CLEAN DEVELOPMENT MECHANISM

AMS-III.BG

Small-scale Methodology

Emission reduction through sustainable charcoal production and consumption

Version 02.0

Sectoral scope(s): 04

United Nations
Framework Convention on
Climate Change

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1. Introduction

1. The following table describes the key elements of the methodology:

Table 1. Methodology key elements

Typical projects	Introduction of new and efficient charcoal production technologies using renewable biomass aimed at displacing the production of charcoal in unimproved traditional kilns that use non-renewable biomass. The charcoal is supplied to the identified consumers (e.g. households, small and medium sized enterprises (SMEs)) included in the project boundary thereby leading to emission reductions. The project activity shall install and operate new (Greenfield) charcoal production facilities characterized by a new investment
Type of GHG emissions mitigation action	Displacement of more-GHG-intensive, non-renewable biomass-fuelled applications by introducing renewable energy technologies

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology is applicable to project activities that displace the use of non-renewable biomass in the production of charcoal supplied to identified consumers included in the project boundary.

3. End users of charcoal shall be: (i) households; or (ii) small and medium enterprises (SME); or (iii) a group of households served by a charcoal market (e.g. charcoal consuming urban areas).[1] End users do not include large scale industries.

4. Measures such as contractual agreements shall be implemented to avoid potential double counting because of potential claims of emission reductions by the end users. These measures shall be described in the Project Design Document (PDD).

5. Project activity shall introduce efficient charcoal production technologies using renewable biomass feedstock[2] such as biomass residues to displace the production of charcoal in unimproved traditional kilns by the informal sector thereby leading to emission reductions. Charcoal production facility may include briquetting facility for the agglomeration of smaller biomass particles. Methane produced during charcoaling process is either: (a) captured and destructed or gainfully used for heat or electricity; or (b) not captured and not destructed. Examples of these technologies include but are not limited to:

[1] Acceptable evidence include, but are not limited to: sales records and receipts of delivery of charcoal products directly to eligible end-users, long-term contracts with an entity (retailer, cooperative, trader etc.) supplying charcoal products to the eligible end-users.

[2] See EB 23, annex 18 for the definition; in cases of charcoal produced from woody biomass, the demonstration of renewability shall be done for the areas where the woody biomass is sourced.

(a) Retort Sedentary kilns[3] which capture the pyrolysis gas; captured gas may be gainfully used for example as a fuel for pre-heating the facility or for wood drying or for production of heat and/or power;

(b) Improved sedentary kilns without the capture of pyrolysis gas;

(c) Casamance kilns.

6. Project kilns not equipped with capture and destruction of the pyrolysis gases are not eligible to claim emissions reduction on account of avoidance of methane emissions from the project activity under this methodology. It is assumed that methane emissions in the project equals to methane emissions in the baseline charcoal generation process.

7. The project activity shall install and operate new (Greenfield) charcoal production facilities characterized by a new investment; replacement and retrofit of existing facilities is not eligible under this methodology. Provisions of "General guidelines for SSC CDM methodologies" shall be applied to demonstrate that the most plausible baseline scenario is the production of charcoal in unimproved traditional kilns by the informal sector.

8. Charcoal manufacturing equipment transferred from existing or decommissioned charcoal production facilities are not eligible.

9. The biomass utilized by the project activity shall not be chemically processed (e.g. esterification to produce biodiesel, degumming and/or neutralization by chemical reagents) prior to the pyrolysis, but it may be processed mechanically (e.g. pressing, filtering, agglomeration) or thermally (e.g. drying, roasting).

10. Biomass used by the project facilities is not stored for more than one year. No storage of the biomass is done in anaerobic conditions.

2.2. Entry into force

11. The date of entry into force is the date of the publication of the EB 73 meeting report on the 31 May 2013.

3. Normative references

12. Project participants shall apply the "General guidelines for SSC CDM methodologies", "General guidance on leakage in biomass project activities" (Attachment C to Appendix B) and the "Guidelines on the demonstration of additionality of small-scale project activities" provided at <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html> mutatis mutandis.

[3] These kilns emit minimal amount of methane during the charcoaling process i.e. efficient process is employed that will result in high charcoal yield and the small amount of methane that is emitted is captured and used or destroyed.

13. This methodology also refers to the latest approved versions of the following tools:

    (a) "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";

    (b) "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

4. Definitions

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

15. For the purpose of this methodology, the following definitions apply:

    (a) **Charcoal** - Charcoal is a solid biofuel obtained from biomass by means of a thermo-chemical process known as "pyrolysis" or "carbonization process", which consists of the thermal decomposition of biomass. Charcoal may be in the form of blocks or can take the form of charcoal briquettes (agglomeration of small carbonized particles or agglomeration of particles that are carbonised);

    (b) **Biomass residue** - is a by-product, residue or waste stream from agriculture, forestry and related industries. This shall not include mixed municipal waste or other wastes that contain fossilized and/or non-biodegradable material (however, small fractions of inert inorganic material like soil or sands may be included);

    (c) **Informal charcoal sector** - is characterized by the use of traditional kilns such as earth mound kilns, pit kilns or equivalent open-end technologies which require no investment besides labour. Individuals or a group of individuals involved in charcoal production, but are not formally registered or formally charged with production and supply of charcoal products or related service by the authorities. Newly established formalized organization by such individuals, e.g. cooperative, can also be considered as the informal sector for the purpose of this methodology;

    (d) **Charcoal production facility** - is a facility comprising one or more carbonization units and which produces one or more types of charcoal products (charcoal, charcoal briquettes).

5. Baseline methodology

5.1. Project boundary

16. The project boundary includes the physical, geographical site(s) of:

    (a) The use of biomass;

    (b) The carbonization units included in the project;

    (c) The areas for storage, processing, bagging and weighting of inputs (biomass) and outputs (charcoal and/or charcoal briquettes);

    (d) The use of charcoal or charcoal products.

5.2. Baseline scenario

17. For the charcoal portion produced from non-renewable biomass in the baseline, it is assumed that in the absence of the project activity, the baseline scenario would be the future use of fossil fuels for meeting similar thermal energy needs.

18. For the charcoal portion produced from renewable biomass in the baseline, traditional open-ended methods resulting in methane emitted to the atmosphere forms the baseline scenario.

5.3. Emission reductions

19. For the project technology equipped with capture and destruction of the pyrolysis gases emission reductions are calculated as follows:

$$ER_y = \sum_i Q_{CCP,i_y} \times \left[\left(f_{NRB,BL,wood} \times NCV_{charcoal,i} \times EF_{projected\_fossilfuel}\right) + \left(SMG_{y,b} - M_d\right) \times \left(1 - f_{NRB,BL,wood}\right) \times GWP_{CH4,y}\right] - PE_{y,fugitive} - PE_{y,flaring} - PE_{FF,y} - PE_{El,y} \quad \text{Equation (1)}$$

Where:

ER_y	=	Emission reductions in year y[4] (t CO_2e/yr)
$Q_{CCP,i,y}$	=	Quantity of charcoal type *i* produced and used in year *y* (t)
$f_{NRB,BL,wood}$	=	Fraction of biomass of type *i* used in the absence of the project activity that can be established as non-renewable biomass; determined as per the procedure found in the latest version of "AMS-I.E: Switch from non-renewable biomass for thermal applications by the user" or on the basis of the published DNA endorsed default values available on the UNFCCC website[5]
$NCV_{charcoal,i}$	=	Net calorific value of the charcoal type *i* produced during the project (TJ/t). This shall be determined using one of the options provided in appendix 1
$EF_{projected\_fossilfuel}$	=	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 t CO_2/TJ
$GWP_{CH4,y}$	=	Global warming potential of methane applicable to the crediting period (t CO_2e/t CH_4)

[4] Project emissions on account of transport are assumed to be negligible.

[5] Default values of fraction of non-renewable biomass can be retrieved at: <http://cdm.unfccc.int/DNA/fNRB/index.html>.

$SMG_{y,b}$	=	Specific methane generation for the baseline charcoal generation process in the year *y* (tonnes CH_4/t charcoal product); a default value of 0.030 t CH_4/t charcoal may be used. Alternatively, the value can be determined in accordance with the procedure provided in the latest version of "AMS-III.K: Avoidance of methane release from charcoal production"
M_d	=	Factor to account for any legal requirement for capture and destruction of methane in the charcoal production facility (tonne of CH_4/tonne of raw material)
$PE_{y,flaring}$	=	If applicable, emissions due to the flare inefficiency in the project charcoal manufacturing plant in the year *y* (t CO_2e) determined in accordance with the procedure provided in AMS-III.K. In case captured pyrolysis gas is gainfully used (e.g. as fuel for pre-heating the facility, or for wood drying, or used for production of heat and/or power), then it can be taken as zero
$PE_{FF,y}$	=	Project emissions due to fossil fuel consumption in charcoal production facilities in year *y* (t CO_2)
$PE_{El,y}$	=	Project emissions due to electricity consumption in charcoal production facilities in year *y* (t CO_2)

20. For $PE_{y,fugitive}$ is calculated as follows :

$$PE_{y,fugitive} = \sum_i Q_{CCPi,y} \; x \; GWP_{CH4,y} \; x \; SMG_{y,b} xf \qquad \text{Equation (2)}$$

Where:

$PE_{y,fugitive}$	=	Fugitive emissions from operation of charcoal producing facility (physical leakage) in the year *y* (t CO_2e)
f	=	A fraction attributed to project charcoal production technology, use a default value of 0.1.

21. For the project activity not equipped with capture and destruction of the pyrolysis gases, emission reductions are calculated as follows:

$$ER_y = \sum_i Q_{CCPi,y} \times \left[\left(f_{NRB,BLwood} \times NCV_{charcoal} \times EF_{projected\_fossilfuel}\right)\right] - PE_{FF,y} - PE_{El,y} \qquad \text{Equation (3)}$$

5.4. Leakage emissions

22. General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of renewable biomass.

6. Monitoring methodology

23. Relevant parameters shall be monitored as indicated in the table below. The applicable requirements specified in the "General guidelines for SSC CDM methodologies" are also an integral part of the monitoring guidelines specified below and therefore shall be referred by the project participants.

6.1. Data and parameters monitored

Data / Parameter table 1.

Data / Parameter:	$Q_{CCP,i,y}$
Data unit:	tonnes
Description:	Produced quantity of charcoal product *i* in year *y*
Source of data:	-
Measurement procedures (if any):	The parameter can be monitored according to one of the following options: Option1: Direct measurement (e.g. use of a scale) of the weight of charcoal products supplied; Option 2: Calculation of the total weight of charcoal supplied; based on the total number of bags supplied and the average weight of charcoal product per bag. The weight of charcoal products per bag is determined on sample basis in accordance with the sampling standard (e.g. using systematic sampling method). Option (b) can only be used if Option (a) is not available
Monitoring frequency:	Continuously or in batches
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	$NCV_{charcoal,i}$
Data unit:	TJ/t
Description:	Net calorific value of the charcoal *i* produced
Source of data:	-

Measurement procedures (if any):	The value can be determined according to one of the following options: Option 1: monitored once during the first year of the crediting period. Measurement is undertaken in laboratories according to relevant national/international standards. Measure quarterly, taking at least three samples for each measurement. The average value can be used for the rest of the crediting period provided that there is no change in the biomass types used for charcoal *i* production; For the purpose of ex ante calculation, IPCC default value can be used. Option 2: using one of the options provided in appendix 1
Monitoring frequency:	Frequency depends on the option chosen above
QA/QC procedures:	If option 1 is chosen, check the consistency of the measurements by comparing the measurement results with, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. (If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements or provide justification)
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	$\mathbf{PE_{FF,y}; PE_{EI,y}}$
Data unit:	t CO_2/y
Description:	Project emissions from energy consumption (electricity, fossil fuel) in charcoal production facilities as per the applicable tools "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" and "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" respectively
Source of data:	-
Measurement procedures (if any):	Electricity and fossil fuel consumption are monitored as per the applicable tools mentioned above. As an alternative option, for the project activity where the monitoring is not possible, default values based on specification of equipment may be conservatively considered (e.g. assuming that all relevant electrical equipment operate at full rated capacity operating for 8760 hours per year)

6.2. Project activity under a programme of activities

24. The proposed methodology is also intended for application to a project activity under a programme of activities (CPA of PoA). In this case, only CPAs for which biomass related leakages can be ruled out shall be included for example using biomass residues as feedstock.

Appendix 1. Determination of net calorific value of charcoal

1. NCV of charcoal may differ from the standard IPCC value for charcoal due to: (i) operating parameters of the carbonization process; as well as (ii) the types of inputs (types and quality of biomass).

2. $NCV_{charcoal,i}$ can be determined according to the following Options 1 to 2.

1. Option 1: deemed value

3. For the charcoal from coconut husks, bamboo and other purely woody source of biomass, the following assumption can be made:

$$NCV_{charcoal,i} = 29.5 GJ/tonne \quad \text{Equation (1)}$$

(Value assumed: from IPCC 2006, Volume 2, Table 1.2)

4. For other charcoal sources such as mixed agricultural wastes, the following minimum default value can be used:

$$NCV_{charcoal,i} = 0.66 \times 29.5\ GJ/tonne = 19.47 GJ/tonne \quad \text{Equation (2)}$$

2. Option 2: determination of $NCV_{charcoal,i}$ based on the three feedstock sizes

5. In accordance with the correlation developed by Parikh et al. (2005) as found in Misginna et al., the net calorific value of charcoal produced can be determined based on the following equation:

$$NCV_{charcoal,i} = 0.3536 \times CC_{i,PJ,y} + 0.1559 \times VM_{i,PJ,y} - 0.0078 \times ASH_{i,PJ,y} \quad \text{Equation (3)}$$

Where:

$NCV_{charcoal,i}$	=	Net calorific value of charcoal *i* produced (TJ/t)
$CC_{i,PJ,y}$	=	Carbon content in the charcoal product from the biomass type *i*, in year *y* (kg carbon/kg charcoal product)
$VM_{i,PJ,y}$	=	Share of volatile matter in the charcoal product from the biomass type *i*, in year *y* (kg volatile matter/kg charcoal product)
$ASH_{i,PJ,y}$	=	Ash content in the charcoal product from the biomass type *i*, in year *y* (kg ash/kg charcoal product)

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Document information

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