CLEAN DEVELOPMENT MECHANISM

CDM-SSCWG44-A04

Small-scale Methodology

AMS-III.BG: Emission reduction through sustainable charcoal production and consumption

Version 03.0

Sectoral scope(s): 04

☐

United Nations
Framework Convention on
Climate Change

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

COVER NOTE

1. Procedural background

1. The small-scale working group (SSC WG) at its 44th meeting considered a request for revision (SSC_704) related to collection and use of charcoal produced from micro gasifiers which are distributed to households for thermal applications.

2. The project participant requested to expand the applicability of the methodology to charcoal production from micro gasifiers.

3. Furthermore, following the approval of the methodological tool "Project emissions from cultivation of biomass" at its seventy-fifth meeting, the SSC WG requested a mandate from the Board to integrate this tool into SSC methodologies. Consequently, the Board mandated this task at its seventy-sixth meeting (EB 76, para 53).

2. Purpose

4. The proposed revised methodology, if approved, allows the micro gasifier based charcoal production projects to apply simplified modalities of small-scale project activities.

3. Key issues and proposed solutions

5. With regard to the request to expand the applicability of the methodology to projects that produce charcoal from micro gasifiers, the SSC WG would like to point out that the quality of the produced charcoal in terms of net calorific value (NCV) is required to be measured directly, in contrast with the option of using default value for other charcoal production process that are covered under the methodology (e.g. improved sedentary kilns). In addition, once approved by the Board, the revised AMS-III.BG is required to be used in combination with AMS-II.G, which is for saving non-renewable biomass through efficient cook stoves. The impact on energy efficiency of the cookstove (micro-gasifier) due to the charcoal production process is addressed while conducting the water boiling test (WBT) by employing conservative options.

4. Impacts
5. The proposed revised methodology, if approved, would allow new types of project activity.

6. Recommendations to the Board
7. The SSC WG recommends that the Board approve the attached draft version of the methodology.

8. References

(a) Response to the request for revision SSC_704 <http://cdm.unfccc.int/methodologies/SSCmethodologies/clarifications/94259>.

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

TABLE OF CONTENTS **Page**

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

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 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. This methodology is also applicable to charcoal for thermal application generated as a by-product in micro gasifier stoves used by households for cooking
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 for thermal applications included in the project boundary.

3. This methodology is also applicable to charcoal generated as a by-product in micro-gasifier stoves using woody biomass for households cooking when used in conjunction with "AMS-II.G: Energy efficiency measures in thermal applications of non-renewable biomass". Auxiliary power consumption in a blower or fan for forced convection is not covered by the methodology.

4. End users of charcoal shall be: (i) households; or (ii) small and medium enterprises (SMEs); 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.

5. 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).

6. Project activity, except for the case indicated in paragraph 3 above, shall introduce efficient charcoal production technologies using renewable biomass feedstock[2] such as

---

[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.

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

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:

(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.

7.   Project kilns not equipped with capture and destruction of the pyrolysis gases are not eligible to claim emissions reductions 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.

8.   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.

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

10.   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).

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

12.   The embedded energy in charcoal produced as by-product in micro-gasifier stoves as indicated in paragraph 3 above shall be neglected when performing water boiling test as per AMS-II.G (see paragraph 17 of AMS-II.G, version 6) to ensure that efficiency estimates are conservative.

2.2.   Entry into force

13.   The date of entry into force is the date of the publication of the EB 79 meeting report on the 1 June 2014.

---

[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.

[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.

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

3. Normative references

14. 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.

15. This methodology also refers to the latest approved versions of the following tools and methodologies:

    (a) "AMS-II.G: Energy efficiency measures in thermal applications of non-renewable biomass";

    (b) "AMS-I.E: Switch from non-renewable biomass for thermal applications by the user";

    (c) "AMS-III.K: Avoidance of methane release from charcoal production";

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

    (e) "Project emissions from cultivation of biomass";

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

4. Definitions

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

17. 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** – it 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** – it is referred as 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. It 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

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

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** – it is a facility comprising one or more carbonization units and which produces one or more types of charcoal products (charcoal, charcoal briquettes);

(e) **Micro gasifier stove** - is a woodstove used for cooking at household level that operates by burning generated wood gas from pyrolysis process simultaneously generating charcoal as a by-product (e.g. TLUD (top lid up draft) stove).[4] The micro-gasifier stove eligible under this methodology shall use woody biomass and shall not use auxiliary fuel/devices, like blower or fan for its operation.

5. Baseline methodology

5.1. Project boundary

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

(a) The use of biomass;

(b) The carbonization units (including the micro-gasifier) 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

19. 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.

20. 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

21. For the project technology equipped with capture and destruction of the pyrolysis gases, including micro-gasifier, emission reductions are calculated as follows:

---

[4] <http://www.drtlud.com/tlud-technology/introduction/>.

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

$$ER_y = \sum_i Q_{CCP,i_y} \times \left[\left(CF \times NCV_{wood} \times \frac{NCV_{charcoal,i}}{NCV_{charcoal,default}} \times f_{NRB,BL,wood} \times \right. \right.$$

$$\left. EF_{projected\_fossilfuel} \right) + \left(SMG_{y,b} - M_d \right) \times \left(1 - f_{NRB,BL,wood} \right) \times$$

$$\left. GWP_{CH4,y} \right] - PE_{y,fugitive} - PE_{y,flaring} - PE_{FF,y} - PE_{El,y} - PE_{BC,y}$$

Equation (1)

Where:

ER_y	=	Emission reductions in year y[5] (t CO_2e/yr)
$Q_{CCP,i,y}$	=	Quantity of charcoal type i produced and used in year y (t)
CF	=	Default wood to charcoal conversion factor
NCV_{wood}	=	Net calorific value of wood. (TJ/t)
$NCV_{charcoal,i}$	=	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.~~
$NCV_{charcoal,default}$	=	Default net calorific value of charcoal (TJ/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[6]
$EF_{projected\_fossilfuel}$	=	Emission factor for the substitution of non-renewable woody biomass by similar consumers (t CO_2/TJ)
$GWP_{CH4,y}$	=	Global warming potential of methane applicable to the crediting period (t CO_2e/t CH_4)
$SMG_{y,b}$	=	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).

---

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

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

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

$PE_{y,flaring}$	=	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 as in the case of micro-gasifier), 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)
$PE_{BC,y}$	=	Project emissions due to biomass cultivation in year y (t CO_2)

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

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

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 |

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

$$ER_y = \sum_i Q_{CCP,i_y} \times \left[\left(CF \times NCV_{wood} \times \frac{NCV_{charcoal,i}}{NCV_{charcoal,default}} \times f_{NRB,BL,wood} \times \right. \right. \qquad \text{Equation (3)}$$

$$\left. \left. EF_{projected\_fossilfuel} \right) \right] - PE_{FF,y} - PE_{El,y} - PE_{BC,y}$$

24. Project activities using cultivated biomass shall calculate $PE_{BC,y}$ according to the methodological tool "Project emissions from cultivation of biomass".

5.4. Leakage emissions

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

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

6. Monitoring methodology

26. 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 not monitored

27. In addition to the parameters listed in the tables below, the provisions on data and parameters not monitored in the tools and methodologies referred to in this methodology apply.

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

Data / Parameter table 1.

Data / Parameter:	CF
Data unit:	-
Description:	Default wood to charcoal conversion factor
Source of data:	-
Measurement procedures (if any):	A factor of 6 kg of firewood (wet basis) per kg of charcoal (dry basis). Alternatively, local conversion factors determined from a field study or literature may be applied
Any comment:	Refer to:<http://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1ref3.pdf>. The term 'wet basis' assumes that the wood is 'air-dried' as is specified in the IPCC default table

Data / Parameter table 2.

Data / Parameter:	NCV_{wood}
Data unit:	TJ/t
Description:	Net calorific value of wood.
Source of data:	-
Measurement procedures (if any):	Use a default value of 0.015 TJ/t based on the gross weight of the wood that is 'air-dried'
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	$NCV_{charcoal,default}$
Data unit:	TJ/t
Description:	Default net calorific value of charcoal.
Source of data:	-
Measurement procedures (if any):	Use a default value provided in section 1 in appendix 1
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	$EF_{projected\_fossilfuel}$
Data unit:	t CO_2/TJ
Description:	Emission factor for the substitution of non-renewable woody biomass by similar consumers
Source of data:	-
Measurement procedures (if any):	Use a default value of 81.6
Any comment:	-

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

Data / Parameter table 5.

Data / Parameter:	$GWP_{CH4,y}$
Data unit:	t CO_2e/t CH_4
Description:	Global warming potential of methane applicable to the crediting period
Source of data:	-
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 6.

Data / Parameter:	M_d
Data unit:	tonne of CH_4/tonne of raw material
Description:	Factor to account for any legal requirement for capture and destruction of methane in the charcoal production facility.

This parameters is equal to zero for the case of charcoal produced from micro-gasifier |
Source of data:	-
Measurement procedures (if any):	-
Any comment:	-

6.2. Data and parameters monitored

28. In addition, the monitoring provisions in the tools and methodologies referred to in this methodology apply.

Data / Parameter table 7.

Data / Parameter:	$Q_{CCP,i,y}$
Data unit:	tonnes
Description:	Produced quantity of charcoal product i in year y
Source of data:	Measurement from project activity production
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 2 can only be used if Option 1 is not available.

Charcoal generated from only woody biomass is eligible for the case of micro-gasifier |
Monitoring frequency:	~~Continuously or~~ in batches
QA/QC procedures:	-
Any comment:	-

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

Data / Parameter table 8.

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. In case of charcoal generated from micro gasifier, Option 1 above or option 2 in 'appendix 1. Determination of net calorific value of charcoal' shall be used
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:	-

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

6.3. Project activity under a programme of activities

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

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

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:

$$NCV_{charcoal,i} = 29.5 \, GJ/tonne$$ 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:

$$NCV_{charcoal,i} = 0.66 \times 29.5 \, GJ/tonne = 19.47 GJ/tonne$$ 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:

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

$$ASH_{i,PJ,y}$$

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)

- - - - -

CDM-SSCWG44-A04
Small-scale Methodology: AMS-III.BG: Emission reduction through sustainable charcoal production and consumption
Version 03.0
Sectoral scope(s): 04

Document information

Version	Date	Description
03.0	14 May 2014	SSC WG 44, Annex 4
		To be considered by the Board at EB 79.
		The revision: (i) includes charcoal produced as a by-product in micro-gasifier wood stoves used in household applications applying AMS-II.G; (ii) removes the PoA-specific provision to scrap the baseline equipment; (iii) replaces the applicability conditions and emission calculations related to the cultivation of biomass, by including reference to the methodological tool "Project emissions from cultivation of biomass", in response to Board mandates from EB 76, (para. 53 of the meeting report) and EB 67 (para. 76 of the meeting report).
02.0	31 May 2013	EB 73, Annex 11
		The revision corrects error in unit of NCV in equation 4 and 5 in appendix 1.
01.0	23 November 2012	EB 70, Annex 27 Initial adoption.

Decision Class: Regulatory
Document Type: Standard
Business Function: Methodology
Keywords: biomass, charcoal, simplified methodologies, type (iii) projects