

Fraction of Non-Renewable Biomass (fNRB)

Assessment for Bolivia, Colombia, Guatemala and Honduras

Prepared by Gold Standard

Funded by Inter-American Development Bank and World Vision Australia

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We would like to thank Dean Thomson, World Vision Australia for his valuable guidance for preparing the fNRB report. We extend our thanks to Microsol for their feedback at various stages. We are also grateful to all the project participants and interested stakeholders who have provided their feedback on this assessment.

**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.

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With endorsements from 80+ NGOs, Gold Standard has more than 1,100+ projects in 70 countries undergoing certification. The Gold Standard has become the global benchmark for the highest integrity and greatest impact in climate and development initiatives.

# Introduction

The project “[Financing efficient cookstoves for rural Andean communities](http://www.fomin.org/Home/News/PressReleases/ArtMID/3819/ArticleID/2751/Promoting-the-use-of-clean-cookstoves-in-Peruvian-Andean-communities-for-better-health-and-a-better-environment.aspx)” 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 (fNRB) 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 fNRB value or apply the default fNRB value if it has already been approved by the [CDM Executive Board (CDM EB)](https://cdm.unfccc.int/DNA/fNRB/index.html) and accepted by the designated national authority (DNA).

During its sixty-seventh meeting[[1]](#footnote-1), the CDM EB approved the fNRB 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 fNRB 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 fNRB 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 DNAs[[2]](#footnote-2) have accepted their respective fNRB values, including only four countries from Latin America and the Caribbean region[[3]](#footnote-3). Therefore, the fNRB 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.G[[4]](#footnote-4) or the Gold Standard (GS) methodology “Technologies and practices to displace decentralized thermal energy consumption” (TPDDTEC)[[5]](#footnote-5) for GS projects in remaining countries from Latin America and the Caribbean. The fNRB 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 fNRB 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 fNRB values for the majority of countries in Latin America. A default fNRB 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 fNRB value for Guatemala, Honduras, Colombia and Bolivia. As part of this project, Microsol also estimated and submitted the default fNRB value for Peru for approval by the Gold Standard Technical Advisory Committee (TAC).

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# Methodologies for assessment of fNRB

The guideline for fNRB 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 fNRB 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 fNRB 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:

fNRB = 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 fNRB 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:



(1)

Where:

fNRB 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 fNRB 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).

 

(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:

(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:

(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:



(5)

Where:

PA Protected Area Extent of Forest (ha)

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

# Conclusion

The fNRB values estimated for selected countries are summarised in the table below and further discussed in detail in the Annex.

Table 1. Default fNRB Value

|  |  |
| --- | --- |
| Country | fNRB Value |
| Bolivia  | 82.59% |
| Colombia | 83.08% |
| Guatemala | 62.74% |
| Honduras | 74.52% |

Default fNRB 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 fNRB values from these countries for GS review as part of project registration process.

# Annex I. Bolivia

The fNRB assessment at national level is estimated as 82.59% as summarised in the table below:

Table 1. fNRB value for Bolivia

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Unit |
| F | Forest Extension |  51,654,945  | ha |
| GR | Growth Rate of Biomass |  5.28  | t/ha-yr |
| MAI | Mean Annual Increment in Biomass Growth |  272,643,323  | t/yr |
| ΔF  | Annual Change in Living Forest Biomass  | (-51,063,829.8)  | t/yr |
| R | Total Annual Biomass Removals | 323,707,153 | t/yr |
| PA | Protected Areas | 10,680,192 | ha |
| DRB | Demonstrably Renewable Biomass | 56,371,816 | t/yr |
| NRB | Non-Renewable Biomass | 263,335,337 | t/yr |
| fNRB | Fraction of Non-Renewable Biomass | 82.59 |  % |

Please refer to the excel sheet titled “Bolivia fNRB assessment” for detailed calculations.

**Data sources**

The fNRB assessment is based on internationally recognised data sources such as FAO, IPCC and local data sources such as the Ministry of Environment and Water as summarised below.

Table 2. fNRB Bolivia- 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 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. [[6]](#footnote-6)
2. IPCC above-ground biomass growth rates for different ecological zones (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4, Table 4.92)[[7]](#footnote-7)
 | Country-specific growth rate 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. The Ecological Zones have been defined considering Altitude, Annual Precipitation, and average temperatures. Domain: Trópical Ecological zones: Bosque Amazonico - Rain Forest Bosque Chiquitano – Moist deciduous forestBosque Seco Interandino – Dry forest Bosque Tucumano Boliviano - Moist deciduous forestBosque Chaqueño – Dry forestBosque Llanureas inundables - Moist deciduous forestBosque de Pantanal - Moist deciduous forestBosque de Yungas – Tropical mountain systemsBosque Andino - Tropical mountain system |
| F | ha | Forest extension | Map of Forest Technical Report 2013 (classification by type of forest), Ministry of Environment and Water, Vice Ministry of Environment, biodiversity, climate change and forest management and development. Directorate General of Forest development. [[8]](#footnote-8) |  National statistics are presented to demonstrate the reduction of forest area, the continuous deforestation trend over time in Bolivia. The FAO FRA 2015 Country report for Bolivia details the annual deforestation rate.[[9]](#footnote-9):1.3.2 Estimation and Projection, FAO FRA 2015 Country Report.

|  |  |
| --- | --- |
| Year | Annual Deforestation Rate (ha) |
| 2005 | 281 283 |
| 2006 | 307 211 |
| 2007 | 345 376 |
| 2008 | 302 249 |
| 2009 | 302 249 |
| 2010 | 289 000 |

 |
| PA | ha | Protected areas | FAO Global Forest Resources Assessments 2015, Country Report, 'Bolivia (Estado Plurinacional de) Evaluación de los Recursos Forestales Mundiales 2015 – Informe Nacional', 4.2.3 Datos originalesTierras de Producción Forestal Permanente, 2001, Page 48.[[10]](#footnote-10) |   |
| ΔF  | t/yr | Annual change in living forest biomass  | Annual Change in Carbon Stock in Living Forest Biomass 2005-2010: FAO Global Forest Resources Assessment 2010, Table 11, column “I”[[11]](#footnote-11)5 FAO FRA 2015, Country Report"Bolivia (Estado Plurinacional de) Evaluación de los Recursos Forestales Mundiales 2015 – Informe Nacional"[[12]](#footnote-12) | Calculated by converting annual Change in Carbon Stock in Living Forest Biomass 2005-2010 (tcarbon/yr) to Annual Change in Living Forest Biomass 2005-2010 (t/yr) using Carbon stock/Biomass Conversion rate (0.47 is used as indicated in the Country report FAO FRA 2015, page 40).  |

# Annex II. Colombia

The fNRB values are estimated at national levels as 83.08% as described in the below table.

Table 3. fNRB value for Colombia

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Unit |
| F | Forest Extension |  58,501,740 | ha |
| GR | Growth Rate of Biomass |  6.34  | t/ha-yr |
| MAI | Mean Annual Increment in Biomass Growth | 371,105,788  | t/yr |
| ΔF  | Annual Change in Living Forest Biomass  | (-23,404,255)  | t/yr |
| R | Total Annual Biomass Removals | 394,510,043 | t/yr |
| PA | Protected Areas | 10,523,300 | ha |
| DRB | Demonstrably Renewable Biomass | 66,754,554 | t/yr |
| NRB | Non-Renewable Biomass | 327,755,489 | t/yr |
| fNRB | Fraction of Non-Renewable Biomass | 83.08 | %  |

Please refer to Excel sheet “Colombia fNRB assessment” for detailed calculations

**Data sources**

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

Table 4. fNRB Colombia Description of the parameters and relevant data sources

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Description | Source | Considerations |
| 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 | Calculated, weighted average [[13]](#footnote-13) Table 14. Distribution of total forest area by ecological zone, Global Forest Resources Assessment 2000[[14]](#footnote-14) 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. The latest FAO FRA 2015[[15]](#footnote-15) Country report for Colombia does not provide classification for type of forest. Thus the FAO report is not the best source to determine the distribution of total forest area by ecological zone for the following reasons:1) the lack of classification of forest areas (type of forest), 2) the lack of information about geographic distribution of forest areas and 3) lack of information about altitude, average mean precipitation and average temperature of forest areas. The for Global Forest Resources Assessment 2000 report provides a more realistic distribution of ecological zones, therefore, the data from this report about the share of forest areas by ecological zone the fNRB values is used for to determine the fNRB value. No other resources available were found with information regarding the distribution of the forest areas by ecological zone for Colombia. |
| F | ha | Forest extension | [[16]](#footnote-16) FAO FRA 2015, Country Report "EVALUACIÓN DE LOS RECURSOS FORESTALESMUNDIALES 2015 INFORME NACIONAL, COLOMBIA", (EVALUATION OF GLOBAL FOREST RESOURCES 2015, NATIONAL REPORT COLOMBIA) | National statistics are shown below to explain how the continuous deforestation has affected the forest areas in Colombia in the last decades. Below, there is an Excerpt of ‘Table 14. Change in coverage Forest coverage/Non-Bosque for analysis periods’ from the Technical report of quantification of national historical deforestation, where it shows the areas deforested the last 20 years[[17]](#footnote-17):

|  |  |  |
| --- | --- | --- |
| Year | Stable Forest Area (ha) | Area Deforested (ha) |
| 1990-2000 | 60,744,902 | 2,797,569 |
| 2000-2005 | 59,256,164 | 1,574,953 |
| 2005-2010 | 57,202,506 | 1,191,365 |

 |
| PA | ha | Protected areas | [[18]](#footnote-18) FAO FRA 2015, Country Report "EVALUACIÓN DE LOS RECURSOS FORESTALESMUNDIALES 2015 INFORME NACIONAL, COLOMBIA", (EVALUATION OF GLOBAL FOREST RESOURCES 2015, NATIONAL REPORT COLOMBIA) | Área de bosque dentro de las áreas protegidas, table 6. Area de Bosque protegido y Area (Forest Area within protected areas, table 6) Forest area within the protected areas. |
| ΔF  | t/yr | Annual change in living forest biomass  | [[19]](#footnote-19) '- Annual Change in Carbon Stock in Living Forest Biomass 2005-2010: FAO Global Forest Resources Assessment 2010, Table 11, column 'Annual change (1 000 t/yr) 2005-2010'. [[20]](#footnote-20) EVALUACIÓN DE LOS RECURSOSFORESTALES NACIONALES 2010DIRECTRICES PARA LA ELABORACIÓNDE INFORMES NACIONALES DESTINADOSA FRA 2010, Appendix 5 TABLE 5.2 2CARBON FRACTION OF ABOVEGROUND FOREST BIOMASS. | Calculated by converting: Annual Change in Carbon Stock in Living Forest Biomass 2005-2010 (tcarbon/yr) to Annual Change in Living Forest Biomass 2005-2010 (t/yr)  |

# Annex III. Guatemala

The fNRB value is estimated at national level as 62.74% as summarised below.

Table 5. fNRB value for Guatemala

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Unit |
| F | Forest Extension |  3,540,151.0 | ha |
| GR | Growth Rate of Biomass |  6.09  | t/ha-yr |
| MAI | Mean Annual Increment in Biomass Growth | 21,559,520  | t/yr |
| ΔF  | Annual Change in Living Forest Biomass  | (-8,510,638.3)  | t/yr |
| R | Total Annual Biomass Removals | 30,070,158 | t/yr |
| PA | Protected Areas | 1,840,000 | ha |
| DRB | Demonstrably Renewable Biomass | 18,215,190 | t/yr |
| NRB | Non-Renewable Biomass | 11,854,968 | t/yr |
| fNRB | Fraction of Non-Renewable Biomass | 62.74 | % |

The fNRB value presented in this report (62.74%) is significantly lower to the fNRB values reported in registered projects. For example GS1321[[21]](#footnote-21) and GS2439[[22]](#footnote-22) registered with fNRB values 95.54% and 88.96% respectively. The primary reason is area designed as protected in the latest FAO FRA report (see table above) is reported as 1,840,000 ha, which is almost th 52% of the total forest area. The fNRB value presented in this report can be considered conservative.

Please refer to Excel sheet “Guatemala fNRB assessment” for detailed calculations

**Data sources**

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

Table 6. fNRB Guatemala- Description of the parameters and relevant data sources

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Description | Source | Considerations |
| 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 | Calculated, weighted average [[23]](#footnote-23) Table 14. Distribution of total forest area by ecological zone, Global Forest Resources Assessment 2000[[24]](#footnote-24) 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. The latest FAO FRA 2015[[25]](#footnote-25) Country report for Guatemala only classifies the forest as Broadleaf, Coniferous and Mix type of forests. The same report explains that mix forest includes 30% -70% of broadleaf and coniferous species. Thus the FAO report is not the best source to determine the distribution of total forest area by ecological zone for the following reasons:1) The generic classification of forest areas, 2) the lack of information about geographic distribution of those areas and 3) lack of information about altitude, average mean precipitation and average temperature. Although this report is not used to determine the Growth Rate in the calculations spread sheet of the fNRB - tab ‘Areas per forest type’ it is explained how the distribution of ecological zones would look like if we take the values from FAO FRA 2015 Report. Under this assumption, the fNRB value would be slightly lower (59.02%) than the value calculated using the Global Forest Resources Assessment 2000 report (62.74%). However, the detailed distribution of the for Global Forest Resources Assessment 2000 report provides a more realistic distribution of ecological zones, therefore, this is the data used to define the fNRB values. No other resources available were found with information regarding the distribution of the forest areas by ecological zone for Guatemala. |
| F | ha | Forest extension | [[26]](#footnote-26) FAO FRA 2015, Country Report "EVALUACIÓN DE LOS RECURSOS FORESTALESMUNDIALES 2015 INFORME NACIONAL, GUATEMALA", (EVALUATION OF GLOBAL FOREST RESOURCES 2015, NATIONAL REPORT GUATEMALA) | Forest Area To estimate the forest area for year 2015, it was taken as the baseline extent of forest reported in the study: Forest Cover Map of Guatemala 2010 and Dynamics of Forest Cover 2006-2010 where forest loss is estimated 1% annual, this was applied to the following years to reach estimates of a forest area by 2015. FAO FRA 2015, Country Report, Section 1.3.2, page 12.National statistics are presented to demonstrate the reduction of forest area, the continuous deforestation trend over time in Guatemala. The FAO FRA 2015 Country report for Guatemala details the annual loss of forest area.[[27]](#footnote-27):Section 1.3.2 Estimation and Projection, FAO FRA 2015 Country Report Guatemala

|  |  |
| --- | --- |
| Year | Lost Area[[28]](#footnote-28) (ha) |
| 2010 | 37 226 |
| 2011 | 36 854 |
| 2012 | 36 485 |
| 2013 | 36 120 |
| 2014 | 35 750 |

 |
| PA | ha | Protected areas | [[29]](#footnote-29) FAO FRA 2015, Country Report "EVALUACIÓN DE LOS RECURSOS FORESTALESMUNDIALES 2015 INFORME NACIONAL, GUATEMALA", (EVALUATION OF GLOBAL FOREST RESOURCES 2015, NATIONAL REPORT GUATEMALA) | Área de bosque dentro de las áreas protegidas, table 6. Area de Bosque protegido y Area (Forest Area within protected areas, table 6) Forest area within the protected areas. |
| ΔF  | t/yr | Annual change in living forest biomass  | [[30]](#footnote-30) '- Annual Change in Carbon Stock in Living Forest Biomass 2005-2010: FAO Global Forest Resources Assessment 2010, Table 11, column 'Annual change (1 000 t/yr) 2005-2010'. [[31]](#footnote-31) EVALUACIÓN DE LOS RECURSOSFORESTALES NACIONALES 2010DIRECTRICES PARA LA ELABORACIÓNDE INFORMES NACIONALES DESTINADOSA FRA 2010, Appendix 5 TABLE 5.2 2CARBON FRACTION OF ABOVEGROUND FOREST BIOMASS. | Calculated by converting: Annual Change in Carbon Stock in Living Forest Biomass 2005-2010 (tcarbon/yr) to Annual Change in Living Forest Biomass 2005-2010 (t/yr)  |

# Annex IV. Honduras

The fNRB is estimated at national level as 74.51% as described in the below table[[32]](#footnote-32):

Table 7. National fNRB result for Honduras

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Unit |
| F | Forest Extension |  6,598,289 | ha |
| GR | Growth Rate of Biomass |  6.65  | t/ha-yr |
| MAI | Mean Annual Increment in Biomass Growth | 43,858,827  | t/yr |
| ΔF  | Annual Change in Living Forest Biomass  | (-17,021,276)  | t/yr |
| R | Total Annual Biomass Removals | 60,880,104 | t/yr |
| PA | Protected Areas | 2,335,000 | ha |
| DRB | Demonstrably Renewable Biomass | 15,520,745 | t/yr |
| NRB | Non-Renewable Biomass | 45,359,359 | t/yr |
| fNRB | Fraction of Non-Renewable Biomass | 74.51 | %  |

Please refer to Excel sheet “Honduras fNRB assessment” for detailed calculations

The fNRB values estimated in several GS registered project have different fNRB values. The primary differences are the data vintage and definition of areas considered for fNRB assessment.

**Data sources**

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

Table 8. fNRB values for Honduras Description of the parameters and relevant data sources

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Description | Source | Considerations |
| 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 | Calculated, weighted average [[33]](#footnote-33) Table 14. Distribution of total forest area by ecological zone, Global Forest Resources Assessment 2000[[34]](#footnote-34) 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. The latest FAO FRA 2015[[35]](#footnote-35) Country report for Honduras only classifies the forest as Broadleaf, Coniferous, Mix and Mangroves type of forests. Thus the FAO report is not the best source to determine the distribution of total forest area by ecological zone for the following reasons:1) the lack of classification of forest areas (type of forest), 2) the lack of information about geographic distribution of forest areas and 3) lack of information about altitude, average mean precipitation and average temperature of forest areas. The for Global Forest Resources Assessment 2000 report provides a more realistic distribution of ecological zones, therefore, the data from this report about the share of forest areas by ecological zone the fNRB values is used for to determine the fNRB value. No other resources available were found with information regarding the distribution of the forest areas by ecological zone for Honduras. |
| F | ha | Forest extension | [[36]](#footnote-36) FAO FRA 2015, Country Report "EVALUACIÓN DE LOS RECURSOS FORESTALESMUNDIALES 2015 INFORME NACIONAL, HONDURAS", (EVALUATION OF GLOBAL FOREST RESOURCES 2015, NATIONAL REPORT HONDURAS) | National statistics are presented to demonstrate the reduction of forest area, the continuous deforestation trend over time in Honduras. The FAO FRA 2015 Country report for Honduras details the annual loss of forest area.[[37]](#footnote-37): Section 1.3.2 Estimation and Projection, FAO FRA 2015 Country Report Honduras

|  |  |
| --- | --- |
| Year | Forest Area [[38]](#footnote-38) (1000 ha) |
| 1990 | 8 070 |
| 2000 | 6 338 |
| 2005 | 5 744 |
| 2010 | 5 150 |

 |
| PA | ha | Protected areas | [[39]](#footnote-39) FAO FRA 2015, Country Report "EVALUACIÓN DE LOS RECURSOS FORESTALESMUNDIALES 2015 INFORME NACIONAL, HOONDURAS", (EVALUATION OF GLOBAL FOREST RESOURCES 2015, NATIONAL REPORT HONDURAS) | Área de bosque dentro de las áreas protegidas, table 6. Area de Bosque protegido y Area (Forest Area within protected areas, table 6) Forest area within the protected areas. |
| ΔF  | t/yr | Annual change in living forest biomass  | [[40]](#footnote-40) '- Annual Change in Carbon Stock in Living Forest Biomass 2005-2010: FAO Global Forest Resources Assessment 2010, Table 11, column 'Annual change (1 000 t/yr) 2005-2010'. [[41]](#footnote-41) EVALUACIÓN DE LOS RECURSOSFORESTALES NACIONALES 2010DIRECTRICES PARA LA ELABORACIÓNDE INFORMES NACIONALES DESTINADOSA FRA 2010, Appendix 5 TABLE 5.2 2CARBON FRACTION OF ABOVEGROUND FOREST BIOMASS. | Calculated by converting: Annual Change in Carbon Stock in Living Forest Biomass 2005-2010 (tcarbon/yr) to Annual Change in Living Forest Biomass 2005-2010 (t/yr)  |

1. [Annex 22 to the report of the 67th meeting of the CDM EB](https://cdm.unfccc.int/Meetings/MeetingInfo/DB/CS8KD6BJMWURL4E/view) [↑](#footnote-ref-1)
2. [Default values of fraction of non-renewable biomass](https://cdm.unfccc.int/DNA/fNRB/index.html) [↑](#footnote-ref-2)
3. Dominican Republic, Grenada, Republic of Haiti, Commonwealth of Jamaica. [↑](#footnote-ref-3)
4. [Energy efficiency measures in thermal applications of non-renewable biomass (AMS-II.G)](https://cdm.unfccc.int/methodologies/DB/KZ6FQOCEEHD1V02ARWTW1W2R9G45BX) [↑](#footnote-ref-4)
5. [Technologies and practices to displace decentralized thermal energy consumption (TPDDTEC)](http://www.goldstandard.org/sites/default/files/revised-tpddtec-methodology_april-2015_final-clean.pdf) [↑](#footnote-ref-5)
6. Idem [↑](#footnote-ref-6)
7. <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_contents.html> [↑](#footnote-ref-7)
8. Map of Forest Technical Report 2013 (classification 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, <http://geo.gob.bo/blog/IMG/pdf/docs.pdf> [↑](#footnote-ref-8)
9. http://www.fao.org/3/a-az169s.pdf [↑](#footnote-ref-9)
10. FAO FRA 2015, <http://www.fao.org/3/a-az169s.pdf> [↑](#footnote-ref-10)
11. <http://www.fao.org/forestry/fra/fra2010/en/> [↑](#footnote-ref-11)
12. <http://www.fao.org/documents/card/en/c/a09d3d41-7085-48ba-ba5e-b7b039eb4bfb/> [↑](#footnote-ref-12)
13. http://www.fao.org/docrep/004/Y1997E/y1997e21.htm#bm73 [↑](#footnote-ref-13)
14. http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4\_Volume4/V4\_04\_Ch4\_Forest\_Land.pdf [↑](#footnote-ref-14)
15. http://www.fao.org/documents/card/en/c/a3123f84-0340-42e4-a048-8247481fd450/ [↑](#footnote-ref-15)
16. http://www.fao.org/documents/card/en/c/a3123f84-0340-42e4-a048-8247481fd450/ [↑](#footnote-ref-16)
17. Cabrera E., Vargas D. M., Galindo G. García, M.C., Ordoñez, M.F., Vergara, L.K., Pacheco, A.M., Rubiano, J.C. y Giraldo, P.

2011. Memoria técnica de la cuantifi cación de la deforestación histórica nacional – escalas gruesa y fi na. Instituto de Hidrología,

Meteorología, y Estudios Ambientales-IDEAM-. Bogotá D.C., Colombia. 106 p. ([http://www.ideam.gov.co/documents/13257/13817/Memoria+T%C3%A9cnica+Deforestaci%C3%B3n+.pdf/5f2741b4-ffa1-4b58-b986-f2fbefd6d006](http://www.ideam.gov.co/documents/13257/13817/Memoria%2BT%C3%A9cnica%2BDeforestaci%C3%B3n%2B.pdf/5f2741b4-ffa1-4b58-b986-f2fbefd6d006)) [↑](#footnote-ref-17)
18. Idem [↑](#footnote-ref-18)
19. http://www.fao.org/docrep/013/i1757e/i1757e.pdf [↑](#footnote-ref-19)
20. http://www.fao.org/forestry/14297-087757bc0751982429c3c4ce3af05febf.pdf [↑](#footnote-ref-20)
21. GS1321 ‘Stove Capital Guatemala Improved Stoves and Water Purification Project’, <https://mer.markit.com/br-reg/public/project.jsp?project_id=103000000001609> [↑](#footnote-ref-21)
22. ‘GS2439 Utsil Naj – Casa saludable para todos – VPA 2’, <https://mer.markit.com/br-reg/public/master-project.jsp?project_id=103000000000039> [↑](#footnote-ref-22)
23. http://www.fao.org/docrep/004/Y1997E/y1997e21.htm#bm73 [↑](#footnote-ref-23)
24. http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4\_Volume4/V4\_04\_Ch4\_Forest\_Land.pdf [↑](#footnote-ref-24)
25. http://www.fao.org/documents/card/en/c/a3123f84-0340-42e4-a048-8247481fd450/ [↑](#footnote-ref-25)
26. http://www.fao.org/documents/card/en/c/a3123f84-0340-42e4-a048-8247481fd450/ [↑](#footnote-ref-26)
27. http://www.fao.org/documents/card/en/c/a3123f84-0340-42e4-a048-8247481fd450/ [↑](#footnote-ref-27)
28. For the estimation of the forest area for year 2015, it was taken as baseline the forest extent reported in the study: Map of forest cover of Guatemala 2010 and dynamic of forest cover 2006-2010 where it is estimated an annual forest lost of 1%, this lost was applied for subsequent year until year 2015 to estimate the forest area and loss of forest areas. [↑](#footnote-ref-28)
29. Idem [↑](#footnote-ref-29)
30. http://www.fao.org/docrep/013/i1757e/i1757e.pdf [↑](#footnote-ref-30)
31. http://www.fao.org/forestry/14297-087757bc0751982429c3c4ce3af05febf.pdf [↑](#footnote-ref-31)
32. Please refer to Excel sheet “Honduras fNRB assessment” for detailed calculations. [↑](#footnote-ref-32)
33. http://www.fao.org/docrep/004/Y1997E/y1997e21.htm#bm73 [↑](#footnote-ref-33)
34. http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4\_Volume4/V4\_04\_Ch4\_Forest\_Land.pdf [↑](#footnote-ref-34)
35. http://www.fao.org/3/a-az235s.pdf [↑](#footnote-ref-35)
36. http://www.fao.org/3/a-az235s.pdf [↑](#footnote-ref-36)
37. http://www.fao.org/3/a-az235s.pdf [↑](#footnote-ref-37)
38. FAO FRA 2015 Country report Honduras, page 16 “The forest area in 1990 and 2000 was adjusted to 961,592 hectares that were included from 2005, and 2010 was projected using a linear extrapolation based on data from 2000 and 2005.” [↑](#footnote-ref-38)
39. Idem [↑](#footnote-ref-39)
40. http://www.fao.org/docrep/013/i1757e/i1757e.pdf [↑](#footnote-ref-40)
41. http://www.fao.org/forestry/14297-087757bc0751982429c3c4ce3af05febf.pdf [↑](#footnote-ref-41)