CLEAN DEVELOPMENT MECHANISM

CDM-MP74-A10

Draft Small-scale methodology

AMS-I.E: Switch from non-renewable biomass for thermal applications by the user

Version 08.0

Sectoral scope(s): 01

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. The Executive Board of the clean development mechanism (CDM) (hereinafter referred to as the Board), at its ninety-third meeting (EB93), adopted the workplan of the Small-Scale Working Group (SSC WG) for 2017, which contained an analysis of "AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user" and "AMS-II.G.: Energy efficiency measures in thermal applications of non-renewable biomass" followed by revision of the methodologies.

2. The SSC WG, at its fifty-first and fifty-third meeting (SSC WG 51 and 53), considered the inclusion of bio-ethanol for cookstoves under AMS-I.E., and agreed to continue analysing the related issues.

3. Furthermore, in the context of the concept note[1] on cost-effective and context-appropriate approaches for MRV, EB94 requested the secretariat, the MP, and SSC WG, to jointly include best practice examples covering monitoring aspects into the methodological tools and sampling guidelines. It is suggested that example survey forms should be included in AMS-I.E. and AMS-II.G.

4. Taking the above EB mandates into account, the SSC WG 54 prepared the draft revised methodologies AMS-I.E. and AMS-II.G. A call for public inputs was launched from 28 July to 11 August 2017. No input was received.

2. Purpose

5. The purposes of this revision are:

   (a) To allow inclusion of bio-ethanol for cookstoves under AMS-I.E.;

   (b) To exclude project activities installing water treatment technologies from AMS-I.E. as they are covered by a separate dedicated methodology;

   (c) To revise the emission factor of "substitution fuels likely to be used by similar users";

   (d) To include example survey forms for optional use by project participants and coordinating and managing entities; and

   (e) To refer to the new draft methodological tool "Calculation of fraction of non-renewable biomass", and remove current requirements to determine fNRB.

[1] <http://cdm.unfccc.int/Meetings/MeetingInfo/DB/O8KXN2TWY09J16Z/view>.

3. Key issues and proposed solutions with regard to feasibility of inclusion of bioethanol for cookstoves

3.1. Current status

6. As per IEA (2006)[2], bio-ethanol based cookstove seems to be a viable and clean technology.

7. The CDM project activities and PoAs using bio-ethanol for cookstoves are listed in table below.

Table. CDM project activities and PoAs using bio-ethanol for cookstoves

Ref	Title	Host Parties	Remark
10268 (PoA registered)	Ethiopia – Clean Cooking Energy Program	Ethiopia	<http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/UOK2Q9S5GP34L7CMBRADHWZ6FITEVY/view>
9595 (PA registered)	Cleanstar Mozambique - Maputo Ethanol Cookstove and Cooking Fuel Project 1	Mozambique	<http://cdm.unfccc.int/Projects/DB/DNV-CUK1363087372.7/view>

Source: UNFCCC

8. In the PoA Ref: 10268, currently the main supply of ethanol is from Ethiopia's sugar industry. In future ongoing initiatives to generate ethanol from micro-distilleries, financed by UNDP and spearheaded by GAIA Association of Ethiopia, is expected to meet the growing demand for cooking.

9. In the project Ref: 9595, the ethanol will be provided by a number of different suppliers, using different renewable biomass types.

3.2. Issues on double counting

10. Like other biofuel methodologies, project proponents should describe in the PDD/PoA-DD how the double counting of emission reductions has been avoided (e.g. end users, distributors of ethanol stoves, and producers of the bio-ethanol). The necessary requirements have been included in the draft revised methodology.

3.3. Issues on project emissions

11. Existing tool "Tool 16: Methodological tool: Project and leakage emissions from biomass" already provides procedures to calculate project and leakage emissions relevant for project activities which utilise biomass. The reference to this tool has been inserted in the draft revised methodology.

[2] <https://www.iea.org/publications/freepublications/publication/cooking.pdf>.

3.4. Issues on safety

12. There is a safety risk of using ethanol as a fuel in cookstoves due to its low flash point. (13 °C). It should be required that project proponents should follow some proven standard to assure the safety of the end-users in their usage conditions. Therefore, the compliance to national or local standards or comparable literature with regard to design, construction and operation of bio-ethanol cookstoves have been proposed in the draft revised methodology.

3.5. Potential co-benefits

13. Ethanol as a cooking fuel has the potential to deliver multiple benefits[3]: improved health and financial savings at the household level; foreign exchange savings at the national level (by substituting imported petroleum); job creation and reduced deforestation.

3.6. Proposal

14. The MP suggests inclusion of ethanol stove in the scope (as examples of technologies/measures) of the methodology AMS-I.E together with necessary conditions related to avoidance of double counting, accounting of project emissions and compliance with safety requirements.

4. Other issues and proposed solutions

15. The MP agreed to remove the project activities installing water treatment technologies from AMS-I.E as there is already a specific methodology for project activities installing water treatment technologies, that is, “AMS-III.AV.: Low greenhouse gas emitting safe drinking water production systems”. There are only a few CDM project activities and PoAs registered using AMS-I.E for water treatment technologies.

16. The current version of the methodology AMS-I.E includes a fossil fuel emission factor of the substitution fuels likely to be used by similar users (81.6 tCO2/TJ), which was developed assuming that the mix of present and future fuels used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression over solid fuel in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices). A 50 per cent weight is assigned to coal as the alternative solid fossil fuel (96 t CO2/TJ) and a 25 per cent weight is assigned to both liquid fuel (71.5 t CO2/TJ for kerosene) and gaseous fuel (63.0 t CO2/TJ for liquefied petroleum gas (LPG)). The MP agreed to revise this default value, based on the global average ratio of cooking fuels (the normalized ratio of kerosene and LPG excluding coal)[4], i.e. 9 per cent for kerosene and 91 per cent for LPG.

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[3] <https://www.sei-international.org/mediamanager/documents/Publications/SEI-DB-Lambe-Ethanol-Ethiopia.pdf>.

[4] Only fossil fuels used for cooking is considered to determine the ratio. This ratio is estimated from several data sources, including i) The DHS Program- Demographic and Health surveys - STATcompiler (www.statcompiler.com) (step 1: Choose country, step 2: Choose ‘complete list’, step 3: Choose ‘household characteristics’) and ii) for China: Cashman S, Rodgers M, Huff M, Feraldi R, Morelli B. Life Cycle Assessment of cookstove fuels in India and China. Washington, DC U.S. Environmental Protection Agency; 2016.

17. The proposed revision also includes example survey forms that may be used by project participants and coordinating and managing entities.

18. Furthermore, current requirements to determine fNRB are removed and a reference to the new draft methodological tool “Calculation of fraction of non-renewable biomass” has been provided.

5. Impacts

19. The draft revision will expand the scope of the methodology and enable more accurate and reliable calculation of emission reductions and also provide further clarity on the requirements to be followed by CDM project activities and component project activities (CPAs) introducing bio-ethanol cookstoves, which have strong relevance for the least developed countries (LDCs) and other regions that are underrepresented in the CDM.

6. Subsequent work and timelines

20. The methodology is recommended by the MP for consideration by the Board at its ninety-seventh meeting. No further work is envisaged.

7. Recommendations to the Board

21. The MP recommends that the Board approve this draft revised methodology, to be made effective at the time of the Board’s approval.

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1. Introduction

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

Table. Methodology key elements

Typical project(s)	Generation of thermal energy by introducing renewable energy technologies for end users that displace the use of non-renewable biomass. Examples of these technologies include, but are not limited to biogas stoves, solar cookers or passive solar homes ~~and safe drinking water applications~~
Type of GHG emissions mitigation action	Renewable energy: 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 comprises of activities to displace the use of non-renewable biomass by introducing renewable energy technologies. Examples of these technologies include, but are not limited to biogas stoves, bio-ethanol stoves, solar cookers, passive solar homes~~, renewable energy based drinking water treatment technologies (e.g. sand filters followed by solar water disinfection; water boiling using renewable biomass)~~.

3. Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.

2.2. Applicability

4. The methodology is applicable for technologies displacing use of non-renewable biomass by renewable energy.

5. Project participants or coordinating and managing entities shall describe in the PDD/PoA-DD how the double counting of emission reductions has been addressed (e.g. end users, distributors of ethanol stoves, and producers of the bio-ethanol).

6. For project activities introducing bio-ethanol cookstoves, project participants or coordinating and managing entities shall demonstrate that the bioethanol cookstoves are designed, constructed and operated to the requirements (e.g. with regard to safety) of a relevant national or local standard or comparable literature. Latest guidelines issued by a relevant national authority or an international organisation may also be used.

2.3. Entry into force

7. The date of entry into force is the date of the publication of the EB 97 meeting report on 3 November 2017.

2.4. Applicability of sectoral scopes

8. For validation and verification of CDM projects and programme of activities by a designated operational entity (DOE) using this methodology, application of sectoral scope 01 is mandatory and sectoral scopes 13 and 15 are conditional.

3. Normative references

9. Project participants shall apply the general guidelines to small-scale (SSC) clean development mechanism (CDM) methodologies and Tool for demonstration of additionality of SSC project activities available at: <http://cdm.unfccc.int/Reference/Guidclarif/index.html#meth> mutatis mutandis.

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

(a) "AMS-I.I.: Biogas/biomass thermal applications for households/small users";

(b) "Project and leakage emissions from biomass";

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

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

(e) "Tool to calculate values of fraction of non-renewable biomass".

4. Definitions

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

5. Baseline methodology

5.1. Project boundary

12. The project boundary is the physical, geographical site of the use of biomass or the renewable energy.

5.2. Baseline emissions

13. It is assumed that in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs.

14. Baseline emissions would be calculated as:

$$BE_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\_fuel}$$ Equation (1)

Where:

BE_y = Baseline emissions during the year *y* in t CO_2e

B_y = Quantity of woody biomass that is substituted or displaced in tonnes

$f_{NRB,y}$	=	Fraction of woody biomass used in the absence of the project activity in year *y* that can be established as non-renewable biomass ~~using survey methods or government data or approved default country specific fraction of non-renewable woody biomass~~ (fNRB) ~~values available on the CDM website~~[1]
$NCV_{biomass}$	=	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossil\ fuel}$	=	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of ~~81.6~~ 63.7 t CO_2/TJ[2]

15. B_y is determined by using one of the following options:

(a) Calculated as the product of the number of households multiplied by the estimate of average annual consumption of woody biomass per household that is displaced by the project activity (tonnes/household/year);

$$B_y = N_{HH} \times (BC_{BL,HH,y} - BC_{PJ,HH,y}) \quad \text{Equation (2)}$$

Where:

N_{HH}	=	Number of households in the project activity, number
$BC_{BL,HH,y}$	=	Average annual consumption of woody biomass per household before the start of the project activity, tonnes/household/year
$BC_{PJ,HH,y}$	=	If it is found that pre-project devices were not completely displaced but continue to be used to some extent, average annual consumption of woody biomass per household in the pre-project devices during the project activity, tonnes/household/year

(b) Calculated as the product of the number of persons served per household multiplied by the number of households and the estimate of average annual consumption of woody biomass per person that is displaced by the project activity (tonnes/person/year);

$$B_y = N_{HH} \times N_{p,HH} \times (BC_{BL,PP,y} - BC_{PJ,PP,y}) \quad \text{Equation (3)}$$

[1] Default values endorsed by designated national authorities and approved by the Board are available at ~~<http://cdm.unfccc.int/DNA/fNRB/index.html> or~~ <http://cdm.unfccc.int/methodologies/standard_base/index.html>.

[2] This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. The value is calculated, based on the global average ratio of cooking fuels (the normalized ratio of kerosene and liquefied petroleum gas (LPG) excluding coal), i.e. 9 per cent for kerosene (71.5 t CO2/TJ) and 91 per cent for LPG (63.0 t CO2/TJ). ~~It is assumed that the mix of present and future fuels used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression over solid fuel in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices). Thus a 50 per cent weight is assigned to coal as the alternative solid fossil fuel (96 t CO_2/TJ) and a 25 per cent weight is assigned to both liquid fuel (71.5 t CO_2/TJ for kerosene) gaseous fuel (63.0 t CO_2/TJ for liquefied petroleum gas (LPG)).~~

Where:

$N_{p,HH}$	=	Average number of persons served per household, number
$BC_{BL,PP,y}$	=	Average annual consumption of woody biomass per person before the start of the project activity, tonnes/person/year
$BC_{PJ,PP,y}$	=	If it is found that pre-project devices were not completely displaced but continue to be used to some extent, average annual consumption of woody biomass per person in the pre-project devices during the project activity, tonnes/person/year

(c) Calculated as the product of the number of persons served per institution[3] multiplied by the number of institutions and the estimate of average annual consumption of woody biomass per person that is displaced by the project activity (tonnes/person/year);

$$B_y = \sum_{1}^{i} N_{p,I,y,i} \times N_{I,i} \times (BC_{BL,PP,y} - BC_{PJ,PP,y}) \qquad \text{Equation (4)}$$

Where:

$N_{p,I,y,i}$	=	Average number of persons served per institution in year y, number
$N_{I,i}$	=	Number of institutions type *i* prior to project implementation, number

(d) Calculated from the thermal energy generated in the project activity as:

$$B_y = \sum_{i}^{n} HG_{p,y} \div \left(NCV_{biomass} \times \eta_{old,i}\right) \qquad \text{Equation (5)}$$

Where:

$HG_{p,y}$	=	Quantity of thermal energy generated by the new renewable energy technology in the project in year *y* (TJ)
$\eta_{old,i}$	=	Efficiency of pre - project device per type of device i

~~(e) In the specific case of renewable energy based water treatment technologies, B_y is calculated as the product of target population of the project multiplied by the volume of drinking water per person per day and the mass of woody biomass that would have been required to boil one litre of water as per the equation below.~~

$$B_y = N_{p,y} \times QDW_{p,y} \times WB_{BL} \times 365 \times 10^{-3} \qquad \text{Equation (6)}$$

~~Where:~~

~~$N_{p,y}$~~	=	~~Project population in year *y* (number).~~
~~$QDW_{p,y}$~~	=	~~Volume of drinking water in litres per person per day (litres).~~

[3] Institutions such as schools, prisons and hospitals.

WB_{BL} = Mass of woody biomass that would have been required to boil one litre of water (kg/litre).

5.3. Differentiation between non-renewable and renewable woody biomass

16. Project participants shall determine the shares of renewable and non-renewable woody biomass in B_y (the quantity of woody biomass used in the absence of the project activity) the total biomass consumption using nationally approved methods (e.g. surveys or government data if available) and then determine $f_{NRB,y}$ as described below. The following principles shall be taken into account:

5.3.1. Demonstrably renewable woody biomass[4] (DRB)

17. Woody[5] biomass is "renewable" if one of the following two conditions is satisfied:

(a) The woody biomass is originating from land areas that are forests[6] where:

(i) The land area remains a forest;

(ii) Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks[7] on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and

(iii) Any national or regional forestry and nature conservation regulations are complied with;

(b) The biomass is woody biomass and originates from non-forest areas (e.g. croplands, grasslands) where:

(i) The land area remains cropland and/or grasslands or is reverted to forest;

(ii) Sustainable management practices are undertaken on these land areas to ensure in particular that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and

(iii) Any national or regional forestry, agriculture and nature conservation regulations are complied with.

[4] This definition uses elements of EB 23, annex 18.

[5] In cases of charcoal produced from woody biomass, the demonstration of renewability shall be done for the areas where the woody biomass is sourced.

[6] The forest definitions as established by the country in accordance with the decisions 11/CP.7 and 19/CP.9 should apply.

[7] Carbon stocks may be estimated following the procedures described in the methodological tool "Project and leakage emissions from biomass".

~~**5.3.2. Non-renewable biomass**~~

~~18. *NRB* is the quantity of woody biomass used in the absence of the project activity (B_y) minus the *DRB* component, as long as at least two of the following supporting indicators are shown to exist:~~

~~(a) A trend showing an increase in time spent or distance travelled for gathering fuel-wood, by users (or fuel-wood suppliers) or alternatively, a trend showing an increase in the distance the fuel-wood is transported to the project area;~~

~~(b) Survey results, national or local statistics, studies, maps or other sources of information, such as remote-sensing data, that show that carbon stocks are depleting in the project area;~~

~~(c) Increasing trends in fuel wood prices indicating a scarcity of fuel-wood;~~

~~(d) Trends in the types of cooking fuel collected by users that indicate a scarcity of woody biomass.~~

~~19. Thus, the fraction of woody biomass saved by the project activity in year *y* that can be established as non-renewable, is:~~

$$f_{NRB,y} = \frac{NRB}{NRB + DRB}$$ ~~Equation (7)~~

~~20. Project participants shall also provide evidence that the trends identified are not occurring due to the enforcement of local/national regulations.~~

5.4. Project emissions

21. The project emissions (PE_y) from cultivation of biomass and from utilization of biomass residues shall be calculated using the latest version of the tool "Project and leakage emissions from biomass".

5.5. Leakage emissions

22. Leakage emissions (LE_y) shall be calculated using the latest version of the tool "Project and leakage emissions from biomass".

23. Leakage emissions (~~LE_y~~) related to the non-renewable woody biomass saved by the project activity shall be assessed based on ex post surveys of users and the areas from which this woody biomass is sourced (using 90/30 precision for a selection of samples). The following potential source of leakage shall be considered: The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass used by the non-project households/users that is attributable to the project activity, then B_y is adjusted to account for the quantified leakage. Alternatively, B_y is multiplied by a net to

gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

24. Project activities switching from baseline device using firewood to efficient project device using charcoal or switching from firewood to processed biomass (briquette, pellets, and woodchips) shall take into account the leakage effects related to the charcoal or processed biomass production.

25. A default value of 0.030 t CH_4/t charcoal may be used in accordance with "AMS-III.BG.: Emission reduction through sustainable charcoal production and consumption".

~~26. General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues.~~

5.6. Emission reductions

27. Emission reductions are to be estimated based on the equation below.

$$ER_y = BE_y - PE_y - LE_y$$ Equation (8)

Where:

ER_y = Emission reductions in year y, tonnes CO_2eq

5.7. Data and parameters not monitored

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

Data / Parameter table 1.

Data / Parameter:	B_y
Data unit:	tonnes/year
Description:	Quantity of woody biomass that is substituted or displaced
Source of data:	-
Measurement procedures (if any):	Calculated using one of the following options: (a) Calculated as the product of the number of households multiplied by the estimate of average annual consumption of woody biomass per household displaced by the project activity (tonnes/household/year); (b) Calculated as the product of the number of households multiplied by the number of persons served per household and the estimate of average annual consumption of woody biomass per person displaced by the project activity (tonnes/person/year); (c) Calculated as the product of the number of institutions multiplied by the number of persons served per institution and the estimate of average annual consumption of woody biomass per person displaced by the project activity (tonnes/person/year); (d) Calculated from the thermal energy generated in the project activity;

	~~(e) In the specific case of renewable energy based water treatment technologies, is calculated as the product of target population of the project multiplied by the volume of drinking water per person per day and the mass of woody biomass that would have been required to boil one litre of water~~
~~Monitoring frequency:~~	~~-~~
~~QA/QC procedures:~~	~~-~~
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	$f_{NRB,y}$
Data unit:	-
Description:	Fraction of woody biomass saved by the project activity during year *y* that can be established as non-renewable biomass
Source of data:	-
Measurement procedures (if any):	As per the draft methodological tool "calculation of fraction of non-renewable biomass" ~~Using survey methods or government data or approved default country specific fraction of non-renewable woody biomass (fNRB) values available on the CDM website~~
~~Monitoring frequency:~~	~~Ex ante~~
~~QA/QC procedures:~~	~~-~~
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	N_{HH}
Data unit:	number
Description:	Number of households in the project activity in year *y*
Source of data:	-
Measurement procedures (if any):	Established ex ante prior to start of the project activity
~~Monitoring frequency:~~	~~Ex ante~~
~~QA/QC procedures:~~	~~-~~
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	$BC_{BL,HH,y}$
Data unit:	tonnes/household/year
Description:	Average annual consumption of woody biomass per household before the start of the project activity
Source of data:	-

Measurement procedures (if any):	Determined ex ante using one of the following options and remains fixed during the crediting period: (a) $N_{p,HH}$ times $BC_{BL,PP,y}$; or (b) Historical data or a sample survey conducted as per the latest version of the standard for "sampling and surveys for CDM project activities and programme of activities"; or (c) Country or region specific values approved through the "procedure for development, revision, clarification and update of standardized baselines", which are available on the CDM website <http://cdm.unfccc.int/methodologies/standard_base/index.html>
~~Monitoring frequency:~~	~~Ex ante~~
~~QA/QC procedures:~~	~~-~~
Any comment:	-

Data / Parameter table 5.

Data / Parameter:	$N_{p,HH}$
Data unit:	number
Description:	Average number of persons served per household prior to project implementation
Source of data:	Established ex ante prior to project implementation based on records of households served by the project
Measurement procedures (if any):	-
~~Monitoring frequency:~~	~~Ex ante~~
~~QA/QC procedures:~~	~~-~~
Any comment:	-

Data / Parameter table 6.

Data / Parameter:	$BC_{BL,PP,y}$
Data unit:	tonnes/person/year
Description:	Average annual consumption of woody biomass per person before the start of the project activity
Source of data:	-
Measurement procedures (if any):	Determined ex ante using one of the following options and remains fixed during the crediting period: (a) A default value of 0.5 tonnes/person per year[8]; (b) Historical data or a sample survey conducted as per the latest version of the standard for "sampling and surveys for CDM project activities and programme of activities". (c) Country or region specific values approved through the "procedure for development, revision, clarification and update of

[8] Refer to "Annex 5 - Information note on the rationale for default factors used in AMS-I.E. and AMS-II.G." of the SSC WG 42 meeting report.

	standardized baselines", which are available on the CDM website <http://cdm.unfccc.int/methodologies/standard_base/index.html>
~~Monitoring frequency:~~	~~Ex ante~~
~~QA/QC procedures:~~	~~-~~
Any comment:	-

~~**Data / Parameter table 7.**~~

~~**Data / Parameter:**~~	~~WB_{BL}~~
~~Data unit:~~	~~kg/litre~~
~~Description:~~	~~Mass of woody biomass that would have been required to boil one litre of water~~
~~Source of data:~~	~~-~~
~~Measurement procedures (if any):~~	~~The quantity of mass of woody biomass that would have been required to boil one litre of water for five minutes determined through a water boiling test (World Health Organization (WHO) recommends a minimum duration of five minutes of water boiling)[9]~~
~~Monitoring frequency:~~	~~Ex ante~~
~~QA/QC procedures:~~	~~-~~
~~Any comment:~~	~~-~~

6. Monitoring methodology

29. The project participants shall maintain a record for the date of commissioning of project devices of each type *i*.

30. Relevant parameters shall be monitored and recorded during the crediting period as indicated in section 6.1 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 followed by the project participants.

31. In order to assess the leakages, monitoring shall include data on the amount of woody biomass saved under the project activity that is used by non-project households/users (who previously used renewable energy sources). Other data on non-renewable woody biomass use required for leakage assessment shall also be collected.

32. Monitoring should confirm the displacement or substitution of the non-renewable woody biomass at each location. In the case of appliances switching to renewable biomass the quantity of renewable biomass used shall be monitored. For this, project proponents may apply the "Standard for sampling and surveys for CDM project activities and programme of activities".

~~33. In the case of renewable energy based water treatment technologies, water quality shall be monitored to ensure that it conforms to drinking water quality specified in relevant~~

~~[9] WHO guidelines for emergency treatment of drinking water at point of the use <http://www.searo.who.int/LinkFiles/List_of_Guidelines_for_Health_Emergency_Emergency_treatment_of_drinking_water.pdf>.~~

~~national microbiological water quality guidelines/standards of the host country. In case a national standard/guideline is not available, the standards/guidelines by the WHO or United States Environmental Protection Agency (US-EPA) shall be applied.~~

6.1. Data and parameters monitored

Data / Parameter table 8.

Data / Parameter:	**Date of commissioning of project device of type *i***
Data unit:	Date
Description:	Actual date of commissioning of the project device.
Source of data:	Internal records
Measurement procedures (if any):	-
Monitoring frequency:	Fixed and recorded at the time of commissioning/distribution
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 9.

Data / Parameter:	**Date of commissioning of batch *j***
Data unit:	Date
Description:	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
Source of data:	Internal records
Measurement procedures (if any):	
Monitoring frequency:	Fixed and recorded at the time of commissioning/distribution of the last project device in the batch
QA/QC procedures:	-
Any comment:	To be reported in the monitoring report

Data / Parameter table 10.

Data / Parameter:	$NCV_{biomass}$
Data unit:	TJ/tonne
Description:	Net calorific value of the non-renewable woody biomass, briquettes or charcoal used in project devices
Source of data:	-
Measurement procedures (if any):	IPCC default for wood fuel, 0.015 TJ/tonne, based on the gross weight of the wood that is ‘air-dried’ may be used if fuel used in project device is also woody biomass. If fuel used in the project device is charcoal, 0.029 TJ/tonne may be used. If briquette is used as project fuel, NCV shall be measured annually
Monitoring frequency:	Yearly

QA/QC procedures:	-
Any comment:	-

Data / Parameter table 11.

Data / Parameter:	$f_{NRB,y}$
Data unit:	-
Description:	Fraction of woody biomass saved by the project activity during year *y* that can be established as non-renewable biomass
Source of data:	-
Measurement procedures (if any):	As per the draft methodological tool "calculation of fraction of non-renewable biomass" ~~Using survey methods or government data or approved default country specific fraction of non-renewable woody biomass (fNRB) values available on the CDM website.~~
Monitoring frequency:	Yearly, if project proponents opt for annual monitoring instead of fixing the value ex ante at the beginning of each crediting period
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 12.

Data / Parameter:	$BC_{PJ,HH,y}$
Data unit:	tonnes/household/year
Description:	Average annual consumption of woody biomass per household in the pre-project devices during the project activity, if it is found that pre-project devices were not completely displaced but continue to be used to some extent
Source of data:	Surveys
Measurement procedures (if any):	Monitoring shall consist of estimation of all project devices or a representative sample thereof, at least once every two years (biennial)
Monitoring frequency:	At least once every two years (biennial)
QA/QC procedures:	-
Any comment:	

Data / Parameter table 13.

Data / Parameter:	$BC_{PJ,PP,y}$
Data unit:	tonnes/person/year
Description:	Average annual consumption of woody biomass per person in the pre-project devices during the project activity, if it is found that pre-project devices were not completely displaced but continue to be used to some extent
Source of data:	Surveys

Measurement procedures (if any):	Monitoring shall consist of estimation of all project devices or a representative sample thereof, at least once every two years (biennial)
Monitoring frequency:	At least once every two years (biennial)
QA/QC procedures:	-
Any comment:	

Data / Parameter table 14

Data / Parameter:	$N_{p,I,y,i}$
Data unit:	number
Description:	Average number of persons served per institution
Source of data:	-
Measurement procedures (if any):	Average number of persons served per institution shall be based on survey undertaken as per Standard for Sampling and surveys for CDM project activities and programme of activities. This parameter shall be monitored every year. If the monitoring period is shorter or longer than one year, the result may be extrapolated for the monitoring period
Monitoring frequency:	Monitored annually ex post
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 15

Data / Parameter:	$HG_{p,y}$
Data unit:	TJ
Description:	Quantity of thermal energy generated by the new renewable energy technology in the project in year *y*
Source of data:	-
Measurement procedures (if any):	For a biogas digester, it shall be monitored as per the requirements stipulated in the Table 2 of "AMS-I.I.: Biogas/biomass thermal applications for households/small users". Alternatively project proponents may use a default biogas generation value of 0.13 Nm3.m-3.day-1 (i.e. volume of biogas generated in normal conditions of temperature and pressure per unit useful volume of the digester per day) for regions/countries where annual average ambient temperature is higher than 20°C
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	In case Option (d) in paragraph 13 is chosen for baseline calculations

Data / Parameter table 16

Data / Parameter:	$\eta_{old,i}$
Data unit:	(i) Default 0.1 or 0.2 (please see details below); (ii) Establish prior to start of implementation based on survey
Description:	Efficiency of pre-project device
Source of data:	-
Measurement procedures (if any):	Efficiency of pre - project device, which is a three-stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be optionally used. Use weighted average values (taking the amount of woody biomass consumed by each device as the weighting factor) if more than one type of device is being replaced
Monitoring frequency:	Fixed for each individual household when included in the project activity database
QA/QC procedures:	-
Any comment:	In case Option (d) in paragraph 13 is chosen for baseline calculations

~~**Data / Parameter table 17**~~

~~**Data / Parameter:**~~	~~$N_{p,y}$~~
~~Data unit:~~	~~Number~~
~~Description:~~	~~Project population in year y~~
~~Source of data:~~	~~-~~
~~Measurement procedures (if any):~~	~~For establishing the project population, a baseline survey shall be conducted to demonstrate target population supplied with renewable energy based water treatment technology by the project would have used water boiling as the water purification method in the absence of the project activity~~
~~Monitoring frequency:~~	~~Yearly~~
~~QA/QC procedures:~~	~~-~~
~~Any comment:~~	~~-~~

~~**Data / Parameter table 18**~~

~~**Data / Parameter:**~~	~~$QDW_{p,y}$~~
~~Data unit:~~	~~Litres~~
~~Description:~~	~~Volume of drinking water in litres per person per day.~~
~~Source of data:~~	~~-~~
~~Measurement procedures (if any):~~	~~The volume of drinking water in litres per person per day shall be established using survey methods, subject to a cap of 5.5 litres[10]~~
~~Monitoring frequency:~~	~~Yearly~~

~~[10] Based on WHO recommendations (Domestic Water Quantity, Service Level and Health, Table 2: Volumes of water required for hydration, WHO 2003).~~

~~QA/QC procedures:~~	~~-~~
~~Any comment:~~	~~-~~

6.2. Representative sampling methods

34. A statistically valid sample of the locations where the systems are deployed, with consideration, in the sampling design, of occupancy and demographics differences can be used to determine parameter values used to determine emission reductions, as per the relevant requirements for sampling in the "Standard for sampling and surveys for CDM project activities and programme of activities". When biennial inspection is chosen a 95 per cent confidence interval and a 10 per cent margin of error requirement shall be achieved for the sampling parameter. On the other hand, when the project proponent chooses to inspect annually, a 90 per cent confidence interval and a 10 per cent margin of error requirement shall be achieved for the sampled parameters. In cases where survey results indicate that 90/10 precision or 95/10 precision is not achieved, the lower bound of a 90 per cent or 95 per cent confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/10 precision.

6.3. Project activity under a programme of activities

35. The use of this methodology in a project activity under a programme of activities (PoA) is legitimate if the following leakages are estimated and accounted for, if required, on a sample basis using a 90/30 precision for the selection of samples, and accounted for:

(a) Use of non-renewable woody biomass saved under the project activity to justify the baseline of other CDM project activities can also be a potential source of leakage. If this leakage assessment quantifies a portion of non-renewable woody biomass saved under the project activity that is then used as the baseline of other CDM project activities then B_y is adjusted to account for the quantified leakage;

(b) Increase in the use of non-renewable woody biomass outside the project boundary to create non-renewable woody biomass baselines can also be a potential source of leakage. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass outside the project boundary, then B_y is adjusted to account for the quantified leakage;

(c) As an alternative to subparagraphs (a) and (b), B_y can be multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

36. The following further conditions apply for the value of fraction of non-renewable (fNRB) applied in a component project activity (CPA) of a PoA. The choice between (a) conduct own studies to determine the local fNRB value and then apply those values in the CPAs; and (b) use default national values approved by the Board; shall be made ex ante. A switch from national value i.e. choice (b) to sub-national values i.e. choice (a) is permitted, under the condition that the selected approach is consistently applied to all CPAs.

37. If the generic CPA consists solely of units that qualify as "microscale CDM units" as defined in the "Methodological tool 19: Demonstration of additionality of microscale project activities", the conditions to ensure that CPAs that will be included meet the small-scale

or microscale thresholds and remain within those thresholds throughout the crediting period of the CPAs are not required.

Appendix. Non-binding survey questionnaire for AMS-I.E. and AMS-II.G.

1. Survey format A: Baseline fuel consumption pattern

1.1. General information[1]

Title of project activity/CPA/PoA	
Name of Surveyor	
Date of survey	mm/dd/yyyy
Period of measurements (for consumption rate)	mm/dd/yyyy to mm/dd/yyyy

1.2. Household profile

Name (Household representative)	
Household size (total number of people)	
- Adult	
- Children	
Address	
Phone number (if available)	

1.3. Stove description prior to the project implementation

(mark x with type of stove used) [2]

"A three-stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. Without a grate or chimney".	
Any other type of stove	

1.4. Household fuel consumption pattern prior to the project implementation[3]

How many meals did you prepare last week or last month?	Meals/week or month

[1] Selection of households should be based on a sampling plan.

[2] An "X" shall be filled in in one of the two alternatives. If the stoves does not have a chimney or a grate, then "X" should be filled out for "Any other type of stoves". Such a stove would then be considered an improved cookstove.

[3] In many cases, the end-user might not be able to provide information on quantity of cooking fuel in terms units mentioned above. In many places the volume of firewood (e.g. the volume capacity and level of filling of the transporting/storage room) is measured, not its weight. This very much depends on the local practice of measurement. The project participants should include such local measurement unit in the questionnaire. In some cases, the measurement unit could also be in terms of money spent on purchasing the fuel. Therefore, the project participant shall provide further guidelines for how the conversion of these reported values to required units (mass or volume) should be carried out (e.g. If a household uses a bag of charcoal every 10 days, then the monthly average can be calculated if the weight (or volume and bulk density) of the full bag can be determined).

1.4.1. Fuel use for cooking

	Yes/No	Quantity of usage	Unit
Charcoal			kg/month or year
Wood			kg/month or year
LPG			kg or Cylinders/month or year
Kerosene			Litres/month or year
Coal			kg/month or year
Electricity			kWh/month or year
Other fuels (explain)			

2. Survey format B: Project survey

2.1. General information[4]

Title of project activity/CPA/PoA	
Name of Surveyor	
Date of survey	mm/dd/yyyy
Period of measurements (for consumption rate)	mm/dd/yyyy to mm/dd/yyyy

2.2. Household profile

Name (Household representative)	
Household size (total number of people)	
- Adult	
- Children	
Address	
Phone number (if available)	

2.3. Household fuel consumption pattern post the project implementation

Cooking device	
Model name/number	
Unique ID	
Date of installation	mm/dd/yyyy
Do you use the project cookstove? (Physically check the stove).[5]	Yes/No
- If yes, have you used the stove regularly since you installed it?[6]	Yes/No

[4] Selection of households should be based on a sampling plan.

[5] The question is to determine if the cookstove is currently in use, i.e. to address the parameter of "usage factor". Physical checks to verify the usage may be done by checking the conditions of stoves, e.g. warm to touch, ashes in grate, and soot on stove.

[6] The question is to determine if the cookstove has been continuously used.

- If yes, is your stove in good condition?[7]	Yes/No
- If no, why did you stop using the stove?	
- How many meals did you prepare using project cookstove last week or last month?	Meals/week or month
Do you use your traditional (baseline) cookstove also?	Yes/No
- If yes, how many meals did you prepare using traditional (baseline) cookstove last week or last month?[8]	Meals/week or month
Do you use any other stove? (ICS etc.)[9]	Yes/No

2.3.1. Fuel use for cooking

	Yes/No	Quantity of usage	Unit
Charcoal			kg/month or year
Wood			kg/month or year
LPG			kg or Cylinders/month or year
Kerosene			Liters/month or year
Coal			kg/month or year
Electricity			kWh/month or year
Other fuels (explain)			

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[7] The project proponent may rephrase the question keeping in mind the objective i.e. whether or not the project cookstove is in usable condition. If the project cookstove is not in usable condition, the PP shall exclude such stoves from project database of the whole crediting year and subsequent years. The PP may include such stoves again on replacing them with new cookstoves of similar efficiency.

[8] The question is to determine if the baseline stove is being used to account for project emissions.

[9] The question is to cross-check if the project cookstove is used for all cooking requirements. It may also detect the situation where a household is taking part in more than one project activity, avoiding double-counting.

Document information

Version	*Date*	*Description*
08.0	11 October 2017	MP 74, Annex 10 To be considered by the Board at EB 97. This draft methodology (CDM-SSCWG54-A03) was available for public input from 28 July to 11 August 2017. It received no input. Revision to: • Allow inclusion of bio-ethanol for cookstoves; • Exclude project activities installing water treatment technologies; • Revise the emission factor of "substitution fuels likely to be used by similar users"; • Include example survey forms; • Refer to the new draft methodological tool "Calculation of fraction of non-renewable biomass".
07.0	22 July 2016	EB 90, Annex 12 Revision to: • Include the default values for baseline fuel wood consumption per person; • Include the procedures to quantify baseline woody biomass consumption for the entire household and; • Introduce the monitoring table.
06.0	28 November 2014	EB 81, Annex 25 The revision: • Introduces the methodological tool "Project and leakage emissions from biomass", streamlines biomass cultivation procedures across small and large scale methodologies; • Removes restrictions for application in a PoA.
05.0	20 July 2012	EB 68, Annex 22 Includes: • A reference to the available country specific default values for fNRB; • A default biogas generation rate for regions/countries where annual average ambient temperature is higher than 20°C; and Specifies: • The requirements of using national or local fNRB values for CPAs under a PoA.
04.0	15 April 2011	EB 60, Annex 20 Requirements for leakage estimation simplified, default net gross adjustment factor is included as an option to account for any leakages, emission factor for the projected fossil fuel revised, more options for sampling and survey included.

Version	*Date*	*Description*
03.0	17 September 2010	EB 56, Annex 17 To expand the applicability to renewable energy water treatment technologies.
02.0	26 March 2010	EB 53, Annex 18 To include the changes below which are consistent with the changes to AMS-II.G. approved by the Board at its fifty-first meeting: • Further clarification on the eligible technology/measures; • Default efficiency factors for baseline cookstoves; • Procedures for sampling; • Revised procedures for quantity of woody biomass that can be considered as non-renewable; and • Clarifications as to which leakage requirements are appropriate for projects versus PoAs.
01.0	1 February 2008	EB 37, Annex 6 Initial adoption.

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