Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories

TYPE III - OTHER PROJECT ACTIVITIES

Project participants shall take into account the general guidance to the methodologies, information on additionality, abbreviations and general guidance on leakage provided at http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html .

III.K. Avoidance of methane release from charcoal production by shifting from pit method to mechanized charcoaling process

Technology/measure

1. This category is applicable to project activities that avoid release of methane from pit charcoal production by producing charcoal in new facility(ies) equipped with recovery and flaring/combustion of methane generated in the production process.

2. The category is applicable under one of the following conditions;

    (a) Local regulations do not require controlling methane emissions in charcoal production;

    (b) There is a widespread non compliance[1] of the local regulation evidenced by:

        (i) Annually collected data from control groups set up by the project activity, or

        (ii) Annually collected data on legal action and enforcement mechanisms implemented under the prevailing regulation, or

        (iii) Official reports (e.g. annual reports of regulatory bodies for pollution control).

3. No relevant changes in greenhouse gas emissions other than methane occur as a consequence of the project activity and/or need to be accounted, except for the possibilities of leakage.

4. The implementation of the project activity shall not result in changes in the type and source of biomass raw material used for production of charcoal (e.g. if in the baseline charcoal was produced from coconut shells, the project activity will only produce charcoal from coconut shells).

5. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

6. If the combustion facility is used for heat and electricity generation that component of the project activity shall use a relevant category under type I.

Boundary

7. The project boundary is the physical, geographical sites:

[1] Less than 50% of charcoal production activities comply in the country

(a) Where the charcoal is manufactured in open pits and the avoided methane emission occurs in absence of the proposed project activity;

(b) Where the charcoal manufacturing with recovery and flaring/combustion of methane takes place;

(c) And in the itineraries between them, where the transportation of raw material for charcoal manufacturing occurs.

Project Activity Emissions

8. Project activity emissions consist of:

(a) Incremental CO_2 emissions due to incremental distances between the charcoal manufacturing facility(ies) to the consumption points in comparison to the baseline case;

(b) Incremental CO_2 emissions due to incremental distances between the raw material collection points to the new charcoal manufacturing facility(ies) in comparison to the baseline case;

(c) CO_2 emissions related to the power used by the project activity facilities, including the equipments for air pollution control required by regulations. If the project activity consumes grid electricity, the corresponding emissions are calculated as described in category I.D;

(d) Fugitive emissions of methane due to capture and flare inefficiencies

$$\mathbf{PE_y = PE_{y,transp1} + PE_{y,transp2} + PE_{y,power} + PE_{y,fugitive}}$$

where:

PE_y project activity direct emissions in the year "y" (tCO_2e)

$PE_{y,transp1}$ emissions from incremental transportation from raw material collection points in the year "y" (tCO_2e)

$PE_{y,transp2}$ emissions from incremental transportation to consumption points in the year "y" (tCO_2e)

$PE_{y,power}$ emissions from electricity or diesel consumption in the year "y"(tCO_2e)

$PE_{y,fugitive}$ fugitive emissions from capture and flare inefficiencies in the project charcoal manufacturing plant in the year "y" ($t\ CO_2e$)

When trucks are used for transportation, emissions from incremental distances for transportations shall be estimated as follows.

$$\mathbf{PE_{y,transp1} = (Q_{y,raw}/CT_{y1}) * DAF_{w1} * EFCO_2}$$

where:

$Q_{y,raw}$ quantity of raw material used in the year "y" (tonnes)

CT_{y1} average truck capacity for raw material transportation (tonnes/truck)

DAFw1 average incremental distance for raw material transportation (km/truck)

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EFCO2 CO2 emission factor for the fuel used (tCO2/km)
Local values or IPCC default values can be used.

$$PE_{y,transp\,2} = (Q_{y,prod}/CT_{y\,2}) * DAF_{w\,2} * EFCO_2$$

where:

$Q_{y,prod}$ quantity of charcoal produced in the year "y" (tonnes)

CT_{y2} average truck capacity for charcoal transportation (tonnes/truck)

DAF_{w2} average incremental distance for charcoal transportation (km/truck)

Fugitive emissions due to capture and flare inefficiencies shall be estimated as follows:

$$PE_{y,fugitive} = (1 - CFE_{project}) * ME_{y,project} * GWP\_CH4$$

where:

$CFE_{project}$ capture and flare efficiency of the methane recovery and combustion equipment in the project charcoal manufacturing plant (a default value of 0.9 shall be used, given no other appropriate value)

$ME_{y,project}$ methane emission potential of the project charcoal manufacturing process in the year "y" (tonnes)

$ME_{y,project}$ shall be estimated ex-ante and reported in the project design document. Amount of methane generated by the project activity in each year will be assessed ex-post through direct measurement.

Baseline

9. The baseline scenario is the situation where, in the absence of the project activity, charcoal is produced in open pits within the project boundary and methane is emitted to the atmosphere. The baseline emissions are the amount of methane that would have been produced from open pits to process the equivalent quantity of raw material used in the project activity to produce charcoal. Only dry weights of the biomass raw material shall be considered for the calculations.

The baseline emissions shall be estimated using the relation below:

$$BE_y = Q_{y,raw} * (M_{y,b} - M_{y,d}) * GWP_{CH4}$$

where:

BE_y baseline emissions (tCO_2e)

$Q_{y,raw}$ quantity of raw material used in the new facility in the year "y" on a dry basis (tonnes)

$M_{y,b}$ methane emission factor for open pit charcoal manufacturing process (tonnes of CH_4/tonne raw material used)

$M_{y,d}$ factor to account for any legal requirement for capture and flare of methane in open pit charcoal production (tonne of CH_4/tonne of raw material)

GWP_{CH4} GWP of CH_4 (a value of 21)

$M_{y,b}$ shall be determined from experiments using relevant statistical methods. A generic procedure is provided in the annex I.

Leakage

10. If the charcoal manufacturing technology is equipment transferred from another activity or if the existing pit charcoaling equipment is transferred to another activity, leakage effects are to be considered.

11. If the implementation of the project activity occurs in conjunction with other project activities directly related to the inputs and outputs associated with the carbonization process (e.g. coconut shell or charcoal), the overall supply chain relationship of the respective baseline and project emissions of the individual project activities must be taken into account. In such cases, provisions to avoid double counting may be included in the CDM-PDD as per the EB guidance on double counting of emission reductions as outlined in the paragraph 38 of the EB26 Meeting Report.

Monitoring

12. The emission reduction achieved by the project activity will be measured as the difference between the baseline emission and the sum of the project emission and leakage.

$$\mathbf{ER_y = BE_y - (PE_y + Leakage_y)}$$

where:

ER_y Emission reduction in the year "y" (tCO_2e)

13. The following parameters shall be monitored and recorded under the project activity:

(a) Quantity of raw material ($Q_{y,raw}$) used each year and its moisture content through representative sampling;

(b) Quantity of charcoal produced ($Q_{y,prod}$) and its moisture content in each year;

(c) The average truck capacity ($CT_{y\,1}$ and CT_{y2}) and the distances over which the raw materials and charcoal are transported in the baseline and the project situation (to determine the component of project activity emission on account of transportation);

(d) The power consumption and/or generation of the production facility.

14. To estimate the fugitive emissions through capture and flare inefficiencies in the project charcoal manufacturing plant, the amount of methane generated, fuelled or flared shall be monitored ex-post, using continuous flow meters. The fraction of methane in the gas should be measured with a continuous analyser or, alternatively, with periodical measurements at a 95% confidence level. Temperature and pressure of the gas are required to determine the density of methane combusted.

15. Regular maintenance should ensure optimal operation of flares. The flare efficiency, defined as the fraction of time in which the gas is combusted in the flare, multiplied by the efficiency of the flaring process, shall be monitored.

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16. The project participants will demonstrate annually that the amount of charcoal raw material used in the project activity facilities would have been used in open pit charcoal manufacturing sites with out methane recovery in the absence of the project activity.

Annex I

Generic procedure for estimating methane emission factor for open pit charcoal manufacturing process ($M_{y,b}$ in the equation for estimating baseline emissions)

The procedures described here are based on the principles that charcoaling yield is inversely proportional to the temperature of carbonization, and the release of methane is directly proportional to the charcoaling temperature. Laboratory and field experiments are to be carried out to establish the relationship between the release of methane and charcoaling temperature. Experimental steps described below need to be repeated several times for data consistency purposes.

Procedure for Laboratory trials

Step 1. Laboratory Rotary type kiln is used for the generation of lab-scale data. Crushed and dried samples of raw material are subjected to charcoaling at different temperatures ranging from 400 ^{0}C to 700^{0}C at different time intervals, varying from 1 to 10 hours of carbonization.

Step 2. The resulting solid masses are weighed and analyzed for their properties. The volatiles released are collected into gas sample bags and their volumes are measured.

Step 3. Using a calibrated gas chromatograph in a certified laboratory, the percentage composition of methane (volume basis) in the collected volatile gas samples is determined.

Step 4. Compute the total weight of methane released when processing 1 tonne of raw material.

Step 5. Conduct a regression analysis and establish a linear or non-linear regression equation that best demonstrates the relationship between the methane emissions and temperature of the carbonisation, consistent with the statistical procedures, the EB guidance on the use of regression in methodologies;

$$\mathbf{CH_4\ (kg/tonne\ of\ raw\ Material) = A \times Temperature\ (^0C) - B}$$

Procedure for field trials

The Pit charcoaling cycle consists of four stages

(a) Pyrolysis phase of over 12 hours when gases are released;

(b) Pacification phase of 12 hours when the pit is closed and hence no gases are released;

(c) Cooling phase of 12 hours;

(d) Unloading of the charcoal and loading of the fresh raw material for the next cycle.

Step 1. Charcoaling temperature and gravimetric charcoal yield (mass of charcoal over mass of biomass raw material) are measured in selected pits. Temperature measurements are done throughout the pyrolysis phase at one-hour intervals in the selected pits.

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III.K. (cont)

Step 2. The projected methane release from the pits is calculated based on the temperature of the charcoaling zone using the co-relation derived using the laboratory testing. Temperature measured at pit locations is recorded in following format:

Location	Temperature (^{0}C)
	Charcoaling zone
1	
2	
3	
4	
Mean charcoaling Temperature (^{0}C)	xx
Standard deviation	x

If the laboratory charcoaling temperatures and the gravimetric charcoal yield are falling in the same range as the pit charcoaling, the correlation between temperature and methane emissions established is valid.

The selected pits should be representative of the industry by way of geographical location, raw material, and size of pits and duration of charcoaling. The measured temperature values are the average of a minimum five measurements covering the cross section of the pit.

Project activity under a programme of activities

The following conditions apply for use of this methodology in a project activity under a programme of activities:

17. In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.