

AMS-I.E

Small-scale Methodology

Switch from non-renewable biomass for thermal applications by the user

Version 06.0

Sectoral scope(s): 01



United Nations
Framework Convention on
Climate Change

TABLE OF CONTENTS	Page
1. INTRODUCTION	3
2. SCOPE, APPLICABILITY, AND ENTRY INTO FORCE	3
2.1. Scope	3
2.2. Applicability	3
2.3. Entry into force	3
3. NORMATIVE REFERENCES	3
4. DEFINITIONS	4
5. BASELINE METHODOLOGY	4
5.1. Project boundary	4
5.2. Baseline emissions.....	4
5.3. Differentiation between non-renewable and renewable woody biomass	6
5.4. Leakage.....	8
6. MONITORING METHODOLOGY	8
6.1. Representative sampling methods.....	9
7. PROJECT ACTIVITY UNDER A PROGRAMME OF ACTIVITIES	9

1. Introduction

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

Table 1. 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, 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.

2.3. Entry into force

5. The date of entry into force is the date of the publication of the EB 81 meeting report on 28 November 2014.

3. Normative references

6. Project participants shall apply the general guidelines to small-scale (SSC) clean development mechanism (CDM) methodologies Guidelines on the demonstrating of additionality of SSC project activities and general guidance on leakage in biomass project activities (attachment C to appendix B) available at:
<<http://cdm.unfccc.int/Reference/Guidclarif/index.html#meth>> mutatis mutandis.

7. This methodology also refers to the latest approved versions of the following approved methodologies:

- (a) “AMS-I.I.: Biogas/biomass thermal applications for households/small users”;
- (b) “Project emissions from cultivation of biomass”.

4. Definitions

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

5. Baseline methodology

5.1. Project boundary

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

5.2. Baseline emissions

10. 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.

11. Emission reductions would be calculated as:

$$ER_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossil_fuel} - PE_{BC,y} \quad \text{Equation (1)}$$

Where:

ER_y	=	Emission reductions during the year y in t CO ₂ e
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)

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

$EF_{projected_fossil\ fuel}$ = Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 t CO₂/TJ²

$PE_{BC,y}$ = Project emissions due to cultivation of biomass

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

- (a) Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year); This can be derived from historical data or estimated using survey methods; or
- (b) Calculated from the thermal energy generated in the project activity as:

$$B_y = HG_{p,y} / (NCV_{biomass} * \eta_{old}) \quad \text{Equation (2)}$$

Where:

$HG_{p,y}$ = Quantity of thermal energy generated by the new renewable energy technology in the project in year y (TJ)
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

η_{old} = 1. Efficiency of the system being replaced, measured using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of system is being replaced;
2. A default value of 0.10 may be optionally used if the replaced system is 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 a chimney; for other types of systems a default value of 0.2 may be optionally used

- (c) 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 (3).

² This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. 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 CO₂/TJ) and a 25 per cent weight is assigned to both liquid and gaseous fuels (71.5 t CO₂/TJ for kerosene and 63.0 t CO₂/TJ for liquefied petroleum gas (LPG)).

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

Where:

- $N_{p,y}$ = Project population in year y (number). 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
- $QDW_{p,y}$ = Volume of drinking water in litres per person per day (litres). The volume of drinking water in litres per person per day shall be established using survey methods, subject to a cap of 5.5 litres³
- WB_{BL} = Mass of woody biomass that would have been required to boil one litre of water (kg/litre). 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)⁴

13. In case biomass is sourced from dedicated plantations, the procedures in the tool “Project emissions from cultivation of biomass” shall be used to calculate $PE_{BC,y}$.

5.3. Differentiation between non-renewable and renewable woody biomass

14. 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 biomass⁵ (DRB)

15. Woody⁶ biomass is “renewable” if one of the following two conditions is satisfied:
- (a) The woody biomass is originating from land areas that are forests⁷ where:

³ Based on WHO recommendations (Domestic Water Quantity, Service Level and Health, Table 2: Volumes of water required for hydration, WHO 2003).

⁴ 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.

⁵ This definition uses elements of EB 23, annex 18.

⁶ In cases of charcoal produced from woody biomass, the demonstration of renewability shall be done for the areas where the woody biomass is sourced.

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

- (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 stocks⁸ 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.

5.3.2. Non-renewable biomass

16. *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.
17. Thus, the fraction of woody biomass saved by the project activity in year y that can be established as non-renewable, is:

$$f_{NRB,y} = \frac{NRB}{NRB + DRB} \quad \text{Equation (4)}$$

⁸ Carbon stocks may be estimated following the procedures described in the methodological tool "Project emissions from cultivation of biomass".

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

5.4. Leakage

19. Leakage 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:
- (a) 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.
20. General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues.

6. Monitoring methodology

21. Monitoring shall consist of checking of all appliances or a representative sample thereof, at least once every two years (biennial) to ensure that they are still operating or are replaced by an equivalent in service appliance.
22. In order to assess the leakages specified under paragraph 19, 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.
23. 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”.
24. In case Option (b) in paragraph 12 is chosen for baseline calculations, monitoring shall include the amount of thermal energy generated by the new renewable energy technology in the project in year y , where applicable.
25. 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 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. Representative sampling methods

26. 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.

7. Project activity under a programme of activities

27. 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.
28. 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.

- - - - -

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
06.0	28 November 2014	EB 81, Annex 25 The revision: <ul style="list-style-type: none"> Introduces the methodological tool “Project emissions from cultivation of 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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.
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: <ul style="list-style-type: none"> Further clarification on the eligible technology/measures; Default efficiency factors for baseline cook stoves; 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.

Decision Class: Regulatory

Document Type: Standard

Business Function: Methodology

Keywords: biomass, simplified methodologies, thermal energy production, type (i) projects