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Climate Security & Sustainable Development

Fraction of Non-Renewable Biomass (f_{NRB}) Assessment for Bolivia, Colombia, Guatemala and Honduras

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Australia

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About Gold Standard

Gold Standard is a standard and certification body that works to ensure every dollar of climate and development funding goes as far as it can. To do this, Gold Standard designs the strongest processes that maximise the impacts of efforts to deliver clean energy and water, responsibly manage land and forests, and transform the lives of the world's poor. Gold Standard then verifies those outcomes, inspiring greater confidence that drives investment to accomplish even more.

Established in 2003 by WWF and other international NGOs as a best practice benchmark for energy projects developed under the UN's Clean Development Mechanism (CDM), Gold Standard was set up to ensure that projects delivered genuine emission reductions and long-term sustainable development.

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1. Introduction

The project "[Financing efficient cookstoves for rural Andean communities](#)" aims to promote the development of Improved Cookstove activities (ICS) by reducing the current complexity of carbon finance based project development. The Fraction of Non-Renewable Biomass (f_{NRB}) value is a critical parameter for GHG emissions reductions calculation and its assessment is of critical importance. For this purpose, the project developer can determine the project-specific f_{NRB} value or apply the default f_{NRB} value if it has already been approved by the [CDM Executive Board \(CDM EB\)](#) and accepted by the designated national authority (DNA).

During its sixty-seventh meeting¹, the CDM EB approved the f_{NRB} assessment approach for least developed countries, small-island developing countries and parties with 10 or less registered CDM project activities as of 31 December 2010. The f_{NRB} calculation methodology has been defined at country level. When the calculation is approved by the CDM EB and acceptance is received from the DNA, the f_{NRB} default value can be applied in small-scale project activities and programme of activities located in the respective host country. Nevertheless, as of July 21st 2016, only thirty-five DNAs² have accepted their respective f_{NRB} values, including only four countries from Latin America and the Caribbean region³. Therefore, the f_{NRB} assessment shall be conducted by the project developer on a case-by-case basis following the assessment approach provided in the CDM methodology AMS-II.G⁴ or the Gold Standard (GS) methodology "Technologies and practices to displace decentralized thermal energy consumption" (TPDDTEC)⁵ for GS projects in remaining countries from Latin America and the Caribbean. The f_{NRB} assessment study usually involves extensive data collection. It can be very challenging to access reliable, accurate, updated and exhaustive information in some countries. Determining the project-specific f_{NRB} value is therefore a source of systemic uncertainty for the project proponent that can involve high costs and may represent a barrier to project development. The current situation also leads to the duplication of efforts due to the absence of validated default f_{NRB} values for the majority of countries in Latin America. A default f_{NRB} value for the represented country would assist the project developer in the development of future project activities.

The project 'Financing efficient cookstoves for rural Andean communities' funded by Inter-American Development Bank and World Vision Australia aims to promote the use of clean cookstoves in Andean countries. Its broader objective is to promote the development of improved cookstove projects by reducing the current complexity of project development while benefiting from the experience of existing projects. To promote the carbon finance based activities, WVA and IDB provided financial support to Gold Standard for the assessment of f_{NRB} value for Guatemala, Honduras, Colombia and Bolivia. As part of this project, Microsol also estimated and submitted the default f_{NRB} value for Peru for approval by the Gold Standard Technical Advisory Committee (TAC).

¹ Annex 22 to the report of the 67th meeting of the CDM EB

² Default values of fraction of non-renewable biomass

³ Dominican Republic, Grenada, Republic of Haiti, Commonwealth of Jamaica.

⁴ Energy efficiency measures in thermal applications of non-renewable biomass (AMS-II.G)

⁵ Technologies and practices to displace decentralized thermal energy consumption (TPDDTEC)

2. Methodologies for assessment of f_{NRB}

The guideline for f_{NRB} assessment is included in the latest methodology “Technologies and Practices to Displace Decentralized Thermal Energy Consumption” (TPDDTEC) version 2.0. Annex 1 of the TPDDTEC provides three options to conduct the f_{NRB} assessment as discussed below:

- 1) Quantitative NRB assessment
- 2) Qualitative NRB assessment
- 3) NRB assessment similar to the CDM approach as provided in the methodology AMS-II.G

This report is based on the third option above: the NRB assessment provided in the AMS II. G methodology. This approach is adopted for the assessment due to its wider application under both the compliance and voluntary carbon streams, thus simplifying the process for developers. Note that for CDM projects, the project developer can apply the default value on DOE validation and approval by the CDM Secretariat.

The present report summarises the development of the f_{NRB} assessment following the NRB assessment approach provided in CDM methodology AMS-II.G. This option is based on the concept of Demonstrably Renewable Woody Biomass (DRB). The applicable equation is as follows:

$$f_{NRB} = NRB / (NRB + DRB)$$

The DRB has been defined as follows: “Renewability must be demonstrated by providing incontrovertible evidence of biomass resources management and evidence of likely continuation of management. Project proponents should not designate DRB if there is contrary evidence or cause to doubt reliability of records.”

2.1 f_{NRB} assessment

The CDM EB 67 Annex 22 proposes a NRB assessment approach for under-represented regions which is similar to approach outlined in the CDM methodology AMS-II.G. The following equations apply:

$$f_{NRB} = \frac{NRB}{NRB + DRB} \quad (1)$$

Where:

f_{NRB}	Fraction of non-renewable biomass (fraction or %)
NRB	Non-renewable biomass (t/yr)
DRB	Demonstrably renewable biomass (t/yr)

Since the available data on forests and wood consumption is the most accessible, complete, and accurate at the national level, the f_{NRB} is estimated at national level. Using the concept of DRB at national level, the value of NRB can be derived from:

- The Total Annual Biomass Removals (R), approximated by the quantity of woody biomass used annually in the country in the absence of the project;
- The proportion of R that is demonstrably renewable (DRB) and non-renewable (NRB).

$$NRB = R - DRB \quad (2)$$

Where:

R Total annual biomass removals (t/yr)

The Total Annual Biomass Removals for a country is inferred by calculating the sum of the Mean Annual Increment in biomass growth (MAI) and the Annual Change in Living Forest Biomass stocks (ΔF). As far as biomass growth (MAI) and change in stock (ΔF) are both known, the balancing removals (R) can be calculated as the sum of the two:

$$R = MAI + \Delta F \quad (3)$$

Where:

MAI Mean Annual Increment of biomass growth (t/yr)

ΔF Annual change in living forest biomass (t/yr)

The Mean Annual Increment of biomass growth (MAI) is calculated as the product of the Extent of Forest (F) in hectares and the country-specific Growth Rate (GR) of the Mean Annual Increment:

$$MAI = F \times GR \quad (4)$$

Where:

F Extent of forest (ha)

GR Annual Growth rate of biomass (t/ha-yr)

The Demonstrably renewable biomass (DRB) is calculated as the product of Protected Area Extent of Forest (PA) in hectares and the country-specific Growth Rate (GR) of the Mean Annual Increment:

$$DRB = PA \times GR \quad (5)$$

Where:

PA Protected Area Extent of Forest (ha)

The detailed calculation of the f_{NRB} value for Guatemala, Honduras, Colombia and Bolivia based on the above methodology is provided in the Annex.

3. Conclusion

The f_{NRB} values estimated for selected countries are summarised in the table below and further discussed in detail in the Annex.

Table 1. Default f_{NRB} Value

Country	f_{NRB} Value
Bolivia	80.49%
Colombia	82.01%
Guatemala	48.00%
Honduras	49.12%

Default f_{NRB} values proposed in this report shall be applicable for a period of five years from the date of release on the Gold Standard website after which these values shall be deemed invalid. Project developers can apply the default value or submit project specific f_{NRB} values from these countries for GS review as part of project registration process.

Annex I. Bolivia

The f_{NRB} assessment at national level is estimated as 80.49% as summarised in the table below:

Table 2. f_{NRB} value for Bolivia

Parameter	Description	Value	Unit
fNRB	fNRB	80.49%	%
NRB	Non-renewable biomass	232635926	t/yr
DRB	Demonstrably renewable biomass	56370802	t/yr
R	Total annual biomass removals	289006728	t/yr
MAI	Mean Annual Increment in biomass growth	289053428	t/yr
GR	Growth rate of biomass	5.28	t/ha-yr
F	Forest extension	54764000	ha
PA	Protected areas	10680000	ha
ΔF	Annual change in living forest biomass	-46700	t/yr

Please refer to the excel sheet titled “ f_{NRB} assessment_Bolivia” for detailed calculations.

Data sources

The f_{NRB} assessment is based on internationally recognised data sources such as FAO, IPCC etc as summarised below.

Table 3. Description of the parameters and relevant data sources

Parameter	Unit	Description	Source	Remarks/comments
NRB	t/yr	Non-renewable biomass	Equation 2	Proportion of Total Annual Biomass Removals (R) that is not demonstrably renewable.
DRB	t/yr	Demonstrably renewable biomass	Equation 5	Calculated as equivalent to the total annual biomass growth in protected areas.
R	t/yr	Total annual biomass removals	Equation 3	Used as a national-level proxy for By i.e., the quantity of woody biomass used in the absence of the project activity. Accounts for all removals (not only woodfuels), which is equivalent to the sum of MAI and the Annual change in living forest biomass.
MAI	t/yr	Mean Annual Increment in biomass growth	Equation 4	Country-specific MAI calculated from extent of forest and its growth rate.
GR	t/ha-yr	Growth rate of biomass	1. Map of Forest Technical Report 2013 (classification	Country-specific growth rate is calculated as a weighted average

			<p>by type of forest), Ministry of Environment and Water, Vice Ministry of Environment, biodiversity, climate change and forest management and development. General Direction of Forest development.</p> <p>2. IPCC above-ground biomass growth rates for different ecological zones (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4, Table 4.92)</p>	<p>based on Map of Forest Technical Report 2013 on distribution of total forest area by ecological zone and IPCC above-ground biomass growth rates for different ecological zones.</p>
F	ha	Forest extension	Global Forest Resources Assessment, Table 1, Forest and other wooded land, page 3, FAO, 2015	
PA	ha	Protected areas	Global Forest Resources Assessment, Table 30. Forest area within protected areas 1990-2015, page 161, FAO, 2015	
ΔF	t/yr	Annual change in living forest biomass	Global Forest Resources Assessment, Table 19, Trends in living forest biomass 1990-2015, page 95, FAO, 2015	

Annex II. Colombia

The f_{NRB} values are estimated at national levels as 82.01% as described in the below table.

Table 4. f_{NRB} value for Colombia

Parameter	Description	Value	Unit
fNRB	fNRB	82.01%	%
NRB	Non-renewable biomass	304344583	t/yr
DRB	Demonstrably renewable biomass	66754554	t/yr
R	Total annual biomass removals	371099137	t/yr
MAI	Mean Annual Increment in biomass growth	371107437	t/yr
GR	Growth rate of biomass	6.34	t/ha-yr
F	Forest extension	58502000	ha
PA	Protected areas	10523300	ha
ΔF	Annual change in living forest biomass	-8300	t/yr

Please refer to Excel sheet “ f_{NRB} assessment_Colombia” for detailed calculations.

Data sources

The f_{NRB} assessment is based on internationally recognized data sources such as FAO, IPCC as summarised below.

Table 5. Description of the parameters and relevant data sources

Parameter	Unit	Description	Source	Remarks/comments
NRB	t/yr	Non-renewable biomass	Equation 2	Proportion of Total Annual Biomass Removals (R) that is not demonstrably renewable.
DRB	t/yr	Demonstrably renewable biomass	Equation 5	Calculated as equivalent to the total annual biomass growth in protected areas.
R	t/yr	Total annual biomass removals	Equation 3	Used as a national-level proxy for By i.e., the quantity of woody biomass used in the absence of the project activity. Accounts for all removals (not only woodfuels), which is equivalent to the sum of MAI and the Annual change in living forest biomass.
MAI	t/yr	Mean Annual Increment in biomass growth	Equation 4	Country-specific MAI calculated from extent of forest and its growth rate.

GR	t/ha-yr	Growth rate of biomass	<p>Calculated, weighted average Table 14. Distribution of total forest area by ecological zone, Global Forest Resources Assessment 2000</p> <p>IPCC above-ground biomass growth rates for different ecological zones (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4, Table 4.92).</p>	Country-specific growth rate is calculated as a weighted average based on Map of Forest Technical Report 2013 on distribution of total forest area by ecological zone and IPCC above-ground biomass growth rates for different ecological zones.
F	ha	Forest extension	Global Forest Resources Assessment, Table 1, Forest and other wooded land, page 4, FAO, 2015	
PA	ha	Protected areas	Global Forest Resources Assessment, Table 30. Forest area within protected areas 1990-2015, page 161, FAO, 2015	
ΔF	t/yr	Annual change in living forest biomass	Global Forest Resources Assessment, Table 19, Trends in living forest biomass 1990-2015, page 95, FAO, 2015	

Annex III. Guatemala

The f_{NRB} value is estimated at national level as 48.00% as summarised below.

Table 6. f_{NRB} value for Guatemala

Parameter	Description	Value	Unit
f_{NRB}	f_{NRB}	48.00%	%
NRB	Non-renewable biomass	10345600	t/yr
DRB	Demonstrably renewable biomass	11205600	t/yr
R	Total annual biomass removals	21551200	t/yr
MAI	Mean Annual Increment in biomass growth	21558600	t/yr
GR	Growth rate of biomass	6.09	t/ha-yr
F	Forest extension	3540000	ha
PA	Protected areas	1840000	ha
ΔF	Annual change in living forest biomass	-7400	t/yr

Please refer to Excel sheet “ f_{NRB} assessment_Guatemala” for detailed calculation

Data sources

The assessment is based on internationally recognized data sources such as FAO, IPCC as is summarised below.

Table 7. Description of the parameters and relevant data sources

Parameter	Unit	Description	Source	Remarks/comments
NRB	t/yr	Non-renewable biomass	Equation 2	Proportion of Total Annual Biomass Removals (R) that is not demonstrably renewable.
DRB	t/yr	Demonstrably renewable biomass	Equation 5	Calculated as equivalent to the total annual biomass growth in protected areas.
R	t/yr	Total annual biomass removals	Equation 3	Used as a national-level proxy for B_y , i.e., the quantity of woody biomass used in the absence of the project activity. Accounts for all removals (not only woodfuels), which is equivalent to the sum of MAI and the Annual change in living forest biomass.
MAI	t/yr	Mean Annual Increment in biomass growth	Equation 4	Country-specific MAI calculated from extent of forest and its growth rate.
GR	t/ha-yr	Growth rate of biomass	Calculated, weighted average Table 14. Distribution of total	Country-specific growth rate calculated as a weighted average based on Forest

			<p>forest area by ecological zone, Global Forest Resources Assessment 2000</p> <p>IPCC above-ground biomass growth rates for different ecological zones (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4, Table 4.92).</p>	Area by ecological Zone (%) and IPCC above-ground biomass growth rates for different ecological zones.
F	ha	Forest extension	Global Forest Resources Assessment, Table 1, Forest and other wooded land, page 5, FAO, 2015	
PA	ha	Protected areas	Global Forest Resources Assessment, Table 30. Forest area within protected areas 1990-2015, page 162, FAO, 2015	
ΔF	t/yr	Annual change in living forest biomass	Global Forest Resources Assessment, Table 19, Trends in living forest biomass 1990-2015, page 97, FAO, 2015	

Annex IV. Honduras

The f_{NRB} is estimated at national level as 49.12% as described in the below table:

Table 8. f_{NRB} value for Honduras

Parameter	Description	Value	Unit
f_{NRB}	f_{NRB}	49.12%	%
NRB	Non-renewable biomass	14983079	t/yr
DRB	Demonstrably renewable biomass	15520745	t/yr
R	Total annual biomass removals	30503824	t/yr
MAI	Mean Annual Increment in biomass growth	30523024	t/yr
GR	Growth rate of biomass	6.65	t/ha-yr
F	Forest extension	4592000	ha
PA	Protected areas	2335000	ha
ΔF	Annual change in living forest biomass	-19200	t/yr

Please refer to Excel sheet “ f_{NRB} assessment_Honduras” for detailed calculations

Data sources

The f_{NRB} is estimated at national level based on internationally recognized data sources such as FAO, IPCC as summarised in the table below.

Table 9. Description of the parameters and relevant data sources

Parameter	Unit	Description	Source	Remarks/comments
NRB	t/yr	Non-renewable biomass	Equation 2	Proportion of Total Annual Biomass Removals (R) that is not demonstrably renewable.
DRB	t/yr	Demonstrably renewable biomass	Equation 5	Calculated as equivalent to the total annual biomass growth in protected areas.
R	t/yr	Total annual biomass removals	Equation 3	Used as a national-level proxy for B_y , i.e., the quantity of woody biomass used in the absence of the project activity. Accounts for all removals (not only wood fuels), which is equivalent to the sum of MAI and the Annual change in living forest biomass.
MAI	t/yr	Mean Annual Increment in biomass growth	Equation 4	Country-specific MAI calculated from extent of forest and its growth rate.

GR	t/ha-yr	Growth rate of biomass	Calculated, weighted average Table 14. Distribution of total forest area by ecological zone, Global Forest Resources Assessment 2000 IPCC above-ground biomass growth rates for different ecological zones (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4, Table 4.92).	Country-specific growth rate calculated as a weighted average based on Forest Area by ecological Zone (%) and IPCC above-ground biomass growth rates for different ecological zones.
F	ha	Forest extension	Global Forest Resources Assessment, Table 1, Forest and other wooded land, page 5, FAO, 2015	
PA	ha	Protected areas	Global Forest Resources Assessment, Table 30. Forest area within protected areas 1990-2015, page 162, FAO, 2015	
ΔF	t/yr	Annual change in living forest biomass	Global Forest Resources Assessment, Table 19, Trends in living forest biomass 1990-2015, page 97, FAO, 2015	

Key References:

1. [Global Forest Resources Assessment, Food and Agriculture Organization of the United Nations \(FAO\) 2015](#)
2. [IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4](#)