CLEAN DEVELOPMENT MECHANISM

PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)

Version 03 - in effect as of: 22 December 2006

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Revision history of this document

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

SECTION A. General description of small-scale project activity

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

Jatropha biofuel and power generation project in Cambodia
Version 01
Completed on 13 February, 2009

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

Unlike conventional biofuels, this proposed biofuel supply chain development maximizes the local benefits and provides a competitive biofuel for electric power generation without governmental subsidies. In a country where only 15 % of the population have an access to the electricity and the tariff is the highest in the Asian region, the proposed biofuel supply chain with an inedible vegetable oil gives an opportunity to provide stable and competitive electric tariffs in an industrial park-Phnom Penh Special Economic Zone (PPSEZ) in Cambodia. Since Cambodia fully depends on imported fossil fuels, this new effort may be able to contribute to its new energy strategy to improve its energy independency and develop a lower-carbon society in the future.

Purpose of the Project

The main objective of the project is production of a competitive biofuel for heavy fuel oil (HFO) generators in PPSEZ - a specially designed industrial park to host domestic and foreign manufacturing with total support of utilities and legal duties in Phnom Penh, Cambodia. Indirect but another primary objective of the project is income generation in rural communities by effectively using unused or unproductive land since the project requires substantial amount of inedible oil seed-*Jatropha curcus* (Jatropha) for the biofuel feedstock.

Due to the limitation of Cambodian national power company's (EDC: Electricite Du Cambodge) electric supply, most of the manufacturing in Cambodia have installed own captive generators powered by imported diesel or HFO. Since there is little public control of fuel price in Cambodia, the cost of the electricity is critical issue for any serious manufacturing in Cambodia. The proposed project aims to substitute a domestic competitive Jatropha based biofuel for the imported expensive and unstable HFO for the HFO generators. Due to the reduction of the HFO use, it is likely to contribute to Cambodian green house gas (GHG) emission reduction in one of primary GHG sources in Cambodia.

Although Cambodia has successfully recovered form the half centuries of chaotic era for last 10years, the benefit of the recovery has mostly improved the living standard of urban communities but little in rural communities. Since Cambodia depends on not only fuels but also basic commodities out side of the nation, any price in Cambodian has continuously increased accordance with the oil crisis even in rural communities. As a result, rural residents have been seeking for new income source other than conventional self-sufficient crop farming. The proposed project does not directly involved in biofuel feed production, but guarantees the long-term purchase from a subsidiary company (CBEDC: Cambodia Bio-Energy Development Corporation) of the proposed project's participant. Thus, the proposed project indirectly guarantees the new income source from Jatropha seed production for rural communities. In order to support participants' income generation, CBEDC provides necessary supports for Jatropha cultivation such as initial clearance, cultivation training, and initial planting of Jatropha. Since the economical productivity of Jatropha mono-farming may not be high enough for participants, CBEDC also aids participants to apply cash-crops' inter cropping to generate additional income. Therefore, the proposed project is likely to contribute to the rural communities' economies rather than other investment projects in Cambodia.

Technologies

A simply refined vegetable oil - known as pure plant oil (PPO) or straight vegetable oil (SVO) technologies is applied for the project to substitute a competitive biofuel for HFO. Since the combustion of the biofuel could be considered as carbon neutral, the electric generation by the Jatropha PPO reduces the GHG emission. The relevant GHG emission from the Jatropha PPO production is relatively small as same as other vegetable oil production so that the proposed project is able to reduce the GHG emission for the power generation.

Contribution to Cambodia sustainable development

Within the Cambodian sustainable development policy, there are three key objectives; namely "Broad-based economic growth, social and cultural development, and sustainable use of natural resources." In order to prove the contribution of a proposed CDM project, four categories of sustainable development criteria are applied to quality the project. The four categories are 1) environmental protection and improvement, 2) enhancement of income and quality of life, 3) economic benefits, and 4) technology transfer.

Environmental protection and improvement; One of primary income sources in rural communities is fuel wood. Since Cambodia depends on fuel woods for residential energy use throughout the nation, the impact of the deforestation has been substantial. The proposed project

effectively uses such degraded land for seed production and provides income opportunities for such rural residents, which is likely to reduce the fuel wood cutting. The byproduct of the Jatropha PPO known as seed cake will be converted to artificial fuel wood and substitute the fuel woods in both rural and urban communities. Therefore, the proposed project is likely to improve the Cambodian natural environment.

Enhancement of income and quality of life; Since the rice production is the popular and high productive cash cropping in Cambodia, the rural communities in up-land area have hardly made enough income and sought for higher productive cash crops. The project indirectly provides opportunities for those up-land residents to increase their income through CBEDC's Jatropha and intercropping program. Unlike other biofuel seed exporting activities, the proposed project not only benefits on income generation but also better quality of life by accessing reasonable market though the CBEDC's farming network as well as continuous agricultural training.

Economic benefits; Fully dependency of imported fuels and other commodities are highly critical threat for Cambodian sustainable development. The proposed project provides an option to develop a renewable energy source by using the degraded or unproductive land in the nation. The improvement of rural communities' purchasing power is likely contributes to the regional economy. In addition, skill training for skilled and unskilled workers is likely to expand their opportunities to work in higher income jobs rather than self-sufficient farming only.

Technology transfer; In spite of its potentiality, agribusinesses have not prospered in Cambodia. The proposed project is one of the most potential fields of agribusinesses in Cambodia. Although the PPO technologies are not applicable in all developing countries, it is competitive and suitable for Cambodia. In addition, the transferred technologies are likely to contribute to the development of lower-carbon society development in Cambodia for the long-run.

A.3. Project participants:

Name of Party involved	Private and/or public entity(ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant
Cambodia (host party)	Phnom Penh Special Economic Zone (PPSEZ)	No
Japan	Japan Development Institute (JDI)	No

	Japan Bio-Energy Development Corporation (JBEDC)	Yes

See contact information at Annex-1

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

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

A.4.1.1. Host Party(ies):

The Royal Kingdom of Cambodia

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

Phnom Penh city and Kampong Speu province

A.4.1.3. City/Town/Community etc:

Phnom Penh Special Economic Zone, Phnom Penh and Ou commune, Kampong Speu

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

PPSEZ is located at 20km west of Phnom Penh center on the national highway No.3 (NH3). Two units of biofuel-adapted generators will be installed in PPSEZ and operated with Jatropha PPO. Existing and newly installed generators will be operated by Colben Energy Limited, which is an independent power producer (IPP) of PPSEZ and has been operating two HFO generators since 2008. The size of PPSEZ is approximately 162 ha at phase I with additional 5 ha for the existing power plant.

The Jatropha PPO plant is located in Ou commune, Kampong Speu province on NH3 adjacent to Phnom Penh city and approximately 50km west of PPSEZ. The feedstock of Jatropha PPO will be produced in the abandoned or non-arable land in Kampong Speu province and two adjacent provinces in Kampot and Kampong Chhnang.

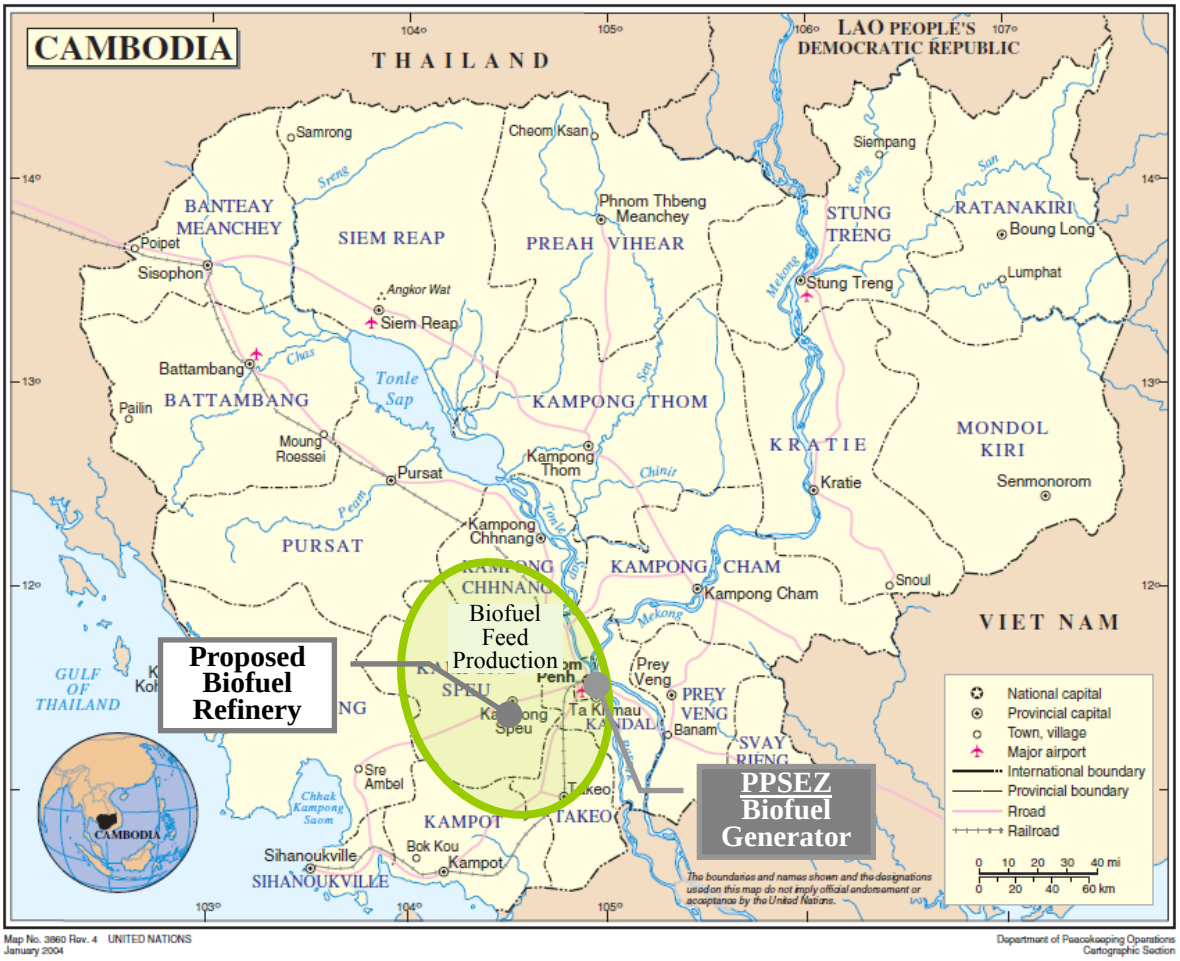

Figure 1: Location of the project site

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

Type and Category of Project Activity

As for Appendix B of the simplified modalities and procedures for small-scale CDM project activities (Appendix B), this project falls under the following category and type of small scale project activities:

Type I: Renewable energy projects
Category A.: Electricity generation by the user/household

As this project applies renewable energy generation for own use and the capacity of the generators do not exceed 15MW, this project is eligible for I.A.

Technologies of project activity

The core technology of the project is to produce Jatropha PPO as same fuel grade as HFO. The PPO technologies have been developed and utilized in European countries to economically utilize rapeseed/colza oil for slow engines, such as agricultural machineries and diesel/HFO generators. PPO technologies are also known as "Simplified edible oil refinery processes" such as filtering, degumming, neutralization, and dewatering, which is commercial and standard technologies.

Unlike fatty acid methyl ester (FAME) known as biodiesel, PPO technologies neither require substantial amount of additives such as methanol and catalytic agents, nor costly FAME facilities. Since Cambodia imports many industrial material and fuels, PPO technologies are ideal for Cambodian circumstances to produce competitive biofuel.

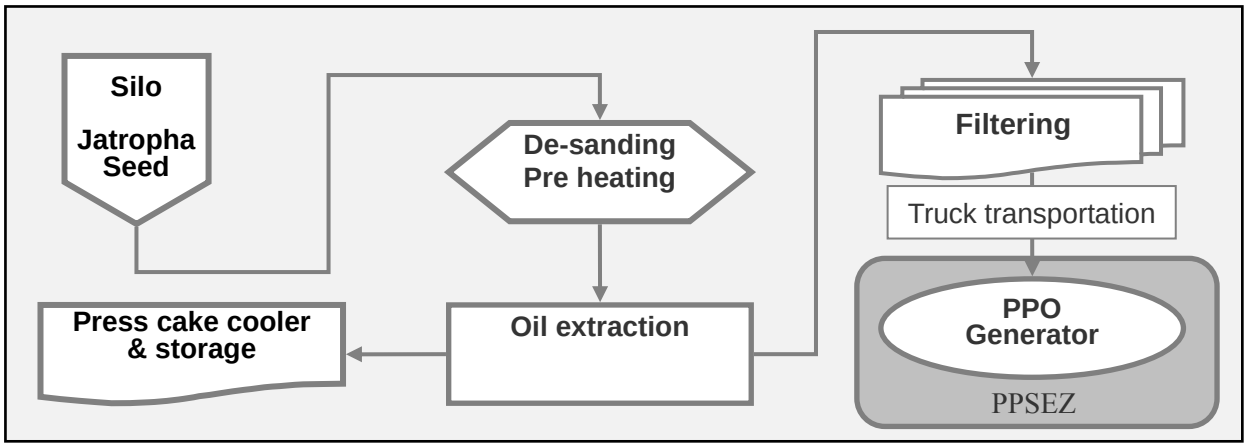

Figure 2: PPO process and material flow diagram

Although Jatropha PPO can be applied to typical HFO generators, the proposed project includes a PPO adapted generator by Wärtsilä, one of major suppliers of middle class generators, to meet the IPP's securities for the suppliers' support.

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

The project will reduce GHG emissions by replacing the use of fossil fuel oil with Jatropha biofuel for the power generation. Table 1 below shows the numerical value of the GHG emissions to be reduced over the crediting period of 10 years.

Table 1: Estimated amount of GHG emissions reduced

tonnes of CO2e/y	2011	2012	2013	2014	2015	2016-2020
	489	971	7,589	26,791	52,645	68,234
Total estimated reductions (tonnes of CO_2e)					429,653	
Total number of crediting years					10 years	
Annual average of the estimated reductions over the first crediting period (tonnes of CO_2e)					42,965	

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

No public funding has been sought for the project activity.

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

As per Appendix C of the simplified modalities and procedures for small-scale CDM project activities, the proposed project is not a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The proposed small-scale CDM project activity is not a debundled component of a large project activity since the project meets none of the above.

SECTION B. Application of a baseline and monitoring methodology

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

As for the categorization of Appendix B titled Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, the project falls under the following category and type of small-scale project activities:

Type I: Renewable energy projects
Category A.: Electricity generation by the user/household

The project activity uses the following approved small-scale methodology;

AMS-I.A. - Electricity generation by the user (Version 13)

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

The project supplies electricity that is generated from Jatropha biofuel to the Phnom Penh Special Economic Zone (PPSEZ), which is not connected to the power grid. In addition, Jatropha biofuel is used by two generators and the capacity of each generator is 6.5MW, which does not exceed 15MW in total. It is important to note that the electricity generated will not be supplied to a household, but solely to the PPSEZ. In sum, the project activity is a small-scale CDM project of Category A of Type I.

B.3. Description of the project boundary:

As indicated in the paragraph 6 of AMS-I.A., the project boundary for the activity relevant to renewable energy projects is defined as: The physical, geographical site of the renewable energy generating unit and the equipment that uses the electricity produced delineates the project boundary.

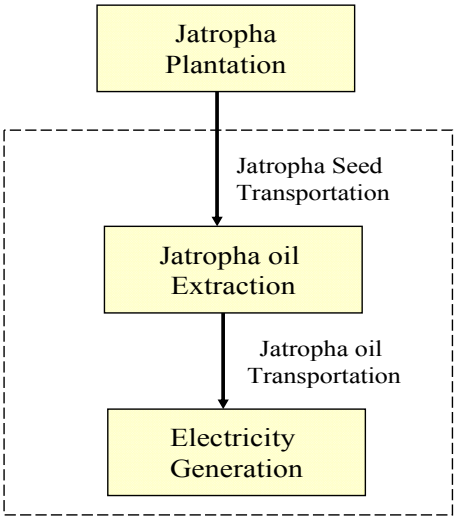

Figure 3. Project Boundary

The project activity includes the production of Jatropha biofuel as well as electricity generation. Therefore, Jatropha biofuel processing plant should be included in the project boundary as well. However, Jatropha plantation is not included in the project boundary, since those activities are not under the control of the project participants.

B.4. Description of baseline and its development:

According to AMS-I.A., the energy baseline is the fuel consumption of the technology in use or that would have been used in the absence of the project activity to generate the equivalent quantity of energy. In the absence of the proposed project, electricity generation using heavy fuel oil would continue to occur at PPSEZ.

The paragraph 7 of AMS-I.A. suggests using one of the options for calculating annual energy consumption and provides three options for the baseline calculation. The project selects the option 2.

Annual energy baseline shall be estimated from the following equation;

$$E_{BL,y} = \sum_i EG_{i,y} / (1 - l) \quad (1)$$

Where:

$E_{BL,y}$	Annual energy baseline (kWh)
$\sum_i$	The sum over the group of *i* renewable energy technologies (e.g. renewable energy technologies for solar home systems, solar pumps) implemented as part of the project activity
$EG_{i,y}$	The estimated annual output of the renewable energy technologies of the group of *i* renewable energy technologies installed (kWh)
l	Average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programmes or distribution companies in isolated areas, expressed as a fraction

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

Additionally of the project is justified based on the guidelines in Attachment A to Appendix B.

As per the guidelines, the project would not have occurred anyway due to at least one of the following barriers; i.e., (a) investment barrier, (b) technological barrier, (c) barrier due to prevailing practice or exiting regulatory or policy requirements, or (d) any other barriers such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies. Project participants should demonstrate one or more of the barriers for the project activity to demonstrate the additionally of the proposed project activity.

Technological barrier

The project will adopt the vegetable oil extraction technology developed by Solar Oil Systems and the oil extraction technology contains a special filtering process. The unique filtering process enables the biofuel manufacturers to produce HFO grade biofuels without chemical additives and detergent drain. Such environmentally sound technology is not available in Cambodia, and therefore a technological barrier is identified for the project activity.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The baseline emissions for the electricity generation are calculated in accordance with AMS-I.A.

Baseline emissions

As stated in the paragraph 8 of AMS-I.A., the baseline emissions are the energy baseline times a default emission factor;

$$BE_{CO2,y} = E_{BL,y} * EF_{CO2} \quad (2)$$

Where:

$BE_{CO2,y}$	Emissions in the baseline in year *y* (tCO_2)
$E_{BL,y}$	Annual energy baseline in year *y* (kWh)
EF_{CO2}	CO_2 emission factor (tCO_2/kWh)

The energy baseline ($E_{BL,y}$) is calculated using Equation 1 above.

Project emissions

No equation is provided in AMS-I.A. to quantify project emissions related to the project activity, however project participants shall use the following equation to calculate the project emissions of the proposed project in year *y*;

$$PE_{CO2,y} = PE_{elec,y} + PE_{fuel,y} + PE_{t,y} \quad (3)$$

Where:

$PE_{CO2,y}$	The project emissions during the year *y* (tCO_2e)
$PE_{elec,y}$	The emissions from electricity consumption due to the project activity in year *y* (tCO_2e)
$PE_{fuel,y}$	The emissions due to fuel consumption in year *y* (tCO_2e)
$PE_{t,y}$	The emissions from transportation related to the project activity in year *y* (tCO_2e)

Emissions from electricity consumption ($PE_{elec,y}$)

The project contains two different activity, Jatropha biofuel production and electricity generation, and project emissions related to those activities should be calculated independently. The emissions from electricity consumption shall be estimated from the following equation;

$$PE_{elec,y} = PE_{elec,plant,y} + PE_{elec,gene,y} \quad (4)$$

Where:

$PE_{elec,plant,y}$	The emissions from electricity consumption at the Jatropha biofuel processing plant in year *y* (tCO_2e)
$PE_{elec,gene,y}$	The emissions from electricity consumption for power generation at PPSEZ in year *y* (tCO_2e)

Emissions from electricity consumption at the Jatropha biofuel production plant ($PE_{elec,plant,y}$)

The emissions from electricity consumption due to the Jatropha biofuel production shall be calculated using the following equation;

$$PE_{elec,plant,y} = E_{PJ,plant,y} * CEF_{grid} \quad (5)$$

Where:

$E_{PJ,plant,y}$	The amount of electricity consumed for Jatropha biofuel processing, which is purchased from Phnom Penh grid (kWh)
CEF_{grid}	The carbon emission factor for the Phnom Penh grid (tCO_2/kWh)

Emissions from electricity consumption for power generation at PPSEZ ($PE_{elec,gene,y}$)

The emissions from electricity consumption for power generation at PPSEZ shall be calculated using the following equation;

$$PE_{elec,gene,y} = E_{PJ,gene,y} * CEF_{elec,gene} \quad (6)$$

Where:

$E_{PJ,gene,y}$	The amount of electricity consumed for power generation at PPSEZ (kWh)
$CEF_{elec,gene}$	The carbon emission factor for electricity consumed in power generation at PPSEZ (tCO_2/kWh)

If the power generation activity at PPSEZ consumes any electricity, it will be the electricity generated from Jatropha biofuel by the project. In that case, the emissions from electricity consumption for power generation at PPSEZ ($PE_{elec,gene,y}$) are assumed to be zero because Jatropha biofuel is considered to be "carbon neutral". Thus, this calculation is not required.

Emissions from fossil fuel consumption ($PE_{fuel,y}$)

The emissions from fossil fuel consumption shall be estimated from the following equation;

$$PE_{fuel,y} = PE_{fact,fuel,y} * + PE_{elec,fuel,y} \quad (7)$$

Where:

$PE_{fact,fuel,y}$	The emissions from fuel consumption at the Jatropha biofuel processing plant in year *y* (tCO_2e)
$PE_{elec,fuel,y}$	The emissions from fuel consumption for power generation at PPSEZ in year *y* (tCO_2e)

Emissions from fossil fuel consumption at the Jatropha biofuel production plant ($PE_{fact,fuel,y}$)

The emissions from fuel consumption due to the Jatropha biofuel extraction shall be calculated using the following equation;

$$PE_{fact,fuel,y} = F_{fact,fuel,y} * NCV_{fuel} * EF_{fuel} \quad (8)$$

Where:

$F_{fact,fuel,y}$	The fuel consumption for Jatropha biofuel processing in year *y* (ton)
NCV_{fuel}	The net caloric value of the fuel (MJ/ton)
EF_{fuel}	The CO_2 emission factor of the fuel (tCO_2/MJ)

In the current project plan, Jatropha biofuel extraction activity consumes only electricity and any fossil fuel is required. Therefore, the emissions from fossil fuel consumption at the Jatropha biofuel processing plant ($PE_{fact,fuel,y}$) are assumed to be zero. Thus, this calculation is not required.

Emissions from fossil fuel consumption for power generation at PPSEZ ($PE_{fact,fuel,y}$)

The emissions from fuel consumption for power generation at PPSEZ shall be calculated using the following equation;

$$PE_{elec,fuel,y} = F_{elec,fuel,y} * NCV_{ff} * EF_{ff} \quad (9)$$

Where:

$F_{elec,fuel,y}$	The fuel consumption for power generation at PPSEZ in year *y* (ton)
NCV_{ff}	The net caloric value of the fossil fuel (MJ/ton)
EF_{ff}	The CO_2 emission factor of the fossil fuel (tCO_2/MJ)

Emissions from transportation ($PE_{t,y}$)

The project contains two different transportation activities, and emissions related to those activities should be calculated independently. The emissions from transportation shall be estimated from the following equation;

$$PE_{t,y} = PE_{t,seed,y} * + PE_{t,oil,y} \quad (10)$$

Where:

$PE_{t,seed,y}$	The emissions from Jatropha seed transportation in year *y* (tCO_2e)
$PE_{t,oil,y}$	The emissions from Jatropha biofuel transportation in year *y* (tCO_2e)

Emissions from seed transportation ($PE_{t,seed,y}$)

The emissions from Jatropha seed transportation shall be calculated using the following equation;

$$PE_{t,seed,y} = NO_{truck,y} * DT_{t,seed,y} * VF_{cons,truck} * NCV_{tf} * D_{tf} * EF_{tf} \quad (11)$$

Where:

$NO_{truck,y}$	The number of trucks used for seed transport in year *y*
$DT_{t,seed,y}$	The average distance travelled by trucks in seed transport in year *y* (km)
$VF_{cons,truck}$	The vehicle fuel consumption in litres per kilometre for trucks (l/km)
NCV_{tf}	The calorific value of the transportation fuel (MJ/kg)
D_{tf}	The fuel density of the transportation fuel (kg/l)
EF_{tf}	The emission factor of the transportation fuel (tCO_2/MJ)

Emissions from oil transportation ($PE_{t,oil,y}$)

The emissions from Jatropha biofuel transportation shall be calculated using the following equation;

$$PE_{t,oil,y} = NO_{tank,y} * DT_{t,oil,y} * VF_{cons,tank} * NCV_{tf} * D_{tf} * EF_{tf} \quad (12)$$

Where:

$NO_{tank,y}$	The number of additional tank lorries used for oil transport in year *y*
$DT_{t,oil,y}$	The average distance travelled for additional oil transport in year *y* (km)

$VF_{cons,tank}$	The vehicle fuel consumption in litres per kilometre for tank lorries (l/km)
NCV_{tf}	The calorific value of the transportation fuel (MJ/kg)
D_{tf}	The fuel density of the transportation fuel (kg/l)
EF_{tf}	The emission factor of the transportation fuel (tCO_2/MJ)

Jatropha biofuel will be transported to PPSEZ by fuel transporters for approximately 50km, while HFO would be transported to PPSEZ by the same transporters from Sihanoukville port for approximately 160km. Therefore, no additional emission should be added for the fuel transport.

Leakage

Leakage is calculated according to Attachment C to Appendix B, "General guidance on leakage in biomass project activities" hereafter referred to as the leakage guideline.

Emission sources of a project activity shall be identified as per the table given in the leakage guidance. Relevant emission source of the project activity is emissions from biomass generation / cultivation, since the biomass type used in the project activity is "Biomass from croplands or grasslands (woody or non-woody)" and the activity in the absence of the project is "the land would be abandoned".

Regarding to emissions from the production of the renewable biomass, the leakage guideline identifies potentially significant emission sources, such as;

(a) Emissions from application of fertilizer; and

(b) Project emissions from clearance of lands.

Therefore, the leakage shall be estimated from the following equation;

$$L_{CO2,y} = L_{f,y} + L_{c,y} \quad (13)$$

Where:

$L_{CO2,y}$	The leakage during the year *y* (tCO_2e)
$L_{f,y}$	The emissions from application of fertilizer in year *y* (tCO_2e)
$L_{c,y}$	The emissions from clearance of lands in year *y* (tCO_2e)

Emissions from application of fertilizer ($L_{f,y}$)

Emissions from fertilizer application ($L_{f,y}$) are calculated as per A/R Methodological tool "Estimation of direct nitrous oxide emission from nitrogen fertilization" (Version 01), which is Annex 16 of EB13 report.

$$L_{f,y} = N2O_{direct-N,t} \quad (14)$$

Where:

$N2O_{direct-N,t}$	Direct N_2O emission as a result of nitrogen application within the project boundary in year *t* (tCO_2e)

The following equations are provided in the tool.

$$N2O_{direct-N,t} = \left(F_{SN,t} + F_{ON,t}\right) * EF_1 * MW_{N2O} * GWP_{N2O} \quad (15)$$

$$F_{SN,t} = \sum_{i}^{I} M_{SFi,t} * NC_{SFi} * \left(1 - Frac_{GASF}\right) \quad (16)$$

$$F_{ON,t} = \sum_{j}^{J} M_{OFj,t} * NC_{OFj} * \left(1 - Frac_{GASM}\right) \quad (17)$$

Where:

$F_{SN,t}$	Mass of synthetic fertilizer nitrogen applied adjusted for volatilization as NH_3 and NO_X in year *t* (t-N/yr)
$F_{ON,t}$	Mass of organic fertilizer nitrogen applied adjusted for volatilization as NH_3 and NO_X in year *t* (t-N/yr)
EF_1	Emission Factor for emissions from N inputs (t-N_2O-N /t-N input)
MW_{N2O}	Ratio of molecular weights of N_2O and N (44/28) (t-N_2O /t-N)
GWP_{N2O}	Global Warming Potential for N_2O (kg-CO_2-e /kg-N_2O) (IPCC default =310, valid for the first commitment period)
$M_{SFi,t}$	Mass of synthetic fertilizer type *i* applied in year *t* (tonne)
NC_{SFi}	Nitrogen content of synthetic fertilizer type *i* applied (g-N/100 g fertilizer)
$Frac_{GASF}$	Fraction that volatilises as NH_3 and NO_X for synthetic fertilizers (dimensionless)
$M_{OFj,t}$	Mass of organic fertilizer type *j* applied in year *t* (tonne)
NC_{OFj}	Nitrogen content of organic fertilizer type *j* applied (g-N/100 g fertilizer)
$Frac_{GASM}$	Fraction that volatilises as NH_3 and NO_X for organic fertilizers (dimensionless)

I	Number of synthetic fertilizer types
J	Number of organic fertilizer types

Emissions from clearance of lands ($L_{c,y}$)

Project emissions from clearance of lands can be significant in cases where an area is deforested to produce the biomass. In the project case, the land would be just abandoned if the absence of the project activity. In that case, the land area can regenerate in the absence of production of the biomass resulting in increasing carbon stocks in carbon pools, but it is suggested to neglect as a simplification according to the leakage guideline. Hence, emissions from clearance of land in the project activity can be neglected.

Emission reductions

To calculate the emission reductions the project participant shall apply the following equation:

$$ER_{CO2,y} = BE_{CO2,y} - PE_{CO2,y} - L_{CO2,y} \quad (18)$$

Where:

$ER_{CO2,y}$	The emissions reductions in year *y* (tCO_2e)
$BE_{CO2,y}$	The emissions in the baseline scenario in year *y* (tCO_2e)
$PE_{CO2,y}$	The emissions in the project scenario in year *y* (tCO_2e)
$L_{CO2,y}$	The leakage in year *y* (tCO_2e)

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

Data / Parameter:	*l*
Data unit:	fraction
Description:	Transmission loss between the power producer and consumers
Source of data used:	historical data from Colben Energy Limited
Value applied:	0%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Electricity is generated at PPSEZ and consumed inside of PPSEZ. Therefore no distribution loss is foreseen.

Any comment:	According to AMS-I.A., a reasonable default value for distribution losses on low voltage rural distribution grid could be 20%.
Data / Parameter:	EF_{CO2}
Data unit:	tCO_2/kWh
Description:	CO_2 emission factor of displaced electricity by the project activity
Source of data used:	historical data from Colben Energy Limited
Value applied:	0.79228 $kgCO_2/kWh$
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated in Annex 3, following AMS-I.D. in a transparent and conservative manner as the weighted average emissions of the current generation mix at PPSEZ.
Any comment:	Calculated at validation

Data / Parameter:	NCV_{ff}
Data unit:	MJ/ton
Description:	The net caloric value of the fossil fuel
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (Volume 2: Energy, 1 Introduction, TABLE 1.2)
Value applied:	40.4 TJ/Gg
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	EF_{ff}
Data unit:	tCO_2/MJ
Description:	The CO_2 emission factor of the fossil fuel
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (Volume 2: Energy, 2 Stationary Combustion, TABLE 2.2)
Value applied:	77,400 $kgCO_2/TJ$

Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	NCV_{tf}
Data unit:	MJ/kg
Description:	The calorific value of the transportation fuel
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (Volume 2: Energy, 1 Introduction, TABLE 1.2)
Value applied:	43.0 TJ/Gg
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	D_{tf}
Data unit:	kg/l
Description:	The fuel density of the transportation fuel
Source of data used:	Japanese Industrial Standards,J IS K 2204:2007 (Diesel)
Value applied:	0.86 g/cm^3
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	If project specific or country data is found, the data is used with higher preference

Data / Parameter:	EF_{tf}
Data unit:	tCO_2/MJ
Description:	The emission factor of the transportation fuel
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (Volume 2: Energy, 2 Stationary Combustion, TABLE 2.2)
Value applied:	74,100 $kgCO_2/TJ$
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	EF_1
Data unit:	t-N_2O-N /t-N input
Description:	Emission Factor for emissions from N inputs
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (Volume 4: Agriculture, Forestry and Other Land Use, TABLE 11.1)
Value applied:	0.01 t-N_2O-N /t-N input
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	MW_{N2O}
Data unit:	t-N_2O /t-N
Description:	Ratio of molecular weights of N_2O and N
Source of data used:	-

Value applied:	44/28 t-N_2O /t-N
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	GWP_{N2O}
Data unit:	kg-CO_2-e /kg-N_2O
Description:	Global Warming Potential for N_2O
Source of data used:	IPCC Fourth Assessment Report, Working Group I Report "The Physical Science Basis" (Chapter 2 Changes in Atmospheric Constituents and in Radiative Forcing, Table 2.14.)
Value applied:	310 kg-CO_2-e /kg-N_2O
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	The default value is valid for the first commitment period

Data / Parameter:	$Frac_{GASF}$
Data unit:	dimensionless
Description:	Fraction that volatilises as NH_3 and NO_X for synthetic fertilizers
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (Volume 4: Agriculture, Forestry and Other Land Use, TABLE 11.3)
Value applied:	0.10
Justification of the choice of data or description of measurement methods and procedures actually applied :	-

Any comment:	-

Data / Parameter:	$Frac_{GASM}$
Data unit:	dimensionless
Description:	Fraction that volatilises as NH_3 and NO_X for organic fertilizers
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (Volume 4: Agriculture, Forestry and Other Land Use, TABLE 11.3)
Value applied:	0.20
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

Baseline emissions

The baseline emissions are calculated based on the energy baseline. Annual energy baseline shall be estimated using Equation 1.

$$E_{BL,y} = \sum_i EG_{i,y} / (1 - l) \quad (1)$$

= 91,104,000 (kWh) / (1-0)

= 91,104,000 (kWh)

The baseline emissions are the energy baseline times a default emission factor, calculated using Equation 2.

$$BE_{CO2,y} = E_{BL,y} * EF_{CO2} \quad (2)$$

= 91,104,000 (kWh) * 0.00079228 (tCO_2/kWh)

= 72,180 (tCO_2/y)

Total baseline emissions ($BE_{CO2,y}$)

Estimated amount of baseline emissions over the crediting period is shown in Table 2.

Table 2: Total baseline emissions

tonnes of CO2e	2011-20	Total for the crediting period
	72,180/y	721,800

Project emissions

Emissions from electricity consumption ($PE_{elec,y}$)

The emissions from electricity consumption ($PE_{elec,y}$) are the sum of emissions from electricity consumption at the Jatropha biofuel processing plant ($PE_{elec,plant,y}$) and emissions from electricity consumption for power generation at PPSEZ ($PE_{elec,gene,y}$).

$PE_{elec,plant,y}$ is calculated using Equation 5.

$$PE_{elec,plant,y} = E_{PJ,plant,y} * CEF_{grid} \quad (5)$$

The amount of electricity consumed for Jatropha biofuel processing ($E_{PJ,plant,y}$) is varied according to the amount of Jatropha seeds processed at the plant and to be shown in Table 4 below.

The carbon emission factor (CEF_{grid}) should be calculated according to AMS-I.D. in a transparent and conservative manner as the weighted average emissions of the current generation mix using historical data of the Phnom Penh grid. CEF_{grid} is calculated in Table 3

Table 3: Calculation for the carbon emission factor of the Phnom Penh grid (CEF_{grid})

	Electricity generation (kWh)	Fuel consumption (ton)	Net calorific value (TJ/Gg)	CO2 emission factor (kgCO2/TJ)	Carbon oxidation factor	CO2 emissions (kgCO2)	CO2 emission factor (kgCO2/ kWh)
Hydropower	40,900,000						
Diesel oil	175,900,000	38,061.3	43.0	74100	1.00	121,274,720	
HFO	512,100,000	130,122	40.4	77400	1.00	406,886,289	
Total	728,900,000					528,161,009	0.7246

The calculated data and result of $PE_{elec,plant,y}$ are shown in Table 4.

Table 4: Calculation data and result of $PE_{elec,plant,y}$

	Amount of Jatropha seeds processed (ton)	EPJ,plant,y (kWh)	PEelec,plant,y (tCO2)
2011	50	878	1
2012	2,390	41,989	30
2013	31,570	554,646	402
2014	79,750	1,401,109	1,015
2015-20	135,240/y	2,376,000/y	1,722
Total for the crediting period			**11,778**

$PE_{elec,gene,y}$ shall be calculated using Equation 8. However, as stated in B.6.1, the emissions from electricity consumption for power generation at PPSEZ ($PE_{elec,gene,y}$) are assumed to be zero.

Sub total emissions from electricity consumption ($PE_{elec,y}$) shall be estimated using Equation 4 and to be shown in Table 5.

$$PE_{elec,y} = PE_{elec,plant,y} + PE_{elec,gene,y} \quad (4)$$

Table 5: Sub total emissions from electricity consumption

	PEelec,plant,y (tCO2e)	PEelec,gene,y (tCO2e)	PEelec,y (tCO2e)
2011	1	0	1
2012	30	0	30
2013	402	0	402
2014	1,015	0	1,015
2015-20	1,722/y	0/y	1,722/y
Total for the crediting period	11,778	0	11,778

Emissions from fossil fuel consumption ($PE_{fuel,y}$)

The emissions from fossil fuel consumption by the project activity ($PE_{fuel,y}$) are the sum of emissions from fuel consumption at the Jatropha biofuel processing plant ($PE_{fact,fuel,y}$) and emissions from fuel consumption for power generation at PPSEZ ($PE_{elec,fuel,y}$).

$PE_{fact,fuel,y}$ shall be calculated using Equation 8. However, as explained in B.6.1., Jatropha biofuel production activity consumes only electricity and no fossil fuel is required, thus the emissions from fossil fuel consumption at the Jatropha biofuel processing plant ($PE_{fact,fuel,y}$) are assumed to be zero.

$PE_{elec,fuel,y}$ shall be calculated using Equation 9.

$$PE_{elec,fuel,y} = F_{elec,fuel,y} * NCV_{ff} * EF_{ff} \quad (9)$$

According to the production planning, limited amount of Jatropha biofuel will be produced at the beginning of the project because of the lack of Jatropha seeds. Thus, heavy fuel oil will be consumed until the project produces enough Jatropha biofuel to meet the demand of power generation at PPSEZ. The amount of fuel consumption for power generation at PPSEZ ($F_{elec,fuel,y}$) in each year and the emissions ($PE_{elec,fuel,y}$) are shown in table 6.

Table 6: Calculation data and result of $PE_{elec,fuel,y}$

	$F_{elec,fuel,y}$ (ton)	$PE_{elec,fuel,y}$ (tCO_2)
2011	22,922	71,676
2012	22,526	70,438
2013	17,578	54,966
2014	9,409	29,422
2015-20	0/y	0/y
Total for the crediting period		**226,501**

Sub total emissions from fossil fuel consumption ($PE_{fuel,y}$) shall be estimated using Equation 7 and to be shown in Table 7.

$$PE_{fuel,y} = PE_{fact,fuel,y} * + PE_{elec,fuel,y} \quad (7)$$

Table 7: Sub total emissions from fossil fuel consumption

	$PE_{fact,fuel,y}$ (tCO_2e)	$PE_{elec,fuel,y}$ (tCO_2e)	$PE_{fuel,y}$ (tCO_2e)
2011	0	71,676	71,676
2012	0	70,438	70,438
2013	0	54,966	54,966
2014	0	29,422	29,422
2015-20	0/y	0/y	0/y
Total for the crediting period	**0**	**226,501**	**226,501**

Emissions from transportation ($PE_{t,y}$)

The emissions from transportation ($PE_{t,y}$) are the sum of emissions from seed transportation ($PE_{t,seed,y}$) and emissions from oil transportation ($PE_{t,oil,y}$).

$PE_{t,seed,y}$ is calculated using Equation 11.

$$PE_{t,seed,y} = NO_{truck,y} * DT_{t,seed,y} * VF_{cons,truck} * NCV_{tf} * D_{tf} * EF_{tf} \quad (11)$$

The number of trucks used for seed transport ($NO_{truck,y}$) is varied according to the amount of Jatropha seeds transported to the oil processing plant and to be shown in Table 8.

Table 8: Calculation data and result of $PE_{t,seed,y}$

	Amount of Jatropha seeds transported (ton)	$NO_{truck,y}$ (number)	$PE_{t,seed,y}$ (tCO_2)
2011	50	10	1
2012	2,390	478	39
2013	31,570	6,314	519
2014	79,750	15,950	1,311
2015-20	135,240/y	27,048/y	2,224/y
Total for the crediting period			**15,211**

$PE_{t,oil,y}$ shall be calculated using Equation 12. However, as stated in B.6.1, emissions due to transport of fuel for power generation will rather decrease by implementing the project, but we regard it as zero in a conservative manner.

Sub total emissions from transportation ($PE_{t,y}$) shall be estimated using Equation 10 and to be shown in Table 9.

$$PE_{t,y} = PE_{t,seed,y} * + PE_{t,oil,y} \quad (10)$$

Table 9: Sub total emissions from transportation

	$PE_{t,seed,y}$ (tCO_2e)	$PE_{t,oil,y}$ (tCO_2e)	$PE_{t,y}$ (tCO_2e)
2011	1	0	1
2012	39	0	39
2013	519	0	519
2014	1,311	0	1,311
2015-20	2,224/y	0/y	2,224/y
Total for the crediting period	**15,211**	**0**	**15,211**

Total project emissions ($PE_{CO2,y}$)

Total project emissions ($PE_{CO2,y}$) shall be estimated using Equation 3 and estimated amount over the crediting period is shown in Table 10.

$$PE_{CO2,y} = PE_{elec,y} + PE_{fuel,y} + PE_{t,y} \quad (3)$$

Table 10: Total project emissions

	PEelec,y (tCO2e)	PEfuel,y (tCO2e)	PEt,y (tCO2e)	PECO2,y (tCO2e)
2011	1	71,676	1	71,678
2012	30	70,438	39	70,508
2013	402	54,966	519	55,887
2014	1,015	29,422	1,311	31,748
2015-20	1,722/y	0/y	2,224/y	3,945
Total for the crediting period	11,778	226,501	15,211	253,491

Leakage

Emissions from application of fertilizer ($L_{f,y}$)

Emissions from fertilizer application are calculated as per A/R Methodological tool "Estimation of direct nitrous oxide emission from nitrogen fertilization" (Version 01). The following equations shall be used for the calculation.

.

$$N2O_{direct-N,t} = \left(F_{SN,t} + F_{ON,t}\right) * EF_1 * MW_{N2O} * GWP_{N2O} \quad (15)$$

$$F_{SN,t} = \sum_{i}^{I} M_{SFi,t} * NC_{SFi} * \left(1 - Frac_{GASF}\right) \quad (16)$$

$$F_{ON,t} = \sum_{j}^{J} M_{OFj,t} * NC_{OFj} * \left(1 - Frac_{GASM}\right) \quad (17)$$

Table 11: Calculation data and result of $N2O_{direct\text{-}N,t}$

	New cultivation area (ha)	Total cultivation area (ha)	$M_{SFi,t}$ (ton)	$M_{OFj,t}$ (ton)	$F_{SN,t}$ (t-N/yr)	$F_{ON,t}$ (t-N/yr)	$N2O_{direct\text{-}N,t}$ (tCO_2)
2008	20	20	0.00	0	0	0	0
2009	1,080	1,100	0.00	0	0	0	0
2010	13,400	14,500	0.00	0	0	0	0
2011	21,000	35,500	0	0	89	3	13
2012	24,000	59,500	0	0	4,800	144	702
2013	0	59,500	1	0	59,556	1,787	8,704
2014	0	59,500	1	0	93,333	2,800	13,641
2015	0	59,500	2	0	106,667	3,200	15,590
2016	0	59,500	0	0	0	0	0
2017	0	59,500	0	0	0	0	0
2018	0	59,500	0	0	0	0	0
2019	0	59,500	0	0	0	0	0
2020	0	59,500	0	0	0	0	0
							38,650

As described in SECTION C, the crediting period will start in 2011, although Jatropha cultivation will start in 2008. For identifying the emissions over the crediting period, leakage of 2011 ($L_{f,2011}$) is to be the total emissions from 2008 to 2011.

Table 12: leakage by application of fertilizer

	$L_{f,y}$ (tCO_2e)
2011	13
2012	702
2013	8,704
2014	13,641
2015	15,590
2016-20	0/y
Total for the crediting period	**38,650**

Emissions from clearance of lands ($L_{c,y}$)

According to the leakage guideline, emissions from clearance of land in the project activity can be neglected and assumed to be zero.

Total leakage ($L_{CO2,y}$)

Total leakage ($L_{CO2,y}$) shall be estimated using Equation 13 and estimated amount over the crediting period is shown in.

$$L_{CO2,y} = L_{f,y} + L_{c,y} \quad (13)$$

Table 13: Total leakage

	Lf,y (tCO2e)	Lc,y (tCO2e)	LCO2,y (tCO2e)
2011	13	0	13
2012	702	0	702
2013	8,704	0	8,704
2014	13,641	0	13,641
2015	15,590	0	15,590
2016-20	0/y	0 /y	0/y
Total for the crediting period	38,650	0	38,650

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

Emission reductions

Total emission reductions ($ER_{CO2,y}$) shall be estimated using Equation 18.

$$ER_{CO2,y} = BE_{CO2,y} - PE_{CO2,y} - L_{CO2,y} \quad (18)$$

Table 14 shows the ex-ante estimation of emission reductions for the crediting period.

Table 14: Total estimated emission reductions

	$BE_{CO2,y}$ (tCO_2e)	$PE_{CO2,y}$ (tCO_2e)	$L_{CO2,y}$ (tCO_2e)	$ER_{CO2,y}$ (tCO_2e)
2011	72,180	71,678	13	489
2012	72,180	70,508	702	971
2013	72,180	55,887	8,704	7,589
2014	72,180	31,748	13,641	26,791
2015	72,180	3,945	15,590	52,645
2016-20	72,180/y	3,945/y	0/y	68,235/y
Total for the crediting period	**721,800**	**253,491**	**38,650**	**429,653**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	Volume of Jatropha biofuel
Data unit:	ton
Description:	The amount of Jatropha biofuel input for power generation
Source of data to be used:	Colben Energy Limited
Value of data	-
Description of measurement methods and procedures to be applied:	Flow meter
QA/QC procedures to be applied:	-
Any comment:	Monitoring frequency is continuously

Data / Parameter:	$EG_{i,y}$
Data unit:	kWh
Description:	The estimated annual output of the renewable energy technologies of the group of *i* renewable energy technologies installed
Source of data to be	Electricity meter of Colben Energy Limited

used:	
Value of data	91,104 MWh
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	-
Any comment:	Monitoring frequency is continuously

Data / Parameter:	$E_{PJ,plant,y}$
Data unit:	kWh
Description:	The amount of electricity consumed for Jatropha biofuel production, which is purchased from Phnom Penh grid
Source of data to be used:	Electricity meter installed at the Jatropha biofuel processing plant
Value of data	<table><tr><td></td><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015-2020</td></tr><tr><td>(kWh/y)</td><td>878</td><td>41,989</td><td>554,646</td><td>1,401,109</td><td>2,376,000/y</td></tr></table> .
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double checked by the electricity distribution company.
Any comment:	To be monitored continuously

Data / Parameter:	CEF_{grid}
Data unit:	tCO_2/kWh
Description:	The carbon emission factor for the Phnom Penh grid
Source of data to be used:	Official utility documents

Value of data	0.7246 $kgCO_2/kWh$
Description of measurement methods and procedures to be applied:	Calculated according to AMS-I.D. in a transparent and conservative manner as the weighted average emissions of the current generation mix
QA/QC procedures to be applied:	Calculated at start of crediting period.
Any comment:	To be monitored annually

Data / Parameter:	$F_{elec,fuel,y}$
Data unit:	ton
Description:	The fuel consumption for power generation at PPSEZ in year *y*
Source of data to be used:	Purchase invoices and/or metering.
Value of data	

	2011	2012	2013	2014	2015-2020
(ton)	22,922	22,526	17,578	9,409	0/y

Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	The amount of fuel will be derived from the paid fuel invoices (administrative obligation).
Any comment:	To be monitored annually

Data / Parameter:	$NO_{truck,y}$
Data unit:	number
Description:	The number of trucks used for seed transport in year *y*
Source of data to be used:	Record of a transportation company
Value of data	

	2011	2012	2013	2014	2015-2020
trucks	10	478	6,314	15,950	27,048/y

Description of measurement methods	-

and procedures to be applied:	
QA/QC procedures to be applied:	-
Any comment:	Monitoring frequency is annually

Data / Parameter:	$DT_{t,seed,y}$
Data unit:	km
Description:	The average distance travelled by trucks in seed transport in year *y*
Source of data to be used:	Expert estimate based on the record of a transportation company
Value of data	30 km
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	Estimated in a transparent and conservative manner and the assumption should be approved by DOE.
Any comment:	Monitoring frequency is annually

Data / Parameter:	$VF_{cons,truck}$
Data unit:	l/km
Description:	The vehicle fuel consumption in litres per kilometre for trucks
Source of data to be used:	Fuel consumption record of a transportation company
Value of data	0.5 l/km
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	-
Any comment:	Monitoring frequency is annually

Data / Parameter:	$M_{SFi,t}$

Data unit:	ton
Description:	Mass of synthetic fertilizer type *i* applied in year *t*
Source of data to be used:	Record of synthetic fertilizer purchased and used
Value of data	

(ton)	2011	2012	2013	2014	2015	2016-2020
$M_{SFi,t}$	0	0	1	1	2	0/y
$M_{OFj,t}$	89	4,800	59,556	93,333	106,667	0/y

Description of measurement methods and procedures to be applied:	Keep record of quantities purchased and used
QA/QC procedures to be applied:	Cross check with synthetic fertilizer purchased and quantity used and total area applied at project level.
Any comment:	To be checked annually

Data / Parameter:	NC_{SFi}
Data unit:	g-N/100 g fertilizer
Description:	Nitrogen content of synthetic fertilizer type *i* applied
Source of data to be used:	Producers of synthetic fertilizer purchased and used
Value of data	21.21 g-N/100 g fertilizer, estimated based on the molecular weight, 28 g-N / 132 g- $(NH_4)_2SO_4$
Description of measurement methods and procedures to be applied:	Keep record of nitrogen content from producers
QA/QC procedures to be applied:	-
Any comment:	If producers do not provide data of nitrogen content, the nitrogen content should be determined by qualified lab before the project start.

Data / Parameter:	$M_{OFj,t}$
Data unit:	ton
Description:	Mass of organic fertilizer type *j* applied in year *t*

Source of data to be used:	Record of organic fertilizer purchased and used
Value of data	See $M_{SFi,t}$
Description of measurement methods and procedures to be applied:	Keep record of quantities purchased and used
QA/QC procedures to be applied:	Cross check with organic fertilizer purchased and quantity used and total area applied at project level.
Any comment:	To be checked annually

Data / Parameter:	NC_{OFj}
Data unit:	g-N/100 g fertilizer
Description:	Nitrogen content of organic fertilizer type *j* applied
Source of data to be used:	Organic fertilizer manufacturer, or determination in lab
Value of data	3.75 g-N/100 g fertilizer, to be adapted from Animal Manure Data Sheet, By Ronald E. Hermanson, P.E. and Prasanta K. Kalita (http://cru.cahe.wsu.edu/CEPublications/eb1719/eb1719.html)
Description of measurement methods and procedures to be applied:	Standard lab procedures
QA/QC procedures to be applied:	-
Any comment:	To be determined before the project start.

B.7.2 Description of the monitoring plan:

The project boundary physically includes the Jatropha biofuel processing plant and power units where Jatropha biofuel is consumed for electricity generation. The required data regarding to the Jatropha biofuel processing plant is collected by operators and reported to the project manager. The required data regarding to power generation is collected by workers of the Colben Energy Limited, and reported to the manager of PPSEZ, then sent to the project manager. The manager computerizes the data and stores it to present to the DOE.

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

Date of completion; 13/02/2009

Name of the responsible entity determining the baseline;

Japan Development Institute.

Address: 3-7-2, Itsuro Bld.5F, Kandanishiki-cho, Chiyoda, Tokyo 101-0054, Japan

Tel: +81-3-5280-7707

Fax: +81-3-5280-7708

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/05/2010 (Starting date of construction)

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

15 years

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

C.2.1. Renewable crediting period

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

N.A.

C.2.1.2. Length of the first crediting period:

N.A.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/01/2011 or date of registration, whichever is later

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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

The legal framework of the environment in Cambodia is provided in the 1996 Law on Environmental Protection and Natural Resources Management, and related sub-decrees. Regarding EIA, the 1999 Sub-Decree No. 72 on Environmental Impact Assessment Process details the provisions of its process as well as a list of projects requiring an EIA. In addition, the General Guideline has been prepared by EIA Department of the Ministry of Environment (MoE) and it has been drafted so as to be consistent with the Law on Environmental Protection and Natural Resources Management. Project owners should follow the guideline to implement EIA.

According to EIA Department, the project activity is required to implement EIA on Jatropha biofuel processing, as well as initial environmental impact assessment (IEIA), because the project adopts a new vegetable oil extraction technology.

The following environmental impacts are expected from the project activity;

- impact on air quality
- impact on water quality
- impact of waste, and
- impact of noise

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

The project will be designed in consideration of environmental impact, and appropriate mitigation measures will be proposed in EIA report when the project activity does not meet any relevant environmental standards in Cambodia.

SECTION E. Stakeholders' comments

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

Comments were received through the meeting with stakeholders. The following stakeholders were identified for the project activity;

- Energy Development Department, Ministry of Industry, Mines and Energy (MIME)
- EIA Department, Ministry of Environment (MOE)
- Forestry Administration (FA), Ministry of Agriculture, Forestry and Fisheries

E.2. Summary of the comments received:

Energy Development Department, MIME;

- has a strong interest in Jatropha biofuel supply development.
- expects the advanced biofuel technology to be transferred from Europe or Japan.

FA, Ministry of Agriculture, Forestry and Fisheries;

- is interested in income generation in rural communities through the proposed biofuel supply chain development.

EIA Department, MoE

- has no objection but needs to understand the PPO refinery processing.
- will request the project participants to disclose the chemicals to be used for PPO production.

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

Response to EIA Department, MOE

- An alkaline component might be used in case of dehydration, deoxidation, dephosphorization process. However, it is not necessary for Cambodian Jatropha biofuel as our best knowledge at this moment.

Other than that, no concerns and negative comments have been received, and modification on the proposed project was not required.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	**Phnom Penh Special Economic Zone (PPSEZ)**
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is used in the project activity.

Annex 3

BASELINE INFORMATION

Calculation of EF_{CO2}

As per AMS-I.D., an emission coefficient should be calculated in a transparent and conservative manner as the weighted average emissions of the current generation mix.

Table 15: Electricity production statistics of the current generation mix at PPSEZ

	unit	April	May	June	July	August	Total
Fuel consumption							
Heavy fuel oil	kg	140,000	683,572	1,182,982	1,000,756	1,285,142	4,292,452
Diesel oil	kg	21,466	2,269	1,681	2,521	168	28,105
Electricity generation	kWh	498,462	2,625,612	4,683,462	4,143,178	5,103,710	17,054,424

Table 16: Calculation for EF_{CO2}

Type of fuel	Electricity Generation (kWh)	Fuel Consumption (kg)	Net Calorific Value (TJ/Gg)	CO_2 Emission Factor ($kgCO_2$ /TJ)	Carbon oxidation factor	CO_2 Emissions ($kgCO_2$)	CO_2 Emission Factor ($kgCO_2$/ kWh)
HFO		4,292,452	40.4	77,400	1.00	13,422,326	
Diesel oil		28,105	43.0	74,100	1.00	89,551	
Total	17,054,424					13,511,877	**0.79228**

Annex 4

MONITORING INFORMATION

Please refer to B.7.

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