CLEAN DEVELOPMENT MECHANISM

TOOL03

Methodological tool

Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion

Version 03.0

United Nations
Framework Convention on
Climate Change

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1. Introduction

1.1. Background

1. This tool provides procedures to calculate emissions associated with the fossil fuels combustion.

2. Scope, applicability, and entry into force

2.1. Scope and applicability

2. This tool provides procedures to calculate project and/or leakage CO_2 emissions from the combustion of fossil fuels. It can be used in cases where CO_2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process *j* this tool is being applied.

2.2. Entry into force

3. The date of entry into force is the date of the publication of the EB 96 meeting report on 22 September 2017.

3. Definitions

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

4. Parameters

5. This tool provides procedures to determine the following parameters:

Parameter	SI Unit	Description
$\boldsymbol{PE_{FC,j,y}}$	tCO_2/yr	CO_2 emissions from fossil fuel combustion in process *j* during the year *y*

5. Baseline methodology procedure

6. CO_2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} \times COEF_{i,y} \qquad \text{Equation (1)}$$

Where:

$PE_{FC,j,y}$ = Are the CO_2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO_2/yr)

$FC_{i,j,y}$ = Is the quantity of fuel type *i* combusted in process *j* during the year *y* (mass or volume unit/yr)

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

i = Are the fuel types combusted in process *j* during the year *y*

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

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

If $FC_{i,j,y}$ is measured in a mass unit:

$$COEF_{i,y} = w_{C,i,y} \times 44/12 \quad \text{Equation (2)}$$

If $FC_{i,j,y}$ is measured in a volume unit:

$$COEF_{i,y} = w_{C,i,y} \times \rho_{i,y} \times 44/12 \quad \text{Equation (3)}$$

Where:

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type *i* (tCO_2/mass or volume unit);

$w_{C,i,y}$ = Is the weighted average mass fraction of carbon in fuel type *i* in year *y* (tC/mass unit of the fuel)

$\rho_{i,y}$ = Is the weighted average density of fuel type *i* in year *y* (mass unit/volume unit of the fuel)

i = Are the fuel types combusted in process *j* during the year *y*

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

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad \text{Equation (4)}$$

Where:

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

$NCV_{i,y}$ = Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)

i = Are the fuel types combusted in process *j* during the year *y*

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

6. Monitoring methodology procedure

6.1. Monitoring procedures

9. Describe and specify in the CDM-PDD all monitoring procedures, including the type of measurement instrumentation used, the responsibilities for monitoring and QA/QC procedures that will be applied. Where the methodology provides different options (e.g. use of default values or on-site measurements), specify which option will be used. Meters should be installed, maintained and calibrated according to equipment manufacturer instructions and be in line with national standards, or, if these are not available, international standards (e.g. IEC, ISO).

10. All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data should be monitored if not indicated differently in the comments in the tables below.

6.2. Data and parameters monitored

Data / Parameter table 1.

Data / parameter:	$FC_{i,j,y}$
Data unit:	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description:	Quantity of fuel type *i* combusted in process *j* during the year *y*
Source of data:	Onsite measurements
Measurement procedures (if any):	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records

Any comment:	Project activities or PoAs, where end users of the subsystems or measures are households/communities/small and medium enterprises (SMEs), faced with data gaps due to meter failure or other reasons unforeseen, may estimate the quantity of fuel, using one of the following options, provided the gap period does not exceed 30 consecutive days within six consecutive months: • The purchased fuel/energy invoices/bills, where the purchased fuel can be identified specifically for the CDM project; • The energy produced by the equipment, adjusted by efficiency. Efficiency of the equipment is determined using the 'Methodological tool: Determining the baseline efficiency of thermal or electric energy generation systems', and energy produced is measured directly or calculated based on operation hours; • The highest value of the parameter for the same calendar period of the previous years; • The fuel consumption of a representative sample of the first batch[1] of project devices. It may be assumed that the fuel consumption measured in a representative sample of the first batch of project devices apply to all subsequent batches.

Data / Parameter table 2.

Data / parameter:	$w_{C,i,y}$
Data unit:	tC/mass unit of the fuel
Description:	Weighted average mass fraction of carbon in fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply: **Data source** / **Conditions for using the data source** (a) Values provided by the fuel supplier in invoices / This is the preferred source (b) Measurements by the project participants / If (a) is not available
Measurement procedures (if any):	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated

[1] Batch is defined as the population of the devices of the same type commissioned at a certain calendar year. To establish the date of commissioning, the project participant may opt to group the devices in "batches" and the latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch.

QA/QC procedures:	Verify if the values under (a) and (b) are within the uncertainty range of the product of the IPCC default values as provided in Table 1.2 and Table 1.3, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (b) should have ISO17025 accreditation or justify that they can comply with similar quality standards
Any comment:	Applicable where Option A is used

Data / Parameter table 3.

Data / parameter:	$\rho_{i,y}$
Data unit:	Mass unit/volume unit
Description:	Weighted average density of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply: **Data source** / **Conditions for using the data source** (a) Values provided by the fuel supplier in invoices — This is the preferred source (b) Measurements by the project participants — If (a) is not available (c) Regional or national default values — If (a) is not available. These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances)
Measurement procedures (if any):	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures:	-
Any comment:	Applicable where Option A is used and where $FC_{i,j,y}$ is measured in a volume unit. Preferably the same data source should be used for $w_{C,i,y}$ and $\rho_{i,y}$

Data / Parameter table 4.

Data / parameter:	$NCV_{i,y}$
Data unit:	GJ per mass or volume unit (e.g. GJ/m³, GJ/ton)
Description:	Weighted average net calorific value of fuel type *i* in year *y*

<table>
<tr><td>Source of data:</td><td>The following data sources may be used if the relevant conditions apply:

<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>(a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source if the carbon fraction of the fuel is not provided (Option A)</td></tr>
<tr><td>(b) Measurements by the project participants</td><td>If (a) is not available</td></tr>
<tr><td>(c) Regional or national default values</td><td>If (a) is not available.

These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances)</td></tr>
<tr><td>(d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If (a) is not available</td></tr>
</table>
</td></tr>
<tr><td>Measurement procedures (if any):</td><td>For (a) and (b): Measurements should be undertaken in line with national or international fuel standards</td></tr>
<tr><td>Monitoring frequency:</td><td>For (a) and (b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated.

For (c): Review appropriateness of the values annually.

For (d): Any future revision of the IPCC Guidelines should be taken into account</td></tr>
<tr><td>QA/QC procedures:</td><td>Verify if the values under (a), (b) and (c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (a), (b) or (c) should have ISO17025 accreditation or justify that they can comply with similar quality standards</td></tr>
<tr><td>Any comment:</td><td>Applicable where Option B is used</td></tr>
</table>

Data / Parameter table 5.

Data / parameter:	$EF_{CO2,i,y}$
Data unit:	tCO_2/GJ
Description:	Weighted average CO_2 emission factor of fuel type *i* in year *y*

<table>
<tr><td>Source of data:</td><td>The following data sources may be used if the relevant conditions apply:

<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>Measurements by the project participants</td><td>If (a) is not available</td></tr>
<tr><td>Regional or national default values</td><td>If (a) is not available

These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances)</td></tr>
<tr><td>IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If (a) is not available</td></tr>
</table>
</td></tr>
<tr><td>Measurement procedures (if any):</td><td>For (a) and (b): Measurements should be undertaken in line with national or international fuel standards</td></tr>
<tr><td>Monitoring frequency:</td><td>For (a) and (b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated.

For (c): Review appropriateness of the values annually.

For (d): Any future revision of the IPCC Guidelines should be taken into account</td></tr>
<tr><td>Any comment:</td><td>Applicable where option B is used.

For (a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options (b), (c) or (d) should be used</td></tr>
</table>

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Document information

Version	*Date*	*Description*
03.0	22 September 2017	EB 96, Annex 4 Revision to provide flexible and objective requirements and best practice examples for missing data management.
02.0	2 August 2008	EB 41, Annex 11 The tool was revised to clarify that the use of rulers is an acceptable measurement method for monitoring $FC_{i,j,y}$.
01.0	22 June 2007	EB 32, Annex 9 Initial adoption.

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