) would otherwise been left to decay anaerobically, baseline emissions in relation to EFB shall be accounted for as zero.
8. The location and characteristics of the disposal site of the biomass, animal manure and co-composting wastewater in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions, using the provisions of AMS-III.G, AMS-III.E (concerning stockpile), AMS-III.D Methane recovery in animal manure management systems" or AMS-III.H respectively. Project activities … in the region to dispose off the waste in solid waste disposal site (landfill)/stockpile(s).	8. As set out above, each CPA will involve the co-composting of EFB and POME wastewater or composting of Solid Biomass Waste from Mills, and therefore the wastewater baseline condition will be accounted accordance with AMS-III.H.
9. The project participants shall clearly define the geographical boundary of the region referred in paragraph 8 (b), and document it in the CDM-PDD. In defining the geographical boundary of the region, project participants should take into account the source of the waste i.e. if waste is transported up to	9. The CPA will clearly define the geographical boundary of the region in the CPA-DD accordance with the methodology requirement which radius is not more than 200 km.

50 km, the region may cover a radius of 50 km around the project activity. In addition, it should also consider the distance to which the final product after composting will be transported. In either case, the region should cover a reasonable radius around the project activity that can be justified with reference to the project circumstances but in no case it shall be more than 200 km. Once defined, the region should not be changed during the crediting period(s).	
10. In case produced compost is handled aerobically and submitted to soil application, the proper conditions and procedures (not resulting in methane emissions) must be ensured.	10. The CPA will only involve co-composting technology which can ensure the aerobic condition during composting process.
11. In case produced compost is treated thermally/mechanically, the provisions in AMS-III.E related to thermal/mechanical treatment shall be applied.	11. In case produced compost is treated thermally/mechanically, the CPA will apply the provisions in AMS-III.E related to thermal/mechanical treatment.
12. In case produced compost is stored under anaerobic conditions and/or delivered to a landfill, emissions from the residual organic content shall to be taken into account and calculated as per the latest version of the Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site.	12. Compost final product will not be stored under anaerobic conditions and not delivered into landfill. CPAs will use the final product of composting as organic compost.

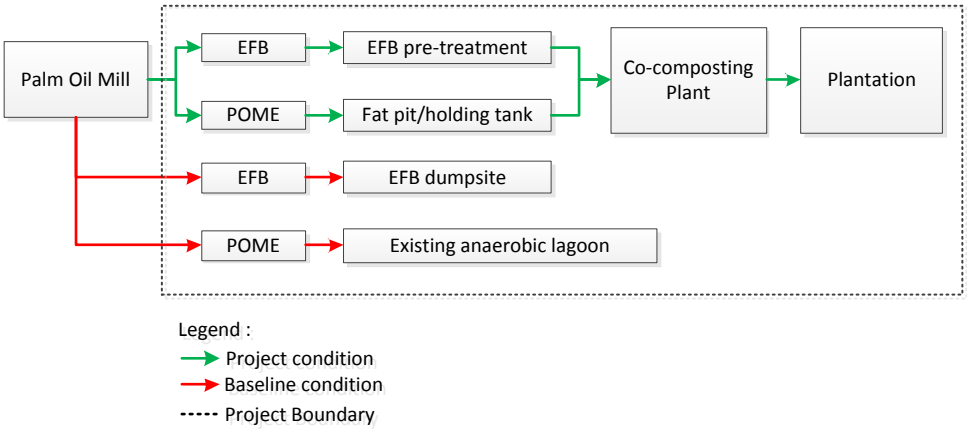
E.3. Description of the sources and gases included in the SSC-CPA boundary

As per methodology **AMS-III.F ver 10,** the project boundary for each CPA is the physical, geographical site of the co-composting facility as well as the site:

(a) If applicable, where the solid waste (EFB) would have been disposed and the methane emission occurs in absence of the CPA;
(b) If applicable where the co-composting wastewater (POME) would have been treated anaerobically in the absence of the CPA;
(c) Where the treatment of biomass through composting takes place;
(d) Where the products from composting (compost) are handled, disposed, submitted to soil application.
(e) And the itineraries between them (a, b, c, and d), where the transportation of waste, wastewater or compost occurs

The CPA boundary is pictorially shown in the figure below. The red arrows express the GHG relevant mass flow of the baseline scenario and the green arrows express the GHG- relevant mass flow of the CPA:

Figure 3: Project boundary



Note: In CPAs where emission reductions are not claimed from the solid organic waste from the Mill (EFB) the EFB dumpsite / disposal site will not be included in the Project Boundary. Likewise, in CPAs where emission reductions are not claimed from POME, the POME lagoons will not be included in the Project boundary.

Emissions sources included or excluded from the project boundary are listed as follows:

Table B-1: GHG sources included or excluded from the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Biomass disposed of in unmanaged landfill / dumpsite	CO_2	No	CO2 emissions from biomass decay in solid waste disposal sites are considered GHG neutral
		CH_4	Yes	Methane emission from Biomass decay in the solid waste disposal site.
		N_2O	No	Excluded for simplification. This is conservative.
	POME Treatment in open lagoons	CO_2	No	CO2 emissions from anaerobic digestion of POME are considered to be GHG neutral.
		CH_4	Yes	Methane emissions from anaerobic digestion of POME in open air lagoons.
		N_2O	No	Excluded for simplification. This is conservative.
Project Activity	Composting Process	CO_2	No	CO2 emissions from composting process are considered to be GHG neutral. Expected to be minimal and excluded for simplification
		CH_4	Yes	Methane emissions from Anaerobic pockets during composting if composting takes place in sub-optimal conditions and is not managed

				properly
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	POME not utilized and run-off diverted into holding tank / existing outdoor ponds	CO_2	No	Excluded for simplification. This emission source is assumed to be very small.
		CH_4	Yes	Methane emissions from portion of POME produced by Mill that may not be able to be used for co-composting and continues to be treated via open air ponds as well as any portion of run off POME / water that may be collected into open air holding tank or existing outdoor POME ponds for treatment and disposal through existing outdoor POME pond system.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Electricity	CO_2	Yes	Some machinery (Shredders, Presses, pumps, fans, conveyors etc) may be run off diesel gensets in the case that the mill does not have excess power, or in case of shredders / presses these are not already in place and operating at the mill. Where mill provides source of power this will be biomass power and as such considered carbon neutral.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Incremental use of fossil fuels for transportation, auxiliary equipment due to project	CO_2	Yes	CO2 emissions from fuel use in loaders, windrow turners, bunker fillers and trucks etc which may be used by the Project Activity. Note in the case of re-application of compost, fuel emissions from trucks utilised for transport will be “net” additional truck movements, as in most cases, the Project Activity will be able to make use of empty trucks travelling from the mill (after dropping off FFB) back to

				the Plantation to collect more FFB.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small..
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.

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

The Mill produces POME and EFB as waste, in the process of extracting crude palm oil (CPO) from FFB. POME is treated in a series of open air anaerobic and then aerobic ponds to digest the high amount of COD / BOD and later further reduction of the COD / BOD in a series of aerobic ponds to a level acceptable to the local environmental regulations before final discharge into a local waterway.

EFBs will be either dumped or left to decay in unmanaged solid waste disposal site, or in some cases it may be being reapplied whole or mulched to the plantation without any composting.

The source of anthropogenic emissions for each CPA will be the anaerobic open air POME ponds installed within the CPA boundary. Depending on the baseline practice for EFB disposal / use it may also include the emissions associated with unmanaged solid waste disposal sites. The baseline scenario will therefore be the existing practice for POME treatment and / or disposal and EFB disposal that is in place at the Mill immediately prior to the implementation of the Project and which in the absence of the project activity would continue to be in place and operate. As set out above this baseline scenario is a situation where POME is treated in a series of open air ponds within the project boundary and methane is emitted to the atmosphere in an uncontrolled manner. Depending on existing practice at the mill EFB waste may also be being left to decay within the project boundary and methane is emitted into the atmosphere in an uncontrolled manner.

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA): >>

E.5.1. Assessment and demonstration of additionality for a typical SSC-CPA:

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

In this case, where the project activity involves the purchase and implementation of co-composting technology and the construction of a co-composting plant to process organic Mill waste to replace the existing legally compliant waste management system at the Mill, (or construction of a composting facility at a greenfields mill in the place of implementing a traditional waste management system of EFB dumping and processing POME through a series of open air lagoons), the main barrier common to all projects will be an Investment Analysis – i.e justifying to the Mill management and owners the capital

required to implement and operate the project vs simply continuing with the current waste management practice at the Mill (or implementing a traditional waste management at the Mill) which is legally compliant and using the funds for other projects/investments.

In addition to revenue produced from each project activity from CERs, it is expected that some other economic/financial benefits will accrue to the project from savings in inorganic fertilizer that are realized by the plantation by being able to reduce their inorganic fertilizer use due the application to field of the output organic compost. In some CPAs there may be revenue through the selling of compost rather than from fertilizer savings. As the projects will most likely generate financial benefits other than CDM-related income, investment comparison analysis or benchmark analysis will be used to demonstrate additionality[24]

As only newly built co-composting facilities are eligible for participation in this PoA, "non-action from the project proponent(s)" is a credible and realistic alternative to the project scenario. The continuation of the existing baseline practice in Mills that wish to be included as CPAs in this PoA will require only minimal investment and operational costs. The outdoor lagoon system for disposal of POME will already be in place (or in a Greenfield's situation open air ponds can be simply dug by the Mill), is legally compliant and only require a continuation of minimal ongoing operating and maintenance costs which are steady and predictable. Current EFB disposal costs likewise only require continuation of ongoing practice and likely comprise only transportation and disposal costs.

In contrast the construction and implementation of a co-composting plant and system for composting and re-application of output compost will require substantial investment costs for equipment, land preparation and construction. Further it requires precious mill management time and resources to create new standard operating procedures for waste management to ensure that it is implemented successfully. From the Mills perspective, as it is not required by law (the existing practices are legally compliant) this is a non "core" project[25] and therefore the capital required to purchase, construct, implement and operate the co-composting plant will need to be justified and weighed against other competing projects and investments that the Mill or project owner could make.

In this case the financial viability of the development and operation of each CPA will be compared with a scenario where the CPA owner does not undertake the project ("non-action") and deploys the financial resources that would have been used to finance the construction, implementation and operation of the project activity for alternative investments.[26]

As set out above, in the case of each CPA, the project owner will have a choice whether to invest the

[24] In accordance with "Tool for the demonstration and assessment of additionality" version 05.2, EB39 Annex 10, page 5.

[25] A Mills key performance criteria is amount of CPO produced and extraction rate of CPO from FFB. Therefore the core revenue and business of Mill Owner is to produce more CPO and extract CPO from FFB at higher extraction rates. Waste management, while important from an environmental and sustainability perspective, does not contribute directly to higher extraction of CPO from FFB and thus is not a core activity for the mill and therefore secondary provided it is legally compliant with existing laws and regulations. The conclusion from this is that additional capital projects in relation to waste management that are above and beyond that required by law are not "necessary" from the perspective of the Mill and must therefore compete for funds with other potential uses of the capital.

[26] This is consistent with "Non-binding best practice examples to demonstrate additionality for SSC project activities", EB 35 annex 34, paragraph 1(a).

capital and undertake the Co-composting project activity, or to not invest in the project and to continue with the status quo existing baseline waste management system in the mill. In such a scenario, the benchmark approach is more suitable as it is suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e. cases where the choice of the developer is to invest or not to invest[27]

To this end and pursuant to version 5 of the Guidelines for the Assessment of Investment Analysis the pre-tax project IRR[28] (without CDM revenues) will be compared with a benchmark rate for investment returns available to the CPA owner in Indonesia[29]. This benchmark represents the minimum pre-tax project IRR that is required for the project to be financially viable relative to the "non-action" scenario[30].

E.5.2. Key criteria and data for assessing additionality of a SSC-CPA:

Pre-tax project IRR calculation

The pre-tax project IRR will be determined based on a list of economic parameters provided by the CPA owner that were available at the date of the investment decision. This list of parameters includes:

Table 5: Parameters for pre-tax project IRR calculation

Project Data	Unit	Comments
Technical lifetime	Year	Shall be determined for each CPA according to: ● The information from technical provider if such information is available; or ● If such information is not available, then according to the latest version of the 'Tool to determine the remaining lifetime of equipment".
Investment Decision Date	DD/MM/YY	Shall be sourced from board or management decision[31].
Date project starts operating	Year	This shall be sourced from an external document such as: ● feasibility study report;

[27] In accordance with 'Guidance on the Assessment of Investment Analysis, EB 51 Annex 58, paragraph 16.

[28] The pre-tax IRR is an appropriate indicator for the investment analysis since many composting projects will be consolidated in the accounts of larger companies. This would make a separate treatment of their tax liabilities difficult and favors a pre-tax assessment and comparison. This is also consistent with paragraph 5 and paragraph 11 of version 3 of the Guidelines for the Assessment of Investment Analysis, EB 51 Annex 58.

[29] The internal rate of return (or IRR) is a common financial valuation metric used by financial analysts to calculate and assess the financial attractiveness / viability of capital intensive projects or investments and is appropriate in this circumstance – see http://www.financialmodelingguide.com/valuation-concepts/financial-valuation-concepts-the-internal-rate-of-return-irr/. Further, Project IRR has been extensively used in other similar registered CDM projects which further supports the appropriateness of its use in this PoA as the financial indicator.

[30] All projects or investments with an IRR that have been calculated in a financial modelingexercise to be greater than the Benchmark should technically be considered as financially viable and accepted – see http://www.financialmodelingguide.com/valuation-concepts/financial-valuation-concepts-the-internal-rate-of-return-irr/.

[31] Depending on the internal authorization procedures of the CPA Owner, this might be a decision of the board decision, a shareholder approval, or a management decision.

		● construction estimation from technical provider or construction company; In the event that more than one external document exists then the most conservative one will be used.
Annual compost production t/year	Tons/year	This shall be sourced from external feasibility study report or technology provider data source. The compost/EFB ratio provided by such document shall be between the range of 0.5 to 1.5 of compost to 1 EFB (for example every 1 ton of EFB will result in somewhere from 0.5 up to 1.5 tons of compost) In the event that more than one external document exists then the most conservative one will be used.
Price of Compost (if Compost sold to a third party)[32]	IDR/t	Shall be sourced from contract or signed commercial agreement between parties..
Estimated Fertilizer savings (If compost reapplied to plantation which is same company as the mill and not purchased)	IDR	Shall be calculated according to one of the following 2 options below : a) Option A: In the event that there is specific externally published data for that region from technology provider or compost expert on specific percentage of fertilizer savings that can expected to be achieved using that specific technology in that region, then this source shall be used and calculated according to the *Option A: specific fertilizer savings* excel template provided during validation; b) Option B: In the event that such data does not exist, then according to the *Option B General fertilizer savings* excel template provided during validation.
Currency	IDR	Average exchange rate (middle rate of the Bank Indonesia) during the twelve months preceding the date of the investment decision date.
Capital and Equipment costs[33] (Note this will be broken down as appropriate into subcomponents)	IDR	Shall be sourced from e.g. quotations or estimates of costs from technology providers and or contracts from technology provider(s). In the case there is more than one potential source for an item, the most conservative one shall be used.
CER revenue	IDR	Shall be sourced from board or management estimation and CER

[32] In placing a value on the compost, there are three potential options as follows:

1. **Option 1**: If the compost is sold to a third party there will be a signed commercial agreement between the parties that sets out a per MT compost price. In such a case this will be used; and
2. **Option 2**: If there is no third party sale of compost as the CPA Owner uses the compost for their own plantation, then the value of the compost will be based on the potential fertiliser savings calculated using one of the 2 options as set out in the "*Estimated Fertiliser Savings*" row in Table 5 above:

[33] Capital equipment is limited to only what is necessary to undertake the Project Activity.

		price shall be sourced from credible relevant publicly accessible price index.
Operation & Maintenance cost: Comprises the following major sub-components set out below[34]	IDR	See below for specific classes of O&M costs.
Fuel and Electricity Costs (includes any fuel and power costs directly related to the Project Activity)	IDR	Information on fuel and electricity costs shall be sourced from historical company purchase records or contracts or government price index and estimation of fuel and electricity usage shall be sourced from technology provider. In the case there is more than one potential source for an item, the most conservative one shall be used.
Labour Costs – (includes additional labour costs directly as a result of the Project Activity)	IDR	Assessment of labour required for Project Activity shall be sourced from technology provider and labour rates shall be based on prevailing internal company labour rate at the associated Crude Palm Oil Mill.. In the case there is more than one potential source for an item, the most conservative one shall be used.
Maintenance costs – (includes any electrical, mechanic, civil maintenance and or equipment maintenance costs directly related to the Project Activity)	IDR	Shall be sourced from technology provider or manufacturer. In the case there is more than one potential source for an item, the most conservative one shall be used.
Land Rental Costs – (includes any rental costs for land directly used for Project Activity)	IDR	Shall be sourced from lease agreement.
Feedstock Costs – (Includes any costs for any raw material feedstock inputs into the Compost Facility)	IDR	Shall be sourced from signed commercial agreement between parties. In the case there is more than one potential source for an item, the most conservative one shall be used.
Ongoing licensing / royalty costs – (includes any ongoing royalty or licensing costs required to be paid by the CPA owner directly in relation to the Project Activity)	IDR	Shall be sourced from signed commercial agreement between CPA owner and technology provider. In the case there is more than one potential source for an item, the most conservative one shall be used.
Insurance.	% of CAPEX	Can be sourced from e.g. insurance quotation/contract.

[34] Please note, not all CPAs will have all sub-components.

Source for the main economic parameters shall be extracted from externally verifiable third party documents and sources such as independent feasibility studies, quotes from suppliers, and contracts with third parties. Any data which is derived from an internal source[35] and which is not verifiable on an independent third party document will be scrutinized before inclusion to ensure that it is based on objective evidence, any calculations and assumptions are transparently disclosed and such data is cross checked against third party or publicly available sources[36] to ensure they are credible and reliable.

Benchmark calculation

As per EB 62 annex 5, paragraph 15, "If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors. The values in the table in Appendix A may also be used, as a simple default option, if a company internal benchmark is used".

In this PoA, for conservativeness, the default value in the Appendix A has been selected as the benchmark in this PoA. In this case, since the sectoral scope of the PoA falls in the waste handling and disposal, therefore the value of 12.5% will be used as the benchmark of the PoA. This is the benchmark which will be adopted for all CPAs under this PoA.

Sensitivity analysis

As specified in the spreadsheet supplied to the DOE, a sensitivity analysis will be also conducted using assumptions that are conservative from the point of view of analyzing additionality, i.e. the "bestcase" conditions for the project IRR were assumed by altering the following parameters: (1) project revenues; (2) total investment, and (3) O&M by +/- 10%.

In addition to revenue produced from each project activity from CERs, it is expected that some other economic/financial benefits will accrue to the project from savings in inorganic fertilizer that are realized by the plantation by being able to reduce their inorganic fertilizer use due the application to field of the output organic compost. In some CPAs there may be revenue through the selling of compost rather than from fertilizer savings, therefore the variation of the project revenues in the sensitivity analysis will cover the variation of compost produced and inorganic fertilizer price and/or compost price.

The full results of each sensitivity analysis will be reported in the respective SSC CPA-DD using the following format:

Table 7: Sensitivity analysis of IRR project without revenue from CDM

Factor	Variation		
	-10%	0%	10%

[35] For example some parameters such as estimation of the additional labor component may be based on internal projection based on number of extra staff required by the project times an applicable salary rate and not on a "third party document".

[36] Such sources could include relevant price indexes, market data, economic studies, as well data from other comparable registered CDM projects.

Project revenue	(will be identified in CPA level)	(will be identified in CPA level)	(will be identified in CPA level)
Project investment	(will be identified in CPA level)	(will be identified in CPA level)	(will be identified in CPA level)
O&M Cost	(will be identified in CPA level)	(will be identified in CPA level)	(will be identified in CPA level)

In addition, a likelihood scenarios analysis where the IRR would meet the benchmark by adjusting project revenue, project investment, and O&M cost shall be included in each CPA-DD. If the IRR exceeds the benchmark while altering one the 3 parameters, the CPA owner shall provide evidence that this scenario is unlikely to occur. If no sufficient proof is provided, the CPA will be considered as non-additional.

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical SSC-CPA:

The PoA comprises CPAs that implement facilities to co-compost organic wastewater (POME) and / or solid biomass waste (EFB) from Crude Palm Oil Mills. The wastewater would otherwise have been treated in an anaerobic wastewater treatment system without biogas recovery. The wastewater in the project scenario is used as a source of moisture and nutrients for the biological treatment process (i.e. aerobic decomposition (composting) of empty fruit bunches (EFB), and palm oil mill effluent (POME). Therefore the PoA adopts methodology AMS-III.F version 10," Avoidance of methane emissions through composting".

In accordance with AMS-III.F version 10, the baseline for each co-composting project activity will include as relevant methane emissions from the wastewater (POME) being treated in open air anaerobic ponds and may or may not also include methane emissions from of the solid waste (EFB) depending on the baseline disposal practice at the Mill.

The methane generation potential of the solid waste composted (if included) will be calculated based on "*Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" version 05.1* and the baseline from the wastewater co-composted will be calculated based on AMS-III.H version 16. Each CPA shall apply the monitoring methodology as required by each baseline condition (as relevant) set out by the "*Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" version 05.1 and AMS-III.H version 16*. Furthermore, AMS-III.F version 10 requires that baseline emissions exclude emissions of methane which would have to be captured, fuelled or flared to comply with national or local safety requirement or legal regulations. Since there are no safety requirements or legal regulations in Indonesia that require methane to be captured, the baseline condition from solid waste disposal and wastewater co-composting are both considered as the baseline scenario existing at the Mill prior to the commencement of the project activity.

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a SSC-CPA:

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A. Baseline Emission

Following equation is to determine baseline emission according to AMS-III.F version 10:

$$BE = BE_{CH4,SWDS,y} + BE_{ww,y} + BE_{CH4,manure,y} - MD_{y,reg} * GWP_CH_4$$

Where:

$BE_{CH4,SWDS,y}$	Yearly methane generation potential of the solid waste composted by the project activity during the years x from the beginning of the project activity (x=1) up to the year y estimated as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (tCO_{2e}). The tool may be used with the factor "f=0.0" assuming that no biogas is captured and flared. With the definition of year x as 'the year since the project activity started diverting wastes from landfill disposal, x runs from the first year of crediting period (x=1) to the year for which emissions are calculated (x=y)'
$MD_{y,reg}$	Amount of methane that would have to be captured and combusted in the year y to comply with the prevailing regulations (ton)
$BE_{CH4,manure,y}$	Where applicable, baseline emissions from manure composted by the project activities, as per the procedures of AMS-III.D
$BE_{ww,y}$	Where applicable, baseline emissions from the wastewater co-composted, calculated as per the procedures in AMS-III.H
GWP_CH_4	GWP for CH4 (value of 21 is used)

Baseline emission due to methane generation potential of the solid waste composted:

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

Where:

$BE_{CH4,SWDS,y}$	Methane emissions avoided during the year y from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of project activity to the end of year y (tCO_{2e})
φ	Model correction factor to account for model uncertainties (0.9)
f	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
GWP_{CH4}	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
OX	Oxidation factor (reflecting the amount of methane on SWDS that is oxidised in the soil or other material cover the waste)
F	Fraction of methane in the SWDS gas (volume fraction) (0.5)

DOC_f Fraction of degradable organic carbon (DOC) that can decompose

MCF Methane correction factor

$W_{j,x}$ Amount of organic waste type j prevented from disposal in the SWDS in year x (tons)

DOC_j Fraction of degradable organic carbon (by weight) in the waste type j

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 emission calculated (x=y)

y Year for which methane emission are calculated

Changes required for methodology implementation in 2nd and 3rd crediting periods:

At the renewal of the crediting period, the following data should be updated according to default values suggested in the most recently published IPCC Guidelines for National Greenhouse Gas Inventories:

- Oxidation factor (*OX*);
- Fraction of methane in the SWDS gas (*F*);
- Fraction of degradable organic carbon (DOC) that can decompose (DOC_f);
- Methane correction factor (*MCF*);
- Fraction of degradable organic carbon (by weight) in each waste type j (DOC_j);
- Decay rate for the waste type j (k_j).

As per AMS-III.H version 16, baseline emission from the wastewater co-composted may comprise of methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$) and methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$).

Baseline emission due to methane emission from baseline wastewater treatment system:

$$BE_{ww,treatment,y} = \sum_i \left(Q_{ww,i,y} * COD_{inflow,i,y} * \eta_{COD,BL,i} * MCF_{ww,treatment,BL,i} \right) * B_{o,ww} * UF_{BL} * GWP_{CH4}$$

Where:

$Q_{ww,i,y}$ Volume of wastewater treated in baseline wastewater treatment system i in year y (m^3). For ex ante estimation, forecasted wastewater generation volume or the designed capacity of the wastewater treatment facility can be used.

$COD_{inflow,i,y}$ Chemical oxygen demand of the wastewater inflow to the baseline treatment system i in year y (t/m^3).

$\eta_{COD,BL,i}$	COD removal efficiency[37] of the baseline treatment system i
$MCF_{ww,treatment,BL,i}$	Methane correction[38] factor for baseline wastewater treatment systems i
i	Index for baseline wastewater treatment system
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC value of 0.25 kg CH4/kg COD)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
GWP_{CH4}	Global Warming Potential for methane (value of 21)

Baseline emission due to methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea:

$$BE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,w} * UF_{bl} * COD_{ww,discharge,BL,y} * MCF_{ww,discharge,y}$$

Where:

$Q_{ww,y}$	Volume of treated wastewater discharged in year y (m^3)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
$COD_{ww,discharge,BL,y}$	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the baseline situation in the year y (t/m^3). If the baseline scenario is the discharge of untreated wastewater, the COD of untreated wastewater shall be used
$MCF_{ww,BL,discharge,y}$	Methane correction factor based on discharge pathway in the baseline situation [39](e.g. into sea, river or lake) of the wastewater (fraction)

B. Project Emission

Project emissions that might occur due to the co-composting process are listed as following:

a. CO_2 emissions due to incremental transportation distances;
b. CO_2 emissions from electricity and/or fossil fuel consumption by the project activity facilities;
c. Methane emissions during composting process;
d. Methane emissions from runoff water;
e. In case the compost is stored under anaerobic conditions and/or delivered to a landfill: the methane emissions from the disposal/storage of compost.

Thus, total project emission from co-composting process is summarized using equation below:

[37] Determined based on paragraph 26,27 or 28 of methodology AMS-III.H version 16

[38] MCF values as per Table III.H.1 in the methodology AMS-III.F version 16

[39] MCF values as per Table III.H.1 in the methodology AMS-III.H version 16

$$PE_y = PE_{y,transp} + PE_{y,power} + PE_{y,comp} + PE_{y,runoff} + PE_{y,reswaste}$$

Where:

PE_y Project activity emissions in the year y ($tCO2_e$)

$PE_{y,transp}$ Emissions from incremental transportation in the year y ($tCO2_e$)

$PE_{y,power}$ Emissions from electricity or fossil fuel consumption in the year y ($tCO2_e$)

$PE_{y,comp}$ Methane emissions during composting process in the year y ($tCO2_e$)

$PE_{y,runoff}$ Methane emissions from runoff water in the year y ($tCO2_e$)

$PE_{y,reswaste}$ In case produced compost is subjected to anaerobic storage or disposed in a landfill: methane emissions from the anaerobic decay of the residual organic content ($tCO2_e$)

Project emission from incremental transportation:

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

Where:

Q_y Quantity of raw waste/manure treated and/or wastewater co-treated in the year y (tons)

CT_y Average truck capacity for transportation (tons/truck)

DAF_w Average incremental distance for raw solid waste/manure and/or wastewater transportation (km/truck)

EF_{CO2} CO_2 emission factor from fuel use due to transportation ($kgCO_2$/km, IPCC default values or local values may be used)

$Q_{y,treatment}$ Quantity of compost produced in year y (tons)

$CT_{y,treatment}$ Average truck capacity for compost transportation (tons/truck)

$DAF_{treatment}$ Average distance for compost transportation (km/truck)

Project emissions from electricity or fossil fuel consumption:

$$PE_{y,power} = EC_y * EF_{grid}$$

Where:

$PE_{y,power}$ Project emission from electricity consumption from the grid (tCO_2)

EC_y Electricity consumption by the project activity (MWh)

EF_{grid} CO2 emission factor of the grid connected with the project activity (tCO_2/MWh)

In case the project activity uses fossil fuel to generate electricity, project emissions due to fossil fuel combustion will be calculated based on "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", as described in the following equation:

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

Where:

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

The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using one of the following two options, depending on the availability of data on the fossil fuel type i, as follows:

Option A: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on the chemical composition of the fossil fuel type i, using the following approach:

If $FC_{i,j,y}$ is measured in a mass unit: $COEF_{i.y} = w_{C,i,y} \times 44/12$

If $FC_{i,j,y}$ is measured in a volume unit: $COEF_{i.y} = w_{C,i,y} \times \rho_{i,y} \times 44/12$

Where:

$COEF_{i,y}$	CO_2 emission coefficient of fuel type i (tCO_2/mass or volume unit)
$w_{C,i,y}$	Weighted average mass fraction of carbon in fuel type i in year y (tC/mass unit of the fuel)
$\rho_{i,y}$	Weighted average density of fuel type i in year y (mass unit/volume unit of the fuel)
i	Are the fuel types combusted in process j during the year y

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i.y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where:

$COEF_{i,y}$	CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

$NCV_{i,y}$	Weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Weighted average CO2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

Option A should be the preferred approach, if the necessary data is available.

Project emissions due to methane emission during composting activity:

$$PE_{y,comp} = Q_y * EF_{composting} * GWP_CH_4$$

Where:

$EF_{composting}$ Emission factor for composting of organic waste and/or manure (t CH_4/ton waste treated). Emission factors can be based on facility/site-specific measurements, country specific values or IPCC default values (table 4.1, chapter 4, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gas Inventories). IPCC default values are 10 g CH_4/kg waste treated on a dry weight basis and 4 g CH_4/kg waste treated on a wet weight basis. $EF_{composting}$ can be set to zero for the portions of Q_y for which the monitored oxygen content of the composting process in all points within the windrow are above 8%. This can be done via sampling with maximum margin of error of 10% at a 90% confidence level. For this purpose a portable oxygen meter can be used with lancets of at least 1 m length. In the case of forced aerated in-vessel and forced aerated pile composting systems continuous measurements may also be done using online sensor(s).

Project emissions from runoff water from the composting yard:

$$PE_{y,runoff} = Q_{y,ww,runpff} * COD_{ww,y,runoff} * B_{o,ww} * MCF_{ww,treatment} * UF_b * GWP_CH_4$$

Where:

$Q_{y,ww,runoff}$	Volume of runoff water in the year y (m^3)
$COD_{y,ww,runoff}$	Chemical oxygen demand of the runoff water leaving the composting yard in the year y ($tons/m^3$). For ex ante estimation, the volume of runoff water may be based in the area of the composting yard and the yearly average rainfall, and the COD for domestic wastewater may be used. For ex post calculations the measured volume and COD shall be used
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC default value of 0.25 kg CH4/kg.COD)
$MCF_{ww,treatment}$	Methane correction factor for the wastewater treatment system where the runoff water is treated (MCF value as per relevant provisions in AMS-III.H)
UF_b	Model correction factor to account for model uncertainties (1.12)

Project emission due to methane emissions from anaerobic storage and/or disposal in a landfill:

This project emission is calculated as per the latest version of the "*Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site*". In addition, if storage of biomass under anaerobic conditions takes place due to the project activity that does not occur in the baseline situation, methane emissions due to anaerobic decay of this biomass shall also be considered. However, the final produced compost will be directly returned back for soil application on site or may be exported to other plantations in which soil application also directly applied. This means the final compost will not be stored in anaerobic storage and/or disposed in a landfill and therefore the project emission from anaerobic storage and/or disposal in a landfill is considered as zero.

C. Leakage Emission

Project technology implemented is brand new and not transferred from another facility, hence the leakage emission is considered as zero.

D. Emission Reduction

The emission reduction achieved by the project activity will be measured as the difference between the baseline emission and the sum of the project emission and leakage, described as following equation:

$$ER_y = BE_y - (PE_y + LE_y)$$

Where:

ER_y Emission reduction in the year y (tCO_{2e})

PE_y Project emission in the year y (tCO_{2e})

LE_y Leakage emissions in year y (tCO_{2e})

E.6.3. Data and parameters that are to be reported in CDM-SSC-CPA-DD form:

Data / Parameter:	**φ**
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	-
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	Accordance with the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" version 05.1
Any comment:	Oonk et el. (1994) have validated several landfill gas models based on 17 realized landfill gas projects. The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results.

Data / Parameter:	**OX**
Data unit:	-
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Volume 05.1, chapter 3

TABLE 3.2 OXIDATION FACTOR (OX) FOR SWDS	
Type of Site	Oxidation Factor (OX) Default Values
Managed (1), unmanaged and uncategorized SWDS	0
Managed covered with CH4 oxidizing material (2)	0.1
(1) Managed but not covered with aerated material	
(2) Examples: soil, compost	

Value applied:	Use 0.1 for managed solid waste disposal sites that are covered with oxidizing material such as soil or compost. Use 0 for other types of solid waste disposal sites
Justification of the choice of data or description of measurement methods and procedures actually applied :	Each of CPA may have their own specification; therefore this has to be specified in CPA level.
Any comment:	-

Data / Parameter:	**F**
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Accordance with the “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site” version 05.1
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC

Data / Parameter:	**DOC_f**

Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Accordance with the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" version 05.1
Any comment:	-

Data / Parameter:	**MCF**
Data unit:	-
Description:	Methane correction factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	Use the following values for MCF: • 1.0 for **anaerobic managed solid waste disposal sites**. These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) leveling of the waste; • 0.5 for **semi-aerobic managed solid waste disposal sites**. These must have controlled placement of waste and will include all of the following structures for introducing air to waste layer: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation system; • 0.8 for **unmanaged solid waste disposal sites . deep and/or with high water table**. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste; • 0.4 for **unmanaged-shallow solid waste disposal sites.** This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres
Justification of the choice of data or description of measurement methods and procedures actually applied :	Accordance with the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" version 05.1
Any comment:	The methane correction factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS

Data / Parameter:	**DOC_j**

Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j*
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value applied:	Apply the following values for the different waste types *j*:

Waste type *j*	**DOC_j (% wet waste)**	**DOC_j (% 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

If a waste type, prevented from disposal by the proposed CDM project activity, cannot clearly be attributed to one of the waste types in the table above, project participants should choose among the waste types that have similar characteristics that waste type where the values of DOC_j and k_j result in a conservative estimate (lowest emissions), or request a revision of / deviation from this methodology.

In the case of empty fruit bunches (EFB), as their characteristics are similar to garden waste, the parameter value correspondent of garden shall be used.

Justification of the choice of data or description of measurement methods and procedures actually applied :	Accordance with the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" version 05.1
Any comment:	-

Data / Parameter:	k_j
Data unit:	-
Description:	Decay rate for the waste type *j*
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Value applied:	

	Boreal and Temperate (MAT≤20°C)		**Tropical (MAT>20°C)**	
Type of $Waste_j$	Dry (MAP/PET <1)	Wet (MAP/PET >1)	Dry (MAP< 1000mm)	Wet (MAP> 1000mm)

Slowly degrading waste	Paper/ textile waste	0.04	0.06	0.045	0.07
	Wood/ straw/ rubber waste	0.02	0.03	0.025	0.035
Moderately degrading waste	Garden and park waste	0.05	0.1	0.065	0.17
Rapidly degrading waste	Food waste/ sewage sludge	0.06	0.185	0.085	0.4
Bulk MSW or Industrial Waste	Mixed composi tion	0.05	0.09	0.065	0.17

NB: MAT . mean annual temperature, MAP . Mean annual precipitation, PET . potential evapotranspiration. MAP/PET is the ratio between the mean annual precipitation and the potential evapo transpiration. If a waste type, prevented from disposal by the proposed CDM project activity, cannot clearly be attributed to one of the waste types in the table above, project participants should choose among the waste types that have similar characteristics that waste type where the values of DOC_j and k_j result in a conservative estimate (lowest emissions), or request a revision of / deviation from this methodology.

In the case of empty fruit bunches (EFB), as their characteristics are similar to garden waste, the parameter values correspondent of garden waste shall be used. In case of sludge from pulp and paper industry, a conservative value of 0.03 shall be used for all precipitation and temperature combinations

Justification of the choice of data or description of measurement methods and procedures actually applied :	Accordance with the “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site” version 05.1
Any comment:	Document in the CDM-PDD the climatic conditions at the SWDS site (temperature, precipitation and, where applicable, evapotranspiration). Use long-term averages based on statistical data, where available. Provide references

Data / Parameter:	**$NCV_{diesel\ oil}$**
Data unit:	TJ/Gg
Description:	Net Calorific Value of Diesel Oil
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	43.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value is obtained from default value of the IPCC 2006, volume 2: Energy (Table 1.2)
Any comment:	-

Data / Parameter:	**$EF_{CO2,\ diesel\ oil}$**
Data unit:	kg/TJ
Description:	CO_2 emission factor of Diesel Oil
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	74,800
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value is obtained from default value of the IPCC 2006, volume 2: Energy (Table 1.3)
Any comment:	-

Data / Parameter:	**$Density_{diesel\ oil}$**
Data unit:	kg/litre
Description:	Density of Diesel Oil
Source of data used:	http://www.pertamina.com/index.php/detail/read/minyak-diesel
Value applied:	0.840
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value is obtained from PERTAMINA (diesel oil main supplier).
Any comment:	-

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

E.7.1. Data and parameters to be monitored by each SSC-CPA:

Data / Parameter:	**Q_y**
Data unit:	Tons

Description:	Quantity of EFB entering the composting or co-composting facility
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in SSC CPA-DD
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD
QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

Data / Parameter:	$Q_{y,\ treatment,\ i}$
Data unit:	Tons
Description:	Quantity of produced compost
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in SSC CPA-DD
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD
QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

Data / Parameter:	$Q_{y,ww,runoff}$
Data unit:	m^3
Description:	The runoff wastewater from composting yard
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in SSC CPA-DD
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD

QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

Data / Parameter:	$COD_{y,ww,runoff}$
Data unit:	t COD/m^3
Description:	The chemical oxygen demand of the runoff wastewater from composting yard
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in SSC CPA-DD
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD
QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

Data / Parameter:	CT_y
Data unit:	tons/truck
Description:	Average truck capacity for transportation
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in SSC CPA-DD
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD
QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

Data / Parameter:	$CT_{y,treatment}$
Data unit:	tons/truck
Description:	Average truck capacity for compost transportation
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of	To be specified in SSC CPA-DD

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD
QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

Data / Parameter:	DAF_y
Data unit:	km/truck
Description:	Average incremental distance for raw solid transportation
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in SSC CPA-DD
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD
QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

Data / Parameter:	$DAF_{y,treatment}$
Data unit:	km/truck
Description:	Average incremental distance for compost transportation
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in SSC CPA-DD
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD
QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

Data / Parameter:	$W_{j,x}$
Data unit:	Tons
Description:	Amount of organic waste type j prevented from disposal in the SWDS in year x
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in SSC CPA-DD
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD
QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

Data / Parameter:	f
Data unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in SSC CPA-DD
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD
QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_{2e}/tCH_4
Description:	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
Source of data to be used:	To be specified in SSC CPA-DD
Value of data applied for the purpose of calculating expected emission reductions in	To be specified in SSC CPA-DD

section B.5	
Description of measurement methods and procedures to be applied:	To be specified in SSC CPA-DD
QA/QC procedures to be applied:	To be specified in SSC CPA-DD
Any comment:	To be specified in SSC CPA-DD

In accordance with AMS-III.F version 10, there are further parameters to be monitored during the crediting periods listed as below:

1. **Check of aerobic conditions of the composting process**
   Each CPA must ensure the aerobic conditions of the composting process. Oxygen content of the gas phase inside the windrows /compost needs to be monitored, and it can be done via multiple sample measurements throughout different stages of the composting process, with maximum margin of error of 10% at a 90% confidence level. For this purpose a portable oxygen meter can be used with lancets of at least 1 m length to measure oxygen in representative points within the spatial dimensions of windrow. In the case of forced aerated in-vessel and forced aerated pile composting systems continuous measurements may also be done using online sensor(s). O_2-measurement instrument will be subject to periodic calibration (in accordance with stipulation of instrument-supplier). CPAs under this PoA may implement different co-composting technology, therefore this aerobic condition monitoring will be described in detail in the CPA-DD level.

2. **Parameters related to emissions from electricity and/or fuel consumption**
   Each CPA shall conduct the monitoring of related parameters to be monitored in the "*Tool to calculate baseline, project and/or leakage emissions from electricity consumption*" version 1.0. In cases where a CPA is using fuel consumption for electricity generation; the monitoring of related parameters to be monitored in the "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*" version 2.0 shall be applied. Alternatively it shall be assumed that all relevant electrical equipment operate at full rated capacity, plus 10% to account for distribution losses, for 8760 hours per annum. And since CPAs under this PoA may have different power sources, this will be described in detail at the CPA-DD level.

3. **Parameters related to baseline emissions from wastewater co-composted**
   Each CPA shall conduct monitoring of related parameters to be monitored in the AMS-III.H version 16 ", and this will also described in detail at the CPA-DD level.

E.7.2. Description of the monitoring plan for a SSC-CPA:

Monitoring Plan for a SSC-CPA is provided to establish a standard by which the coordinating entity will conduct monitoring and verification. The monitoring plan will be in accordance with all relevant rules and regulations of the CDM and therefore can facilitate accurate and consistent monitoring of the PoA's certified emission reductions during crediting periods. For that, a monitoring organization system has been established within the Coordinating Entity and an organizational structure to take responsibility for organizing and supervising all monitoring activities required for accurate and timely verification and reporting of the CERs generated.
Monitoring Plan for a SSC-CPA has specific objectives as follows:

a. Conducting and maintaining a reliable and accurate monitoring system

b. Provide guidance and assistance for the implementation of necessary measurement and to record management operations
c. Provide guidance for meeting CDM requirements for verification and certification

Operational and Performance Obligations
The Monitoring Plan will be conducted according to a CDM Operations and Monitoring Manual [40] which will be prepared before the beginning of the first crediting period. The CDM Operation and Monitoring Manual will comprise the monitoring and recording procedures (including corrective action procedures in order to provide for continually improved performance in future monitoring and reporting), record keeping system, and management and operational structure including procedures for emergency preparedness.

Monitoring Data and Archiving
Parameters to be monitored which are defined in section E.7.1 are to be recorded in accordance with methodology requirements. The data will be archived electronically, backed up regularly, and be stored by the coordinating entity for 2 years after the end of the crediting period of each CPA or the last issuance of CERs of this project, whichever occurs last.

All measuring devices in the co-composting plant will be periodically calibrated subject to the manufacturer's specification, international standard or national standard if available. The calibration is to be conducted by an accredited party.

Quality Assurance and Quality Control
The quality assurance and quality control system for recording, maintaining and archiving data shall be maintained by each SSC-CPA. In order to maintain and upgrade the capability and skill of the operator, training related to the monitoring and data management system of the co-composting system will be performed. Prior to the operation of the project, trainings are to be conducted for each of SSC-CPA personnel in order to ensure that the persons in charged are competent in performing their duties related to monitoring.

E.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 baseline study was concluded on 1 March 2011. The entity determining the baseline is Carbon Conservation, listed in Annex 1 of this document

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[40] The CDM Operations and Monitoring Plan shall be finalized after registration of the PoA in order to embrace the final monitoring plan contained in the registered POADD document

Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

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Annex 2

The PoA does not receive any public funding.

Annex 3

Described in detail at Section E,

Annex 4

Described in detail at section E.7.2

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