Information note

Default values of fNRB for LDCs and SIDs

I. Background

1. In line with the priorities of the work of the CDM Executive Board (the Board) on methodological issues in particular for the development of standardized baselines in the area of rural energy supply, the SSC WG 35 continued to work on the methodologies AMS-I.E "Switch from Non-Renewable Biomass for Thermal Applications by the User" and AMS-II.G "Energy efficiency measures in thermal applications of non-renewable biomass". Taking into account the public inputs received in response to call for inputs opened at EB 63, SSC WG provided feedback to the secretariat on the options for developing country specific default values for the fraction of non-renewable biomass (fNRB).

2. This document describes the materials and methods used to develop the default values referred to above for inclusion in AMS-I.E and AMS-II.G (Annex 1). Project proponents have an option to use these conservative country specific default values or determine project specific values by undertaking a study in the project region as prescribed in the methodology. Therefore these default values are not mandatory to apply.

II. Methodology for the calculation of fNRB

3. The requirements from AMS-I.E and AMS-II.G to calculate fNRB are reproduced in Annex 1 which is essentially captured in the equation below.

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

Where:

$fNRB$	Fraction of non-renewable biomass (fraction or %)
NRB	Non-renewable biomass (t/yr)
DRB	Demonstrably renewable biomass (t/yr)

4. On a project-specific basis, project participants determine the shares of renewable (DRB) and non-renewable woody biomass (NRB) in the total biomass consumption (i.e. B_y - the quantity of woody biomass used in the absence of the project activity). A national-level default value for fNRB can be derived by calculating Total Annual Biomass Removals (R) from each country as a proxy for B_y and estimating the proportion of R that is demonstrably renewable (DRB) and non-renewable (NRB).

$$NRB = R - DRB \quad \textbf{(2)}$$

Where:

R	Total annual biomass removals (t/yr)

5. Total Annual Biomass Removals (R) for each 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). Given biomass growth (MAI) and change in stock (ΔF) are both known, the balancing removals (R) can be calculated as the sum of the two:

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

Where:

R	Total annual biomass removals (t/yr)
MAI	Mean Annual Increment of biomass growth (t/yr)
ΔF	Annual change in living forest biomass (t/yr)

6. Mean Annual Increment of biomass growth (MAI) is calculated in equation 4 as the product of the Extent of Forest (F) in hectares and the country-specific Growth Rate (GR) of the Mean Annual Increment:

$$MAI = F \times GR \quad \textbf{(4)}$$

Where:

MAI	Mean Annual Increment of biomass growth (t/yr)
F	Extent of forest (ha)
GR	Annual Growth rate of biomass (t/ha-yr)

7. Demonstrably renewable biomass (DRB) is calculated in equation 5 as the product of Protected Area Extent of Forest (PA) in hectares and the country-specific Growth Rate (GR) of the Mean Annual Increment:

$$DRB = PA \times GR \quad \textbf{(5)}$$

Where:

PA	Protected Area Extent of Forest (ha)

Parameter	Units	Description	Source	Considerations
fNRB	%	Fraction of non-renewable biomass	Equation 1	
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. Accounts for all removals (not only woodfuels), which is equivalent to the sum of Mean Annual Increment of biomass growth 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

Parameter	Units	Description	Source	Considerations
GR	t/ha-yr	Growth Rate of biomass	Distribution of total forest area by ecological zone (FAO Global Forest Resources Assessment 2000, Table 14; http://www.fao.org/DOCREP/004/Y1997E/y1997e21.htm#bm73) Above-ground biomass growth rates (t/ha-yr) for different ecological zones (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4, Table 4.9)	Country-specific growth rate calculated as a weighted average based on FAO reporting on distribution of total forest area by ecological zone and IPCC above-ground biomass growth rates for different ecological zones
F	ha	Extent of forest	FAO Forest Resource Assessment (FRA) 2010 Global Tables, Table 2	
PA	ha	Protected area extent of forest	FAO Forest Resource Assessment (FRA) 2010 Global Tables, Table 6	15% of extent of forest used as default in countries with no figures on protected areas reported (Burkina Faso, Chad, Dominican Republic, Ethiopia, Guinea-Bissau, Guyana, Mauritania, Samoa, Togo, Trinidad and Tobago). Average protected areas for all other LDCs with available data was 16% of extent of forest.
ΔF	t/yr	Annual change in living forest biomass	Annual change in carbon stock in living forest biomass 2005-2010 (FAO Forest Resource Assessment 2010 Global Tables, Table 11) Carbon stock/Biomass Conversion rate (2003 IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry): 0.5 is used as a default for the carbon fraction of dry matter	Calculated by converting: Annual Change in Carbon Stock in Living Forest Biomass 2005-2010 (t-carbon/yr) to Annual Change in Living Forest Biomass 2005-2010(t/yr)

III. Default values of fNRB

8. The default values of fNRB are summarized in the table below and the detailed calculation for the proposed default values is shown in the Annex 2.

Country	Default values of fNRB
Angola	97%
Bangladesh	83%
Benin	81%
Bhutan	40%
Burkina Faso	90%
Burundi	77%
Cambodia	76%
Cape Verde	89%
Chad	92%
Cuba	40%
Dominican Republic	85%
DR Congo	90%
Equatorial Guinea	68%
Eritrea	97%
Ethiopia	88%
Fiji	90%
Gambia	91%
Grenada	88%
Guinea	96%
Guinea-Bissau	85%
Guyana	85%
Haiti	96%
Jamaica	65%
Liberia	97%
Madagascar	72%
Malawi	81%
Mali	73%
Mauritania	85%
Mauritius	100%
Mozambique	91%
Myanmar	95%
Nepal	86%
Niger	82%
Papua New Guinea	99%
Rwanda	98%
Samoa	85%
Senegal	85%
Sierra Leone	95%
Sudan	81%
Togo	97%
Trinidad and Tobago	85%
Uganda	82%
UR Tanzania	96%
Zambia	81%

Annex 1

DIFFERENTIATION BETWEEN NON-RENEWABLE AND RENEWABLE WOODY BIOMASS

1. 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:

Demonstrably renewable woody biomass[1] (DRB)

Woody[2] biomass is "renewable" if one of the following two conditions is satisfied:

2. The woody biomass is originating from land areas that are forests[3] where:

   (a) The land area remains a forest;

   (b) 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

   (c) Any national or regional forestry and nature conservation regulations are complied with.

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

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

   (b) 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

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

Non-renewable biomass

4. Non-renewable woody biomass (*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 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;

---

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

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

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

- 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;
- Increasing trends in fuel wood prices indicating a scarcity of fuel-wood;
- Trends in the types of cooking fuel collected by users that indicate a scarcity of woody biomass.

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

$$f_{NRB,y} = \frac{NRB}{NRB + DRB} \quad \textbf{(6)}$$

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

Annex 2

CALCULATION FOR THE DEFAULT VALUES OF fNRB FOR LDCs and SIDs

	F	GR	MAI	ΔF	R	PA	DRB	NRB	fNRB
Country	Extent of Forest (ha)	Growth Rate of biomass (t/ha-yr)	Mean Annual Increment (t/yr)	Annual Change in Living Forest Biomass (t/yr)	Total Annual Biomass Removals (t/yr)	Protected Areas Extent of Forest (ha)	Biomass Growth in Protected Areas (t/yr)	Total Annual Removals - Protected Area Growth (t/yr)	fNRB = NRB/(NRB+DRB)
Angola	58,480,000	3.17	185,308,500	(18,000,000)	203,308,500	1,862,000	5,900,213	197,408,288	97%
Bangladesh	1,442,000	4.93	7,113,386	0	7,113,386	247,000	1,218,451	5,894,935	83%
Benin	4,561,000	3.02	13,753,696	(6,000,000)	19,753,696	1,263,000	3,808,577	15,945,119	81%
Bhutan	3,249,000	2.26	7,331,369	4,000,000	3,331,369	883,000	1,992,490	1,338,879	40%
Burkina Faso	5,649,000	2.18	12,316,232	(6,000,000)	18,316,232	847,350	1,847,435	16,468,797	90%
Burundi	172,000	2.38	408,500	0	408,500	40,000	95,000	313,500	77%
Cambodia	10,094,000	4.09	41,279,413	(12,000,000)	53,279,413	3,092,000	12,644,734	40,634,679	76%
Cape Verde	85,000	0.68	57,375	0	57,375	9,000	6,075	51,300	89%
Chad	11,525,000	0.80	9,266,100	(8,000,000)	17,266,100	1,728,750	1,389,915	15,876,185	92%
Cuba	2,870,000	3.30	9,471,000	6,000,000	3,471,000	634,000	2,092,200	1,378,800	40%
Dominican Republic	1,972,000	8.93	17,600,100	0	17,600,100	295,800	2,640,015	14,960,085	85%
DR Congo	154,135,000	7.29	1,123,721,218	(80,000,000)	1,203,721,218	16,297,000	118,813,279	1,084,907,939	90%
Equatorial Guinea	1,626,000	9.70	15,772,200	(2,000,000)	17,772,200	586,000	5,684,200	12,088,000	68%
Eritrea	1,532,000	0.98	1,495,615	(504,800)*	2,000,415	55,000	53,694	1,946,721	97%
Ethiopia	12,296,000	1.77	21,803,882	(6,000,000)	27,803,882	1,844,400	3,270,582	24,533,300	88%
Fiji	1,014,000	8.20	8,314,800	840,000*	7.474,800	92,000	754,400	6,720,400	90%
Gambia	480,000	2.35	1,128,960	0	1,128,960	43,000	101,136	1,027,824	91%
Grenada	17,000	7.93	134,887	0	134,887	2,000	15,869	119,018	88%

	F	**GR**	**MAI**	**ΔF**	**R**	**PA**	**DRB**	**NRB**	**fNRB**
Country	Extent of Forest (ha)	Growth Rate of biomass (t/ha-yr)	Mean Annual Increment (t/yr)	Annual Change in Living Forest Biomass (t/yr)	Total Annual Biomass Removals (t/yr)	Protected Areas Extent of Forest (ha)	Biomass Growth in Protected Areas (t/yr)	Total Annual Removals - Protected Area Growth (t/yr)	fNRB = NRB/(NRB+DRB)
Guinea	4,940,000	4.09	20,225,595	(6,000,000)	26,225,595	242,000	990,809	25,234,787	96%
Guinea-Bissau	2,022,000	3.93	7,950,504	0	7,950,504	303,300	1,192,576	6,757,928	85%
Guyana	15,205,000	6.34	96,369,290	0	96,369,290	2,280,750	14,455,394	81,913,897	85%
Haiti	101,000	7.88	796,234	0	796,234	4,000	31,534	764,700	96%
Jamaica	337,000	8.66	2,917,746	0	2,917,746	118,000	1,021,644	1,896,102	65%
Liberia	4,329,000	6.52	28,207,764	(8,000,000)	36,207,764	194,000	1,264,104	34,943,660	97%
Madagascar	12,553,000	3.26	40,922,780	(14,000,000)	54,922,780	4,752,000	15,491,520	39,431,260	72%
Malawi	3,237,000	2.65	8,562,674	(2,000,000)	10,562,674	757,000	2,002,454	8,560,220	81%
Mali	12,490,000	2.24	27,924,518	(4,000,000)	31,924,518	3,900,000	8,719,425	23,205,093	73%
Mauritania	242,000	0.68	163,350	0	163,350	36,300	24,503	138,848	85%
Mauritius	35,000	3.15	110,250	0	110,250	0	0	110,250	100%
Mozambique	39,022,000	2.33	91,057,837	(16,000,000)	107,057,837	4,143,000	9,667,691	97,390,147	91%
Myanmar	31,773,000	4.26	135,472,129	(32,000,000)	167,472,129	2,081,000	8,872,864	158,599,265	95%
Nepal	3,636,000	3.15	11,467,944	0	11,467,944	526,000	1,659,004	9,808,940	86%
Niger	1,204,000	2.09	2,511,243	0	2,511,243	220,000	458,865	2,052,378	82%
Papua New Guinea	28,726,000	7.59	217,958,525	(24,000,000)	241,958,525	313,000	2,374,888	239,583,638	99%
Rwanda	435,000	2.38	10,370,000	2,000,000	8,370,000	62,000	147,250	8,222,750	98%
Samoa	171,000	8.20	1,402,200	0*	1,402,200	25,650	210,330	1,191,870	85%
Senegal	8,473,000	2.17	18,365,228	(4,000,000)	22,365,227.50	1,532,000	3,320,610	19,044,618	85%
Sierra Leone	2,726,000	4.51	12,294,260	(4,000,000)	16,294,260	187,000	843,370	15,450,890	95%
Sudan	69,949,000	2.88	201,767,891	(2,000,000)	203,767,891	13,346,000	38,496,537	165,271,354	81%

	F	**GR**	**MAI**	**ΔF**	**R**	**PA**	**DRB**	**NRB**	**fNRB**
Country	Extent of Forest (ha)	Growth Rate of biomass (t/ha-yr)	Mean Annual Increment (t/yr)	Annual Change in Living Forest Biomass (t/yr)	Total Annual Biomass Removals (t/yr)	Protected Areas Extent of Forest (ha)	Biomass Growth in Protected Areas (t/yr)	Total Annual Removals - Protected Area Growth (t/yr)	fNRB = NRB/(NRB+DRB)
Togo	287,000	3.70	1,063,048	(3,718,000)*	4,781,048	43,050	159,457	4,621,591	97%
Trinidad and Tobago	226,000	7.05	1,593,300	0	1,593,300	33,900	238,995	1,354,305	85%
Uganda	2,968,000	5.65	16,778,846	(6,000,000)	22,778,846	731,000	4,132,526	18,646,320	82%
UR Tanzania	33,428,000	2.16	72,087,482	(48,000,000	120,087,482	2,000,000	4,313,000	115,774,482	96%
Zambia	49,468,000	2.61	129,334,086	(16,000,000)	145,334,086	10,680,000	27,922,860	117,411,226	81%

* Annual Change in Living Forest Biomass was not reported for Eritrea, Fiji, Samoa, and Togo. Value assumed to be zero in Samoa given 0% Change in Extent of Forest 2005-2010 (FAO FRA 2010, Table 3). Value in Eritrea calculated as Annual Change Rate 2005-2010 of Forest Extent (-4,000ha/yr from FRA 2010 Table 3) multiplied by Average Biomass Density in Eastern and Southern Africa (126.2 t/ha, calculated from FAO FRA 2010, Table 11, divided by 2003 IPCC carbon stock:biomass conversion factor). Value in Fiji calculated as Annual Change Rate 2005-2010 of Forest Extent (3,000ha/yr from FRA 2010 Table 3) multiplied by Average Biomass Density in Oceania (280.0 t/ha, calculated from FAO FRA 2010, Table 11, divided by 2003 IPCC carbon stock:biomass conversion factor). Value in Togo calculated as Annual Change Rate 2005-2010 of Forest Extent (-20,000ha/yr from FRA 2010 Table 3) multiplied by Average Biomass Density in Western and Central Africa (185.9 t/ha, calculated from FRA 2010, Table 11, divided by 2003 IPCC carbon stock:biomass conversion factor).

- - - - -