

**CDM-MP74-A12**

## Draft Small-scale Methodology

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AMS-III.AK: **Biofuel Biodiesel** production  
and use for transport applications

Version 03.0 - Draft

Sectoral scope(s): 05, 07 and 15

DRAFT

## COVER NOTE

### 1. Procedural background

1. The Executive Board of the clean development mechanism (CDM) (hereinafter referred to as the Board), at its 89<sup>th</sup> meeting, requested the Methodologies Panel (MP) to work on the following areas:
  - (a) Explore the broadening of the applicability of the existing methodologies beyond captive fleets;
  - (b) Explore the broadening of the applicability of the existing biodiesel methodology to cover biofuels.
2. At EB94, the Board approved the revision of ACM0017 Production of biofuel.
3. At its 73<sup>rd</sup> meeting, the MP agreed to incorporate the revisions of ACM0017 into small scale methodologies AMS-III.AK and AMS-I.H.

### 2. Purpose

4. The purpose of the draft revision is to:
  - (a) Broaden the applicability of the methodology beyond captive fleets;
  - (b) Broaden the applicability of the methodology to cover biofuels;
  - (c) Include reference to the methodological tools “Project and leakage emissions from biomass”, “Project and leakage emissions from transportation of freight”; and “Upstream leakage emissions associated with fossil fuel use”.

### 3. Key issues and proposed solutions

5. The default values associated with the cultivation of land to produce biomass feedstock are updated based on the emission sources and parameters of the methodological tool: “Project and leakage emissions from biomass”.

### 4. Impacts

6. The revision of the methodology, if approved, will broaden its applicability beyond captive fleets and to cover biofuels. Furthermore, the revision will simplify the provisions for calculation of project and leakage emissions by referring to the tool “Project and leakage emissions from biomass”.

**5. Subsequent work and timelines**

7. After receiving public inputs on the document, the MP will continue working on the revision of the methodology at its next meeting and recommend to the Board for its consideration at a future meeting of the Board.

**6. Recommendations to the Board**

8. Not applicable (call for public inputs).

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## 1. Introduction

- The following table describes the key elements of the methodology:

**Table 1. Methodology key elements**

<b>Typical project(s)</b>	<del>Biofuel Biodiesel</del> production that is used for transportation applications, where the <del>biofuel biodiesel</del> is produced from waste oil/fat, seeds or crops that are cultivated in dedicated plantations or biomass residues (e.g. agricultural residues, wood residues, organic wastes). <del>oilseed cultivated on dedicated plantations and from waste oil/fat</del>
<b>Type of GHG emissions mitigation action</b>	Renewable energy. Displacement of more-carbon-intensive fossil fuel for combustion in vehicles/transportation applications by use of renewable biomass

## 2. Scope, applicability, and entry into force

### 2.1. Scope

- This methodology comprises project activities for cultivation ~~or~~ sourcing of ~~seeds, crops, oilseeds~~ waste oil/fat ~~or biomass residues~~ to be used in production of ~~biofuel biodiesel~~ for use in transportation applications.<sup>1</sup>

### 2.2. Applicability

- ~~The methodology is applicable to project activities that reduce emissions through the production of (blended) biofuels to be used in vehicles/transportation applications within the host country. This methodology is only applicable if the final biodiesel blending proportion is a maximum of 20 per cent by volume (B20). This is to ensure that technical performance characteristic of the blended biodiesel do not differ from those of petrodiesel.~~
- Only ~~biodiesel~~ ~~biofuels~~ consumed in excess of mandatory regulations are eligible for the purpose of the project activity.<sup>2</sup>
- This methodology is applicable under the following conditions:
  - In the baseline situation the vehicles/transportation applications use ~~fossil fuels diesel~~;
  - ~~The target consumer group (e.g. captive fleet of vehicles, gas stations, bulk consumers) and distribution system of the biofuel shall be identified and described in the CDM-PDD; Biodiesel or its blends are end-used in a captive fleet of vehicles/transportation applications;~~

<sup>1</sup> Domestic water borne transport as defined by IPCC 2006, vol.2, chapter 3 is eligible.

<sup>2</sup> Regulations that have been implemented since the adoption by the COP of the Modalities and Procedures of CDM (Decision 17/CP.7, 11 November 2001) need not to be taken into account.

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- (c) The fossil fuels, the biofuels and the blended biofuels ~~petrodiesel, the biodiesel and the blended biodiesel~~ comply with the national regulations (if existent) or with applicable suitable international standards—such as ASTM D6751, EN14214, or ANP42;
- (d) If the (blended) biofuels are sold to an identified consumer group within the host party, the buyer and the producer of the (blended) biofuel are bound by a contract that allows the producer to monitor the sale of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption. ~~Final users and the producer of the biodiesel and its blends are bound by a contract that states that the final consumers shall not claim emission reductions resulting from its consumption. The contract also enables the producer to monitor the consumption of biodiesel and its blends. Only the producer of the biodiesel may claim emission reductions under this methodology;~~
- (e) If the biofuel is blended but not sold to an identified consumer group, the blender and the producer of the biofuel are bound by a contract that allows the producer to monitor the blending of biofuel to ensure that blending proportions and amounts are monitored and meet all regulatory requirements, and that states that no CERs resulting from its consumption will be claimed;
- (f) The blending proportion of the biofuel must be appropriate to ensure that the technical performance characteristics of the blended biofuels do not differ significantly from those of fossil fuels;
- (g) For biodiesel, the condition in 5(f) above is assumed to be met if the blending proportion is up to 20% by volume (B20). If the project participants use a blending proportion of more than 20%, it shall be demonstrated in the CDM-PDD that the technical performance characteristics of the blended biodiesel do not differ significantly from those of petrodiesel and comply with all local regulations;
- (h) Any alcohol used for esterification is methanol from fossil fuel origin. Volumes of biodiesel produced with alcohols other than methanol (for example, ethanol) are not included in the quantity of biodiesel for which emission reductions are claimed;<sup>3</sup>
- (i) The export of biofuel ~~biodiesel~~ produced under this category is not allowed. In any case where the host party exports beyond the national boundary (blended) biofuels of the same type(s) as the biofuel(s) produced in the project plant, the consumption of the produced (blended) biofuel shall be monitored in order to ensure that no double counting occurs. The consumer and the producer of the (blended) biofuel shall be bound by a contract that allows the producer to monitor the consumption of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption.
6. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO<sub>2</sub> equivalent annually.

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<sup>3</sup> Only methanol from fossil fuel origin is included because the methodology does not provide procedures for estimating emissions associated with the use of other alcohols than methanol from fossil fuel origin. Project proponents are invited to propose procedures to estimate the emissions associated with the production of other alcohols that could be used for esterification, such as ethanol or methanol from renewable sources, as a revision to this methodology.

7. If the project activity utilizes biomass sourced from dedicated plantations, the applicability conditions prescribed in the methodological tool **“Project and leakage emissions from biomass”** **“project emissions from cultivation of biomass”** shall apply.

### 2.3. Entry into force

8. Not applicable (call for public inputs).

### 2.4. Applicability of sectoral scopes

9. For validation and verification of CDM projects and programme of activities by a designated operational entity (DOE) using this methodology, application of the following sectoral scopes are mandatory:

- (a) If biofuel is produced from waste oil/fat or biomass residues as a feedstock, then sectoral scopes 5 and 7 apply.
- (b) If biofuel is produced from anything other than waste oil/fat or biomass residues as a feedstock, then sectoral scopes 5, 7 and 15 apply.

## 3. Normative references

10. Project participants shall apply the “General guidelines for SSC CDM methodologies” and “Guidelines on the demonstration of additionality of small-scale project activities” provided at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html> **mutatis mutandis**
11. This methodology also refers to the latest approved versions of the following approved methodologies and tools:
- (a) “AMS-I.D.: “Grid connected renewable electricity generation”;
- (b) “AMS-III.F.: “Avoidance of methane emissions through composting”;
- (c) “AMS-III.G.: “Landfill methane recovery”;
- (d) “AMS-III.H.: Methane recovery in wastewater treatment”;
- (e) **“Project and leakage emissions from biomass”**~~Project emissions from cultivation of biomass~~”;
- (f) “Project and leakage emissions from transportation of freight”;
- (g) “Upstream leakage emissions associated with fossil fuel use”;
- (h) “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion”;
- (i) “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”;
- (j) **“Apportioning emissions from production processes between main product and co- and by-product”**.

## 4. Definitions

12. The definitions contained in the Glossary of CDM terms shall apply.

13. Furthermore, the following definitions apply:

- (a) **Biodiesel** - is a diesel fuel consisting of long-chain alkyl (methyl, propyl or ethyl) esters which is produced by esterification of vegetable oils and/or waste oil/fat with alcohols from biogenic and/or fossil origin;
- (b) **Bioethanol** - is an alcohol produced through the fermentation of sugars or starches, followed by a distillation process and, if required, a dehydration processes;
- (c) **Biofuel production plant** - is the plant where feedstock (e.g. oil, waste oil/fat sugar, starch) is processed to biofuel;
- (d) **Biogenic** - means that the oils and/or fats originate from either vegetable or animal biomass, but not from mineral (fossil) sources;
- (e) **Biomass** - non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms including:
  - (i) Biomass residue;
  - (ii) The non-fossilized and biodegradable organic fractions of industrial and municipal wastes; and
  - (iii) The gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material;
- (f) **Biomass residues** -non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms which is a by-product, residue or waste stream from agriculture, forestry and related industries;
- (g) **Blended biofuel** - blend of fossil fuel and biofuels;
- (h) **Dedicated plantations** - are plantations that are newly established as part of the project activity for the purpose of supplying feedstock to the project plant. In case the dedicated plantation is an A/R CDM project, then the procedures of the approved A/R methodology apply;
- (i) **Esterification** - denotes the formation of an ester compound from carbonic acid and alcohol. Transesterification denotes the exchange of one alcohol in an ester against another (for example glycerol against methanol). In this methodology, "esterification" is used to denote both esterification and transesterification for simplicity;
- (j) **Mill** - is a plant where seeds or crops are processed into starch/sugar;
- (k) **Oil production plant** - is a plant where oil seeds from plants are processed to vegetable oil;
- (l) **Oil seeds** - are seeds of plants from which oil can be derived;

- (m) **Petrodiesel** - is 100% fossil fuel diesel;
- (n) **Vegetable oil** - is oil of biogenic origin that is produced from oil seeds from plants;
- (o) **Waste oil/fat** - is defined as a residue or waste stream of biogenic origin from restaurants, agro and food industry, slaughterhouses or related commercial sectors.

## 5. Baseline methodology

### 5.1. Project boundary

14. ~~The project boundary is the geographical area of the oil seeds cultivation, itinerary for transportation of the feedstock sources<sup>4</sup> processing of oil seeds and biodiesel production, the sites where the waste water and solid waste are treated, the areas where biodiesel is blended and sold to the final users. The vehicles/transportation applications of the final users where the biodiesel or blends thereof are consumed are also included in the project boundary.~~ The spatial extent of the project boundary encompasses:

- (a) Where applicable, transportation of raw materials (e.g. seeds and/or biomass residues) to the project plant(s), feedstock (e.g. vegetable oil and/or waste oil/fats) to the biofuel production plant; and the biofuels to the site where it is blended with fossil fuels;
- (b) The biofuel production plant at the project site, comprising the processing unit(s) (e.g. esterification, fermentation, hydrolysis) plus other installations on the site (e.g. storage, refining, blending, etc.);
- (c) The feedstock processing plant(s) (e.g. oil production plant, mill) on-site or off-site;
- (d) The sites where the waste water and solid waste are treated;
- (e) If blended biofuel is produced: the facility where the biofuel is blended with fossil fuel (regardless of the ownership of the blending facility);
- (f) Where applicable, transport applications, vehicles or gas stations where the (blended) biofuel is consumed;
- (g) If the feedstock is sourced from plants produced in dedicated plantations: the geographic boundaries of the dedicated plantations.

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<sup>4</sup>~~Feedstock sources are the harvested parts of the plants from dedicated plantations that are transported from the fields to the facility for plant oil processing and/or biodiesel production. In case of waste oil/fat the feedstock sources are the activities where they are generated.~~

## 5.2. Baseline

15. Baseline emissions are calculated based on the amount of displaced fossil fuel determined as follows:

$$BE_y = BF_y \times NCV_{BF,y} \times EF_{CO_2,FF,y} \quad \text{Equation (1)}$$

~~$$BE_y = BD_y \times NCV_{BD,y} \times EF_{CO_2,PD,y}$$~~

With:

$$BF_y = \min[(P_{BF,y} - P_{BF,on-site,y} - P_{BF,other,y}), (f_{PJ,y} \times f_{FF,y} \times C_{BF,y} - P_{BF,other,y})] \quad \text{Equation (2)}$$

~~$$BD_y = \min[(P_{BD,y} - P_{BD,on-site,y} - P_{BD,other,y}), (f_{PJ,y} \times f_{PD,y} \times C_{BBD,y} - P_{BD,other,y})]$$~~

Where:

$BE_y$	=	Baseline emissions during the year $y$ (t CO <sub>2</sub> )
$BD_y$	=	Quantity of <b>biofuel biodiesel</b> eligible for crediting in year $y$ (tonnes)
$NCV_{BD,y}$	=	Net calorific value of <b>biofuel biodiesel</b> produced for the year $y$ (GJ/t)
$P_{BD,y}$	=	Production of <b>biofuel biodiesel</b> in the project plant in year $y$ (tonnes)
$P_{BD,on-site,y}$	=	Quantity of <b>biofuel biodiesel</b> consumed at the project <b>biodiesel production</b> plant in year $y$ (tonnes) <sup>5</sup>
$P_{BD,other,y}$	=	Quantity of <b>biofuel biodiesel</b> that is either produced with other alcohols than methanol from fossil origin or that is produced using other oil seeds or waste oil(s)/fat(s) than those eligible under this methodology according to the applicability conditions
$C_{BD,y}$	=	Consumption of (blended) <b>biofuel biodiesel</b> from the project plant by the <b>captive</b> consumer(s) in year $y$ (tonnes)
$f_{PJ,y}$	=	Fraction of blending in year $y$ (volume ratio)
$EF_{CO_2,PDFF}$	=	Carbon dioxide emissions factor for the <b>displaced fossil fuel petrodiesel</b> (t CO <sub>2</sub> /GJ)

<sup>5</sup> If in a particular year some amount of **biofuel biodiesel** produced has not been consumed and the excess stock is carried over to the next year then it can be added to the amount produced in the next year.

$f_{PDFE,y}$  = Blending fraction of fuel used for blending. Use 1.0 if pure fossil fuel petrodiesel is used for blending otherwise use the fraction of fossil fuel petrodiesel in the fuel used for blending (blending rate shall be established volume by volume)

16.  $BD_y$  is determined in equation (2) as the lowest value between the amounts calculated based on: (a) the production of biodiesel in year  $y$  ( $P_{BD,y}$ ); and (b) the consumption of biodiesel by the captive consumers in year  $y$  ( $C_{BD,y}$ ). In the case of blended biodiesel, the consumption of eligible quantity of biodiesel is calculated by the multiplying the consumption of eligible quantity of blended biodiesel by the blending fraction ( $C_{BBD,y} \times f_{P,y}$ ). In case the biodiesel produced by the project activity is blended with already blended biodiesel, then only the fraction of petrodiesel shall be considered ( $f_{PD,y}$ ). Only those (blended) biodiesel quantity shall be considered as eligible for which the applicability conditions are fulfilled. Therefore, biodiesel quantity produced and consumed for the purpose of the project activity (self-consumption) are subtracted from the first amount, and quantity which do not fulfil the applicability criteria are subtracted from the amount of biodiesel in both cases.

17. Only biodiesel and blends thereof which are consumed by captive fleets and which is sold to the end users at filling stations and recorded by calibrated metering systems are included.

18. Project participants shall determine  $C_{BF,y}$  as follows:

- (a) For (blended) biofuels that are sold to an identified consumer group,  $C_{BF,y}$ , shall be based on the monitored amount of (blended) biofuel consumed or sold;
- (b) For biofuels that are blended but not sold to an identified consumer group,  $C_{BF,y}$  shall be based on the monitored amount of biofuel blended at the blending facility(ies).

### 5.3. Project emissions

19. Project emissions ( $PE_y$ ) are the emissions related to the cultivation of oil-seeds biomass feedstock and production and distribution of biofuel biodiesel ("field-to-tank" emissions). The emissions from the combustion of the renewable carbon content in biofuel biodiesel ("tank to wheel") are carbon neutral and may be disregarded. The following sources of project emissions shall be considered:

#### 5.3.1. Project emissions at the biofuel production plant and feedstock processing plant ( $PE_{BP,y}$ )

20. These emissions include fuel and electricity consumption that occur at the site of the biofuel production plant and, if applicable, emissions associated with the anaerobic treatment of wastewater in the feedstock processing plant(s) (e.g. oil production plant(s)/mill(s)).

21. These emissions are estimated as follows:

$$PE_{BP,y} = \sum_j PE_{FC,j,y} + PE_{EC,y} + PE_{W,y} \quad \text{Equation (3)}$$

**Where:**

$PE_{BP,y}$	=	Project emissions at the biofuel production facility and, if applicable, the feedstock processing plant(s) in year $y$ (tCO <sub>2</sub> )
$PE_{FC,j,y}$	=	Project emissions from combustion of fuel type $j$ in the biofuel production plant and the feedstock processing plant(s) in year $y$ (tCO <sub>2</sub> )
$PE_{EC,y}$	=	Project emissions from electricity consumption in the biofuel production plant and the feedstock processing plant(s) in year $y$ (tCO <sub>2</sub> )
$PE_{W,y}$	=	Project emissions from anaerobic treatment of waste/waste water in year $y$ (tCO <sub>2</sub> )

22. Emissions from fossil fuel consumption ( $PE_{FC,y}$ ) should include CO<sub>2</sub> emissions from all fossil fuel consumption that occurs at the site of the biofuel production plant and, if applicable, the feedstock processing plant(s) (e.g. oil production plant(s) and/or mill(s)) that is attributable to the project activity. The project emissions from fossil fuel combustion ( $PE_{FC,y}$ ) shall be calculated following the latest version of "Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion". For this purpose, the processes  $j$  in the tool correspond to all fossil fuel combustion sources at these plants.

23. Emissions from electricity consumption ( $PE_{EC,y}$ ) includes electricity delivered from the grid to the biofuel production plant and, if applicable, the feedstock processing plant (s) (e.g. oil production plant(s)/mill(s)). Electricity generated on-site should not be included here.<sup>6</sup> The project emissions from electricity consumption ( $PE_{EC,y}$ ) shall be calculated following the latest version of "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation".

24. Emissions from solid waste disposal and wastewater treatment ( $PE_{W,y}$ ) are calculated as per provisions in AMS-III.G. (landfill); AMS-III.F. (composting) and AMS-III.H. (waste water treatment) in the cases where the wastes are disposed/treated under anaerobic conditions;

### 5.3.2. Project emissions from fossil carbon in the biofuel due to the use of methanol from fossil origin in the esterification process ( $PE_{MeOH,y}$ )

25. Project emissions from fossil fuel carbon in the biofuel biodiesel due to the use of methanol from fossil origin in the esterification process are estimated as follows:

$$PE_{MeOH,y} = MC_{MeOH,y} \times EF_{C,MeOH} \times \frac{44}{12} \quad \text{Equation (4)}$$

**Where:**

$PE_{MeOH,y}$	=	Project emissions from fossil carbon in the biofuel biodiesel due to esterification with methanol of fossil origin in year $y$ (t CO <sub>2</sub> e)
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<sup>6</sup> On-site electricity generation with fossil fuels should be included in  $PE_{FC,y}$ . On-site electricity generation with biomass residues or biofuel biodiesel is accounted as zero emissions, as the use of biomass residues is not assumed to result in any emissions and emissions associated with the production of biodiesel are included in the emission sources accounted under this methodology.

$MC_{MeOH,y}$	=	Quantity of methanol consumed in the <b>biofuel biodiesel</b> plant, including spills and evaporations in year $y$ (tonnes)
$EF_{C,MeOH}$	=	Carbon emission factor of methanol, based on molecular weight (tC/t MeOH) (= 12/32)
$\frac{44}{12}$	=	Molecular weight ratio to convert tonnes of carbon into tonnes of CO <sub>2</sub> (t CO <sub>2</sub> /tC)

### 5.3.3. Project emissions from transportation ( $PE_{TR,y}$ )

26. Project emissions resulting from transportation of biomass feedstock to the **biofuel production plant/feedstock processing plant** and **biofuel to the site where it is blended with fossil fuel** are estimated using the latest version of the methodological tool “Project and leakage emissions from transportation of freight”, if the transportation distance is more than 200 km, otherwise they can be neglected;

### 5.3.4. Project emissions associated with the cultivation of land to produce biomass feedstock in dedicated plantations ( $PE_{BC,y}$ )

27. Project emissions associated with the cultivation of lands in a dedicated plantation are estimated by following the provisions in the methodological tool: “Project and leakage emissions from biomass”. Project participants should clearly document and justify in the CDM-PDD which emission sources are applicable to the project activity.
28. Alternatively, project participants may choose a simplified approach to calculate this emission source using conservative **default values** for the emissions associated with the cultivation of lands. This approach can only be used for **palm, cassava, jatropha, soy, corn, sugarcane or pongamia**.

#### 5.3.4.1. Use of a default emission factor

$$PE_{BC,y} = PE_{SOC,y} + \sum_s A_{s,y} \times EF_{s,y} \quad \text{Equation (5)}$$

Where:

$PE_{BC,y}$	=	Project emissions associated with the cultivation of land to produce biomass feedstock in year $y$ (tCO <sub>2</sub> )
$PE_{SOC,y}$	=	Emissions resulting from loss of soil organic carbon, in year $y$ (t CO <sub>2</sub> e) to be estimated as per the methodological tool: “Project and leakage emissions from biomass”.
$A_{s,y}$	=	Area in which feedstock type $s$ is cultivated for use in the project plant in year $y$ (ha)
$EF_{s,y}$	=	Default emission factor for the GHG emissions associated with the cultivation of land to produce biomass feedstock type $s$ (tCO <sub>2</sub> e/ha). See Table 2 below for available values.

**Table 2. Conservative default emission factors for the GHG emissions associated with the cultivation of land to produce biomass feedstock**

Feedstock type s	Fresh palm fruit bunches	Cassava roots	Jatropha nuts	Soybeans	Corn Seed	Sugarcane	Pongamia
$EF_{s,y}$ (t CO <sub>2</sub> e/ha)	2.5	1.9	2.6	0.8	2.1	2.3	1.5

29. An excel sheet that can be used to calculate the emission factors for the GHG emissions associated with the cultivation of land to produce crops is provided at the following weblink at UNFCCC CDM website:

<<https://cdm.unfccc.int/methodologies/SSCmethodologies/approved>>

- (a) CO<sub>2</sub> emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion”, including the consumption of fossil fuels for processing (e.g. pressing and filtering, transesterification, degumming, neutralization) of biodiesel and excluding the consumption of fossil fuels related to the cultivation of oil seeds, if any;
- (b) CO<sub>2</sub> emissions from electricity consumption by the project activity using the latest version of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”, including the consumption of fossil fuels for processing (e.g. pressing and filtering, transesterification, degumming, neutralization) of biodiesel and excluding the consumption of electricity related to the cultivation of oil seeds, if any;
- (c) Methane emission from solid waste disposal and wastewater treatment are calculated as per provisions in AMS-III.G. (landfill); AMS-III.F. (composting) and AMS-III.H. (waste water treatment) in the cases where the wastes are disposed/treated in under anaerobic conditions;
- (d) Emissions from cultivation of oil seeds are calculated using the latest version of the tool “Project emissions from cultivation of biomass”;
- (e) Emissions from transportation of oil seeds to the biodiesel production plant are estimated using the latest version of the tool “Project and leakage emissions from transportation of freight”, if the transportation distance is more than 200 km, otherwise they can be neglected;
- (f) Emissions from fossil fuel carbon in the biodiesel due to the use of methanol from fossil origin in the trans-esterification process.
30. The Project emissions of sources 17(a) through 17(e) above will be allocated to the biofuel biodiesel produced from each feedstock oilseed type  $s_k$  and its co- and by-products, apportioning by market prices. For each feedstock oilseed type  $s_k$  the project

emissions shall be calculated separately and then summed to determine the total project emissions in year  $y$ , as follows:

$$PE_y = \sum_s [FP_{BD,s,y} \times AF_{1,s,y} \times (PE_{TR,s,y} + PE_{BP,s,y} + PE_{MeOH,y} + AF_{2,s,y} \times PE_{BC,s,y})] \quad \text{Equation (6)}$$

Where:

$PE_y$	=	Project emissions in year $y$ (t CO <sub>2</sub> e)
$FP_{BF,s,y}$	=	Amount of biofuel biodiesel produced with feedstock type $sk$ plant oil type $k$ that is produced by the project activity in year $y$ (tonnes)
$AF_{1,s,y}$	=	Allocation factor for the production of biofuel biodiesel from feedstock oilseed type $sk$ in year $y$ (fraction)
$AF_{2,s,y}$	=	Allocation factor for the land cultivation of feedstock type $s$ in year $y$ (fraction)
$PE_{TR,s,y}$	=	Emissions from transportation of feedstock sources of type $sk$ and/or biofuel biodiesel in year $y$ (t CO <sub>2</sub> e)
$PE_{BP,s,y}$	=	Emissions from biofuel biodiesel production using feedstock oilseed type $sk$ in year $y$ (t CO <sub>2</sub> e)
$PE_{MeOH,y}$	=	Emissions from fossil fuel carbon in methanol used in the transesterification process in year $y$ (t CO <sub>2</sub> e)
$PE_{BC,s,y}$	=	Emissions from cultivation of land for feedstock type $s$ in year $y$ (t CO <sub>2</sub> e)
$PE_{W,s,y}$	=	Where applicable project emissions of CH <sub>4</sub> from solid waste and/or waste water in year $y$ (t CO <sub>2</sub> e)

34. The allocation factors are estimated as per the methodological tool “Apportioning emissions from production processes between main product and co and by-product” calculated using the amount of fuels, co-products and by-products obtained from the oilseed type  $k$  and respective market prices, as per the following equation:

$$AF_y = \frac{FP_{BD,k,y} \times MP_{BD,k,y}}{FP_{BD,k,y} \times MP_{BD,k,y} + M_{OM,k,y} \times MP_{OM,k,y} + M_{G,k,y} \times MP_{G,y}} \quad \text{Equation (7)}$$

Where:

$FP_{BD,k,y}$	=	Amount of biodiesel from oilseed type $k$ produced and consumed in the year $y$ (tonnes)
$MP_{BD,k,y}$	=	Market price of biodiesel from oilseed type $k$ in year $y$ (\$/tonnes)
$M_{OM,k,y}$	=	Amount of oilseed meal (press-cake) obtained from oilseed type $k$ in year $y$ (tonnes)

$MP_{OM,k,y}$  = Market price of oilseed meal (press-cake) obtained from oilseed type  $k$  in year  $y$  (\$/tonnes)

$M_{G,k,y}$  = Amount of glycerin associated with the production of biodiesel from oilseed type  $k$  in year  $y$  (tonnes)

$MP_{G,y}$  = Market price of glycerin in year  $y$  (\$/tonnes)

32. If any other co-products or by-products from oilseed crop type  $k$  are sold in the market, they may be included in the denominator of the above equation accordingly.

33. The project emissions from cultivation of oil seeds are calculated using the latest version of the tool “Project emissions from cultivation of biomass”.

34. The project emissions from transportation of feedstock and biodiesel are estimated using the latest version of the tool “Project and leakage emissions from transportation of freight”; if the transportation distance is more than 200 km, otherwise they can be neglected.

35. Project emission of methane from solid waste disposal and/or wastewater treatment is calculated as per provisions in AMS-III.G. (landfill), AMS-III.F. (composting) or AMS-III.H. (waste water treatment).

#### 5.4. Leakage

36. Leakage emissions are calculated as follows:

$$LE_y = LE_{BR} + LE_{MeOH,y} - LE_{FF,y} \quad \text{Equation (8)}$$

Where:

$LE_y$  = Leakage in year  $y$  (t CO<sub>2</sub>)

$LE_{BR}$  = Leakage due to displacement of existing uses of waste oil/fat or biomass residues in year  $y$  (t CO<sub>2</sub>)

$LE_{MeOH,y}$  = Leakage emissions associated with production of methanol or the chemicals used for pre-treatment and/or hydrolysis of lignocellulosic biomass used in ~~biofuel~~ ~~biodiesel~~ production in year  $y$  (t CO<sub>2</sub>)

$LE_{FF,y}$  = Negative leakage due to reducing indirect emissions associated with the production of ~~fossil fuel~~ ~~petrodiesel~~ (t CO<sub>2</sub>)

##### 5.4.1. Leakage due to displacement of existing uses of waste oil/fat or biomass residues

37. Leakage emissions from the diversion of existing applications of waste oil/fat and/or biomass residues are estimated in accordance with the methodological tool: “Project and leakage emissions from biomass”. If the biodiesel oil is produced from waste oil/fat, the “General guidance on leakage in biomass project activities” for small-scale projects shall be taken into account.  $LE_{BR}$  shall be estimated accordingly.

#### 5.4.2. Leakage emissions associated with production of methanol/chemicals used in biofuel production

38. Leakage effects due to the upstream emissions for the methanol production may be disregarded<sup>7</sup> if the leakage due to the avoided production of fossil fuel petrodiesel (including production of crude oil and refining of crude oil) is also disregarded. Otherwise, the leakage emissions due to the production of methanol used in the esterification process shall be calculated as follows:

$$LE_{MeOH,y} = MC_{MeOH,y} \times EF_{MeOH,PC} \quad \text{Equation (9)}$$

Where:

- $LE_{MeOH,y}$  = Leakage emissions associated with production of methanol used in **biofuel biodiesel** production in year  $y$  (t CO<sub>2</sub>)
- $MC_{MeOH,y}$  = Quantity of methanol consumed in the **biofuel biodiesel** plant, including spills and evaporation on-site in year  $y$  (t MeOH)
- $EF_{MeOH,PC}$  = Pre-combustion (i.e. upstream) emissions factor for methanol production (t CO<sub>2</sub>/t MeOH)

39. Emissions from production of chemicals that are used for pre-treatment and/or hydrolysis of lignocellulosic biomass to produce cellulosic ethanol are estimated in accordance with the methodological tool: “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”.

#### 5.4.3. Leakage related to the avoided production of fossil fuel

40. The substitution of fossil fuels biodiesel by for biofuel petrodiesel reduces indirect (“upstream”) emissions associated with the production of fossil fuels petrodiesel ( $LE_{FF,y}$ ) and is treated as negative leakage<sup>7</sup> and can be calculated based on the methodological tool “Upstream leakage emissions associated with fossil fuel use”, as follows:

$$LE_{FF,y} = BF_y \times \sum_x \sum_i \sum_j NCV_{BF,y} \times EF_{i,j,x,y} \quad \text{Equation (10)}$$

Where:

- $LE_{FF,y}$  = Leakage related to the avoided production of fossil fuel in year  $y$  (tCO<sub>2</sub>)
- $BF_y$  = Quantity of biofuel eligible for crediting in year  $y$  (t)
- $NCV_{BF,y}$  = Net calorific value of biofuel produced in year  $y$  (GJ/t)
- $EF_{i,j,x,y}$  = Emission factor for upstream emissions stage  $i$  associated with consumption of fossil fuel type  $x$  from fossil fuel origin  $j$  applicable to year  $y$  (t CO<sub>2</sub>e/TJ)

<sup>7</sup> Emission reduction from reducing international bunker fuel consumption is not eligible under CDM as per EB 25 report, paragraph 58.

41. For the purpose of this methodology, the following upstream emissions stages *i* are considered:

(a) Production of crude oil. These include emissions from venting, flaring and energy uses;

(b) Oil refinery. These include emissions from energy uses, production of chemicals and catalysts, disposal of production wastes (including flaring) and direct emissions;

(c) Long distance transport.<sup>8</sup>

## 5.5. Emission reduction

42. The emission reductions achieved by the project activity shall be calculated as the difference between the baseline emissions and the sum of the project emissions and leakage.

$$ER_y = BE_y - \text{MAX}(PE_y + LE_y, 0) \quad \text{Equation (11)}$$

Where:

$ER_y$  = Emission reductions in the year *y* (t CO<sub>2</sub>e)

$LE_y$  = Leakage emissions in year *y* (t CO<sub>2</sub>e)

43. The emissions from the production of plant oil are compared to the emissions from the production of the petrodiesel, which is avoided by displacing petrodiesel consumption with plant oil and is considered as negative leakage. The project emissions from the production of plant oil may be compensated by this negative leakage. However, project proponents shall not claim emission reductions from this comparison.

## 6. Monitoring methodology

44. Relevant parameters shall be monitored as indicated in the tables below. The applicable requirements specified in the “General guidelines for SSC methodologies” (e.g. calibration requirements, sampling requirements) are also an integral part of the monitoring guidelines specified below and therefore shall be referred by the project participants.

Data / Parameter table 1.

Data / Parameter:	$P_{BFD,y}$
Data unit:	tonnes

<sup>8</sup> Emissions from international long distance transport (transport of crude oil to the refinery) will not be taken into account since the EB has clarified that CDM project activities cannot claim emission reductions from reducing international bunker fuel consumption. EB 25 report paragraph 58 states that “The Board agreed to confirm that the project activities/parts of project activities resulting in emission reductions from reduced consumption of bunker fuels (e.g. fuel saving on account of shortening of the shipping route on international waters) are not eligible under the CDM.”

Description:	Production of biofuel biodiesel in the project plant in year y
Measurement procedures (if any):	Measurements are undertaken using calibrated meters. Measurement results shall be cross checked with records for consumption or and sales (e.g. invoices/receipts)
Monitoring frequency:	Continuously or in batches
Any comment:	-

**Data / Parameter table 2.**

<b>Data / Parameter:</b>	$P_{BFD, on-site, y}$
Data unit:	tonnes
Description:	Quantity of biofuel biodiesel consumed at the project biodiesel production plant and/or the feedstock processing oil production plant(s) in year y
Measurement procedures (if any):	Measurements are undertaken using calibrated meters at production site
Monitoring frequency:	Continuously or in batches
Any comment:	-

**Data / Parameter table 3.**

<b>Data / Parameter:</b>	$P_{BFD, other, y}$
Data unit:	tonnes
Description:	Quantity of biofuel biodiesel that is either produced with other alcohols than methanol from fossil origin or that is produced using other feedstock oil seeds or waste oil(s)/fat(s) than those eligible under this methodology according to the applicability conditions
Measurement procedures (if any):	Measurements are undertaken using calibrated meters at production site
Monitoring frequency:	Continuously or in batches
Any comment:	-

**Data / Parameter table 4.**

<b>Data / Parameter:</b>	$C_{BFD, y}$
Data unit:	tonnes
Description:	Quantity-Consumption of (blended) biofuel biodiesel from the project plant consumed/sold to identified consumer/blended by the captive consumer(s) in year y
Measurement procedures (if any):	Measurements are undertaken using calibrated meters at fuelling stations. Measurement results shall be cross checked with records for sales (e.g. invoices/receipts). For (blended) biofuels that are sold to an identified consumer group $C_{BF, i, y}$ shall be based on the monitored amount of (blended) biofuel sold. In case of biofuels that are blended but neither used in stationary facilities nor sold to an identified consumer group, $C_{BF, i, y}$ shall be based on the amount of biofuel blended at the blending facility(ies).
Monitoring frequency:	Continuously or in batches

Any comment:	-
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**Data / Parameter table 5.**

<b>Data / Parameter:</b>	<b>NCV<sub>BFD,y</sub></b>
Data unit:	GJ/tonnes
Description:	Net calorific value of <b>biofuel biodiesel</b> produced in year <i>y</i>
Measurement procedures (if any):	Measured according to relevant national/ international standards Analysis has to be carried out by accredited laboratory
Monitoring frequency:	Annually
Any comment:	-

**Data / Parameter table 6.**

<b>Data / Parameter:</b>	<b>f<sub>PJ,y</sub></b>
Data unit:	%
Description:	Fraction of blending in year <i>y</i> (ratio)
Measurement procedures (if any):	Measured volumes or flows by calibrated meters at blending stations.
Monitoring frequency:	Every produced blend must be monitored
QA/QC procedures:	During the process of creating the blended <b>biofuel biodiesel</b> at the blending station, the blending operation shall be monitored to assure adequate mixing of the products in the correct proportions. <b>For automotive purposes the blending ratio must not exceed 20%.</b> This includes measuring and recording the volumes and blend levels as verified through bills of lading, meter printouts or other auditable records of both the <b>biofuel biodiesel</b> and <b>fossil diesel</b> fuel, which comprise the blend
Any comment:	See "BQ-9000 Quality Assurance Program Requirements for the Biodiesel industry" for further information

**Data / Parameter table 7.**

<b>Data / Parameter:</b>	<b>f<sub>PFFD,y</sub></b>
Data unit:	%
Description:	<b>Blending fraction of Fraction of petrodiesel in the fuel used for blending</b>
Measurement procedures (if any):	Data from the supplier of the fuel used for blending
Monitoring frequency:	Continuously or in batches
Any comment:	-

**Data / Parameter table 8.**

<b>Data / Parameter:</b>	<b>FP<sub>BFD,s,y</sub></b>
Data unit:	tonnes
Description:	Amount of <b>biofuel biodiesel</b> produced with <b>feedstock oilseed</b> type <b>sk</b> by <b>the project activity produced and consumed</b> in the year <i>y</i> (tonnes)

Measurement procedures (if any):	Measurements are undertaken using calibrated meters at fuelling stations. Measurement results shall be cross checked with records for consumption and sales (e.g. invoices/receipts)
Monitoring frequency:	Continuously or in batches
Any comment:	-

**Data / Parameter table 9.**

<b>Data / Parameter:</b>	$M_{OM,k,y}$
Data unit:	tonnes
Description:	Amount of oilseed meal (press-cake) obtained from oilseed type $k$ in year $y$
Measurement procedures (if any):	Measurements are undertaken at production site. Measurement results shall be cross checked with records for consumption and sales (e.g. invoices/receipts)
Monitoring frequency:	Continuously or in batches
Any comment:	-

**Data / Parameter table 10.**

<b>Data / Parameter:</b>	$M_{G,k,y}$
Data unit:	tonnes
Description:	Amount of glycerin associated with the production of biodiesel from oilseed type $k$ in year $y$
Measurement procedures (if any):	Measurements are undertaken at production site. Measurement results shall be cross checked with records for consumption and sales (e.g. invoices/receipts)
Monitoring frequency:	Continuously or in batches
Any comment:	-

**Data / Parameter table 11.**

<b>Data / Parameter:</b>	$MC_{MeOH,y}$
Data unit:	tonnes
Description:	Mass of MEOH/chemicals consumed in the biofuel biodiesel plant, including spills and evaporation, in year $y$
Measurement procedures (if any):	Measured continuously by calibrated equipment at the project site. Cross-checked with purchase data and adjusted for stock changes when deemed necessary
Monitoring frequency:	Continuously or in batches
Any comment:	-

**Data / Parameter table 12.**

<b>Data / Parameter:</b>	$A_{s,y}$
Data unit:	Ha

Description:	Area in which biomass feedstock type s is cultivated for use in the project plant in year y
Source of data:	Project participants
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

## **7. Project activity under a programme of activities**

45. The methodology is applicable to a programme of activities; no additional leakage estimations are necessary other than that indicated under leakage section above.

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### Document information

Version	Date	Description
Draft 03.0	11 October 2017	MP 74, Annex 12 A call for public input will be issued for this draft methodology. This revision broadens the applicability of biofuel and includes reference to related tools.
02.0	28 November 2014	EB 81, Annex 17 This revision removes the applicability conditions related to land eligibility and project emission calculations related to the cultivation of biomass and includes reference to the approved tools.
01.0	30 July 2010	EB 55, Annex 30 Initial adoption.

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