

TOOL30

Methodological tool

Calculation of the fraction of non-renewable biomass

Version 04.0



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.	PROCEDURE.....	3
3.1.	Procedure to estimate the total consumption of woody biomass (<i>H</i>)	5
3.2.	Procedure to estimate the quantity of renewable biomass available (<i>RB</i>)	6
4.	DATA AND PARAMETERS	6

1. Introduction

1. This methodological tool determines the fraction of woody biomass that can be established as non-renewable biomass (f_{NRB}).

2. Scope, applicability, and entry into force

2.1. Scope

2. This tool provides guidance and a step-wise procedure/method to calculate values of f_{NRB} . The tool may be applied when calculating baseline emissions in applicable methodologies (e.g. AMS-I.E., AMS-II.G., AMS-III.Z., AMS-III.AV., AMS-III.BG.) for a project activity or a programme of activities (PoA) that displaces the use of non-renewable biomass.

2.2. Applicability

3. This tool may be used by:
 - (a) DNAs to submit region- or country-specific default f_{NRB} values, following the procedures for development, revision, clarification and update of standardized baselines (SB procedures); or
 - (b) project participants¹ to calculate project- or PoA-specific f_{NRB} values.

2.3. Entry into force

4. The date of entry into force is the date of the publication of the EB 115 meeting report on 8 September 2022.

3. Procedure

5. Project participants and DNAs shall identify and clearly delineate the applicable area for which f_{NRB} is determined. For project- or PoA-specific f_{NRB} values, project participants shall assess and use the area from which woody biomass is sourced for end-users included in the project activity and justify the selection of the area in CDM project design documents. For region- or country-specific f_{NRB} values, DNAs shall specify the applicable area.
6. Project participants and DNAs may choose between the following two options to determine the value of f_{NRB} :
 - (a) Use the default value as provided in TOOL33;² or
 - (b) Calculate f_{NRB} by determining the share of renewable and non-renewable woody biomass in the total quantity of woody biomass consumption for the country/region or the project area (hereinafter referred as the applicable area) following the

¹ In context of this methodological tool, the term project participant also includes coordinating and managing entities for a PoA.

² The default f_{NRB} value of 0.3 may be used irrespective of the versions of the applicable methodology (e.g. AMS-I.E., AMS-II.G., AMS-III.Z., AMS-III.AV., AMS-III.BG.).

procedure and requirements in the paragraphs below. The project participants shall compare and analyse the calculated values against the values for f_{NRB} reported in relevant scientific literature and justify any differences. This analysis shall be included in the appropriate section of the PDD. The relevant scientific literature should include at least:

- (i) Bailis, R.; Drigo, R.; Ghilardi, A. & Masera, O. (2015). The carbon footprint of traditional woodfuels. *Nature Climate Change*, 5(3), pp. 266–272.

7. The fraction of woody biomass that can be established as non-renewable is:

$$f_{NRB} = \frac{NRB}{NRB + RB} \quad \text{Equation (1)}$$

Where:

- f_{NRB} = Fraction of non-renewable biomass in the applicable area in the relevant period (fraction or %)
- NRB = Quantity of non-renewable biomass consumed in the applicable area in the relevant period (tonnes)
- RB = Quantity of renewable biomass that is available on a sustainable basis in the applicable area in the relevant period (tonnes)

8. The relevant period should be one year, unless the methodology referring to this tool specifies otherwise.
9. The value of f_{NRB} for the applicable area shall be calculated using either of the two following options:
- (a) **Ex ante:** the f_{NRB} value is determined once at the validation stage, thus no monitoring and recalculation of the f_{NRB} value during the crediting period is required;
- (b) **Ex post:** the $f_{NRB,y}$ value is determined for the year y in the crediting period, requiring the f_{NRB} value to be updated annually, following a consistent calculation procedure throughout the crediting period.
10. In the case of ex ante calculation of f_{NRB} , the parameter f_{NRB} shall be estimated using the most recent historical year for which data is available. In the case of ex-post calculation of f_{NRB} , the parameter f_{NRB} shall be estimated for the applicable year y of the crediting period. Where available, the same vintage of data should be used for all parameters applied in this tool to calculate f_{NRB} . Where data for one single vintage is not available for all parameters, different vintages may be used for parameters, as long as it can be justified (e.g. the use of different vintages leads to a conservative estimate of f_{NRB}).
11. The quantity of non-renewable biomass consumed in the applicable area (NRB) shall be determined as the difference between the total consumption of woody biomass in the applicable area (H) and the quantity of renewable biomass that can be sustainably harvested in the applicable area (RB):

$$NRB = H - RB \quad \text{Equation (2)}$$

Where:

H = Total consumption of woody biomass in the applicable area in the relevant period (tonnes)

12. Cubic meters (m³) instead of tonnes (t) of wood may be used for estimation of f_{NRB} values, as long as the same unit and the same conversion factor (e.g. wood density, moisture content) are consistently used for estimation of both the total consumption of woody biomass (H) and the renewable biomass available (RB).
13. If the f_{NRB} value is estimated at the national level, as a cross check, project proponent shall compare the value of estimated NRB with the product of: i) total average above ground biomass tonnage of the area of forest areas deforested in recent past (tonnes/ha), and ii) most recent available observed annual rate of deforestation (ha/yr). If the estimated NRB value is more than 10% above the value calculated as per the product of biomass and deforestation rate, justification shall be provided for the higher value for NRB.

3.1. Procedure to estimate the total consumption of woody biomass (H)

14. The total consumption of woody biomass (H) is calculated using the following equation, accounting for all consumption within the applicable area (not only wood fuel but also timber and industrial consumption):

$$H = HW \times N + CE + NE \quad \text{Equation (3)}$$

Where:

HW = Average consumption of wood fuel per household, including fuelwood and charcoal, in the applicable area in the relevant period (tonnes/household)

CE = Commercial woody biomass consumption for energy applications (e.g. commercial, industrial or institutional uses of woody biomass in ovens, boilers etc.) that are extracted from forests or other land areas in the applicable area in the relevant period (tonnes)

NE = Commercial woody biomass consumption for non-energy applications (e.g. construction, furniture) that are extracted from forests or other land areas in the applicable area in the relevant period (tonnes)

N = Number of households consuming wood fuel within the applicable area in the relevant period (number)

15. For the parameters HW and N , an aggregated value ($HW \times N$) may be used in the calculation, if official statistics provide total household wood fuel consumption ($HW \times N$) but not disaggregated values for HW and N separately.
16. For the purpose of this tool, wherever charcoal is used for household or commercial applications, the corresponding quantity of wood fuel shall be determined using a wood to charcoal conversion factor (CF).
17. When using data expressed in inventoried volumes (e.g. industrial roundwood) to estimate commercial woody biomass consumption for non-energy applications (e.g. construction, furniture), a biomass expansion factor (i.e. ratio of aboveground oven-dry biomass of trees to oven-dry biomass of inventoried volume) may be used to consider the above ground biomass within trunks and branches.

18. A biomass expansion factor shall not be applied to fuel wood consumption by households or commercial woody biomass consumption for energy applications, when estimating the parameters *HW* and *CE* in the equations above.

3.2. Procedure to estimate the quantity of renewable biomass available (*RB*)

19. The quantity of renewable biomass available in the applicable area (*RB*) is estimated using the following equation:

$$RB = \sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest,i})) + \sum (MAI_{other,i} \times (F_{other,i} - P_{other,i})) \quad \text{Equation (4)}$$

Where:

$MAI_{forest,i}$	= Mean Annual Increment of woody biomass growth per hectare in sub-category <i>i</i> of forest areas in the relevant period (tonnes/ha/yr)
$MAI_{other,i}$	= Mean Annual Increment of woody biomass growth per hectare in sub-category <i>i</i> of other land areas in the relevant period (tonnes/ha/yr)
$F_{forest,i}$	= Extent of forest in sub-category <i>i</i> in the relevant period (ha)
$F_{other,i}$	= Extent of other land in sub-category <i>i</i> in the relevant period (ha)
$P_{forest,i}$	= Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest areas (in sub-category <i>i</i>) in the relevant period (ha)
$P_{other,i}$	= Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within other land areas (in sub-category <i>i</i>) in the relevant period (ha)
<i>i</i>	= Sub-category <i>i</i> of forest areas and other land areas ³

4. Data and parameters

Data / Parameter table 1.

Data / Parameter:	<i>HW</i>
Data unit:	tonnes/household
Description:	Average consumption of wood fuel per household, including fuelwood and charcoal, in the applicable area in the relevant period

³ Other land areas shall include any land areas from which woody biomass may be sourced, such as wooded lands and agricultural lands. Where any of potential sources of supply are not taken into account, it shall be justified.

Source of data:	<p>Use one of the following options:</p> <p>(a) Approved standardized baselines valid for the applicable area; or</p> <p>(b) Official statistics or reports or peer-reviewed literature; or</p> <p>(c) Results of a sampling survey conducted as per the latest version of “Standard for sampling and surveys for CDM project activities and programmes of activities”; or</p> <p>(d) The default value provided in TOOL30 for the average annual consumption of woody biomass per person for cooking multiplied with the average number of people per household.</p> <p>The most recent available historical data shall be used. However, the vintage of the above data shall not be before year 2000</p>
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	If national studies or government data are used, cross-check the values with global data (e.g. Global Forest Resources Assessment by the FAO, other UN data) and provide justification for any differences
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	CE
Data unit:	tonnes
Description:	Commercial woody biomass consumption for energy applications (e.g. commercial, industrial or institutional uses of woody biomass in ovens, boilers etc.) that are extracted from forests or other land areas in the applicable area in the relevant period
Source of data:	<p>For country or region, it may be determined through existing studies or government data or surveys.</p> <p>For the project area, it may be determined through surveys.</p> <p>The most recent available historical data shall be used.</p> <p>It shall be demonstrated that there is no double counting in calculating <i>CE</i> values, as a part of which may be actually used for household purposes (e.g. production of charcoal used for households may be already counted under <i>HW</i>). In case national studies or government data do not provide clear information to demonstrate that the values are only for commercial purpose and do not include household consumption, supporting evidence or an official letter of confirmation signed by appropriate government authority should be provided. In the absence of such evidence, the estimation of fuelwood and charcoal for energy applications in commercial sector shall be based on data on consumption estimates and not the supply of fuelwood and charcoal for energy applications as the latter is very likely to lead to double counting</p>
Measurement procedures (if any):	-
Monitoring frequency:	-

QA/QC procedures:	If national studies or government data are used, cross-check the values with global data (e.g. Global Forest Resources Assessment by the FAO, other UN data) and provide justification for any differences
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	NE
Data unit:	tonnes
Description:	Commercial woody biomass consumption for non-energy applications (e.g. construction, furniture) that are extracted from forests or other land areas in the applicable area in the relevant period
Source of data:	For country or region, it may be determined through existing studies or government data or surveys. For the project area, it may be determined through surveys. The most recent available historical data shall be used
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	If national studies or government data are used, cross-check the values with global data (e.g. Global Forest Resources Assessment by the FAO, other UN data) and provide justification for any differences
Any comment:	The determination of mass or volume of “woody biomass” may be based on the above ground biomass within trunks and branches. Biomass expansion factor (i.e. ratio of aboveground oven-dry biomass of trees to oven-dry biomass of inventoried volume) may be considered for that purpose. Below ground biomass, twigs and leaves should be excluded in the calculations. Biomass expansion factor may be multiplied only with the amount of the woody biomass used for non-energy applications (e.g. construction, furniture)

Data / Parameter table 4.

Data / Parameter:	N_i
Data unit:	Number
Description:	Number of households consuming wood fuel within the applicable area in the relevant period
Source of data:	For country or region, it may be determined through existing studies or government data or surveys. For the project area, it may be determined through surveys. If the most recent available data for N is only available for an earlier year than the year for which the estimation of f_{NRB} value is done, then the historical annual population growth rate may be used to estimate the population value for the year for which the f_{NRB} value is established. For example, if the latest available historical population data is 2015, it may be extrapolated, taking into account the historical annual population growth rate to calculate the population in 2018 (year in which the estimation of f_{NRB} is being done).

Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	When average consumption of wood fuel per household (<i>HW</i>) is given in terms of average value per household using wood fuel, the number of households should be counted only for the households consuming wood fuel excluding the ones consuming other fuels

Data / Parameter table 5.

Data / Parameter:	$MAI_{forest,i}$, $MAI_{other,i}$
Data unit:	tonnes/ha/yr
Description:	Mean Annual Increment of woody biomass growth per hectare in sub-category <i>i</i> of forest areas in the relevant period Mean Annual Increment of woody biomass growth per hectare in sub-category <i>i</i> of other land areas in the relevant period
Source of data:	The following data source may be used: (a) Global Forest Resources Assessment 2000 by the FAO for “Distribution of total forest area by ecological zone” (Table 14); and/or (b) 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories for “Above-ground biomass growth rates for different ecological zones” (Chapter 4, Table 4.9). Use a weighted average based on the forest area of three categories (i.e. primary forests, above and below 20 years secondary forests), if such data is available. Otherwise, use a simple average of the two age categories of secondary forests or a simple average of the three categories if primary forests exist; (c) Global Forest Resources Assessment (e.g. Table 17 “Net annual increment in forest 1990-2015” in 2015 version); (d) National studies or government data or official statistics. The most recent available data shall be used. However, the vintage of the above data shall not be before year 2000. It is required to determine MAI values for different sub-categories of forest areas and other land areas. However, in the absence of the local data in the country, global data (such as 2019 Refinement to 2006 IPCC Guidelines) or data of similar ecological zones in other regions may be used with due justification. Further, if the MAI value for other land areas is not available in a country while only the MAI value for forest areas exists, the MAI value for forest areas may be used as the MAI value for other land areas with due justification
Measurement procedures (if any):	-
Monitoring frequency:	-

QA/QC procedures:	If national studies or government data or official statistics are used, compare values with FAO and IPCC defaults and provide justification of differences
Any comment:	Mean Annual Increment (MAI) and Mean Annual Change (MAC) are two different concepts. The Annual Change in Growing Stock ($m^3/ha/year$) should not be considered as MAI. In the context of this document, the MAI expresses the production potential of a land area to deliver woody biomass, and it should be understood as an average quantity of woody biomass produced per hectare of forest areas or other land areas during one year of growth ($m^3/ha/year$) or ($tonnes/ha/year$). The MAC, understood as net change in growing stock of total forest area, can be negative if there is a net reduction in the growing stock in a given year, say in the case of deforestation; however, the MAC is not used in the equations of this document

Data / Parameter table 6.

Data / Parameter:	$F_{forest,i}$, $F_{other,i}$
Data unit:	ha
Description:	Extent of forest in sub-category i in the relevant period Extent of other land in sub-category i in the relevant period
Source of data:	The following data source may be used: (a) Global Forest Resources Assessment by the Food and Agriculture Organization of the United Nations (FAO); (b) Official statistics; (c) Project-specific survey data. If the value of f_{NRB} is calculated for a project area for the year y , and during this year a decrease in the forest area is projected to occur, the extent of the forest area available to provide woody biomass to the users can correspond to the forest area (hectares) at the beginning of the year y , or the average of the values of the forest area at the beginning and at the end of the year y
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 7.

Data / Parameter:	$P_{forest,i}$, $P_{other,i}$
Data unit:	ha
Description:	Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest areas (in sub-category i) in the relevant period. Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within other wooded land areas (in sub-category i) in the relevant period

Source of data:	<p>The following data source may be used for the data on protected area:</p> <p>(a) Global Forest Resources Assessment by the Food and Agriculture Organization of the United Nations (FAO);</p> <p>(b) National studies or government data or official statistics.</p> <p>The most recent available data shall be used.</p> <p>To define “geographically remote area”, DNAs/PPs may consider proximity to roads or rivers. For example, forests/other wooded lands that are beyond the average distance travelled to collect fuelwood can be considered non-accessible. The information of the average travel distance may be sourced from national studies or peer-reviewed literature, or surveys in the project area.</p> <p>All areas that are accessible to either the forest industries or to individual households are considered to be “accessible”. Therefore, wood extraction by the forest industries and fuelwood collection by individual households should both be considered when estimating the “non-accessible areas”</p>
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	Consideration of this parameter is optional. If DNAs or PPs wish to consider non-accessible areas, they shall provide justification

Data / Parameter table 8.

Data / Parameter:	CF
Data unit:	-
Description:	Wood-to-charcoal conversion factor
Source of data:	<p>One of the following three options should be used to determine this factor:</p> <p>i) The default value provided in TOOL33 may be used;</p> <p>ii) Project participants may determine the factor applicable to their region based on a sample of tests of kilns. In this case, the project participants should provide a clear description of the testing method used including the standard followed and the sampling approach;</p> <p>iii) Project participants may use country or region specific values included in an approved and valid standardized baseline</p>
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
04.0	8 September 2022	EB 115, Annex 22 Revision to introduce a reference to TOOL33 for using default values.
03.0	14 December 2020	EB 108, Annex 11 Revision to streamline the application of this tool.
02.0	28 March 2019	EB 102, Annex 7 Revision to: <ul style="list-style-type: none">• Provide options of data sources for parameters, which could be used by DNAs and project participants to establish an f_{NRB} value;• Clarify the requirements on the data vintage for parameters used in the calculation of f_{NRB} values.
01.0	1 November 2017	EB 97, Annex 9 Initial adoption.

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