

ASB0037-2017

Standardized baseline

Baseline woody biomass consumption for household cookstoves in Mali

Version Draft 01.0



United Nations
Framework Convention on
Climate Change

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1. Introduction

1.1. Background

1. This standardized baseline provides the values for baseline woody biomass consumption per person for household cookstoves to estimate emission reduction from project activities for efficient cookstoves in Mali.

2. Scope, applicability, and entry into force

2.1. Scope and applicability

2. The scope of the standardized baseline covers the values of baseline woody biomass consumption per person for household cookstoves in Mali.
3. Clean development mechanism (CDM) project activities can apply this standardized baseline under the following conditions:
 - (a) The project activity is implemented in Mali; and
 - (b) The approved CDM methodology that is applied to the project activity is small-scale methodology AMS-II.G “Energy efficiency measures in thermal applications of non-renewable biomass” and/or small-scale methodology AMS-I.E “Switch from non-renewable biomass for thermal applications by the user”; and
 - (c) The standardized values are applicable to households using only firewood and/or charcoal in the pre-project scenario as a cooking fuel; households using LPG and/or kerosene in the pre-project scenario as a cooking fuel are not eligible to apply the standardized values in this document¹¹;and
 - (d) The standardized values are not applicable to standalone renewable energy based water treatment technologies under AMS-I.E.
4. Project participants who do not wish to use this standardized baseline may alternatively estimate their own values, by applying the latest applicable version of the methodology.

2.2. Entry into force and validity

5. This standardized baseline enters into force upon adoption by the CDM Executive Board on 30 October 2017. This standardized baseline is valid from 30 October 2017 to 29 October 2020.

3. Normative references

6. This standardized baseline is based on the proposed top-down standardized baseline TSB0009 “Baseline woody biomass consumption for cookstoves in Mali”.

¹¹ One way to demonstrate this condition is to check and record fuel use at the time of distribution of the project stove.

7. This standardized baseline is derived from small-scale methodology AMS-II.G “Energy efficiency measures in thermal applications of non-renewable biomass” and small-scale methodology AMS-I.E “Switch from non-renewable biomass for thermal applications by the user”.
8. For more information regarding proposed new standardized baselines as well as their consideration by the CDM Executive Board please refer to http://cdm.unfccc.int/methodologies/standard_base/index.html.

4. Definitions

9. The definitions contained in the Glossary of CDM terms shall apply.
10. The definitions contained in the latest version of AMS-II.G and AMS-I.E shall apply.
11. The standardized baseline values are expressed as:
 - (a) **Per person** values based on **woodfuel users**, i.e. residents of households that use firewood and/or charcoal as a cooking fuel in the pre-project scenario;
 - (b) **Tonnes of air-dry woody biomass equivalent** (i.e. firewood as such and wood used for the production of the charcoal).
12. The following definitions shall be applied in accordance with FAO Unified Bioenergy Terminology².
 - (a) **Woodfuel**: "All types of biofuels originating directly or indirectly from woody biomass". In this document, firewood and wood-for-charcoal are grouped as woodfuel;
 - (b) **Charcoal**: "Solid residue derived from carbonization distillation, pyrolysis and torrefaction of firewood";
 - (c) **Firewood (fuelwood)**: "Woodfuel where the original composition of the wood is preserved";

5. Parameters and values

13. This standardized baseline shall be used together with the methodologies AMS-II.G (version 08.0) and/or AMS-I.E (version 07.0)³. For the estimation of baseline emissions of project activities, the provisions in the methodology AMS-II.G version 8.0 or AMS-I.E version 7.0 for determining the values of the parameters listed in Table 1 below, do not apply. Instead, standardized values provided in the Table 1 below shall be used.

² FAO (2004): Unified Bioenergy Terminology (UBET)

Accessed on 18 April 2017 from <http://www.fao.org/docrep/007/j4504e/j4504e00.htm>

³ The standardized baseline can be used together with future versions of methodologies AMS-II.G or AMS-I.E as long as the requirements related to the parameter mentioned in Table 1 do not change.

Table 1. Standardized values for AMS-II.G and AMS-I.E

Parameter	Unit	Description	Applicable values	Source																														
$B_{old,p}$ under AMS-II.G	tonnes/ person/ year	Annual quantity of woody biomass that would have been used per person in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices	<p>The following conditions apply:</p> <p>(a) Use values in the table below, according to the location of households (i.e. regions and urban areas or rural areas);</p> <p>Annual per capita consumption values [tonnes/person/year]</p> <table border="1"> <thead> <tr> <th>Region</th> <th>Urban area</th> <th>Rural areas</th> </tr> </thead> <tbody> <tr> <td>Sikasso</td> <td>1.17</td> <td>0.55</td> </tr> <tr> <td>Ségou</td> <td>0.72</td> <td>0.79</td> </tr> <tr> <td>Kidal</td> <td>1.34</td> <td>0.48</td> </tr> <tr> <td>Gao</td> <td>0.49</td> <td>1.03</td> </tr> <tr> <td>Bamako</td> <td>0.53</td> <td>0.65</td> </tr> <tr> <td>Mopti</td> <td>0.74</td> <td>0.68</td> </tr> <tr> <td>Kayes</td> <td>0.96</td> <td>0.68</td> </tr> <tr> <td>Tombouctou and Koulikoro</td> <td>0.90</td> <td>0.73</td> </tr> <tr> <td>National average⁴</td> <td>0.63</td> <td>0.72</td> </tr> </tbody> </table>	Region	Urban area	Rural areas	Sikasso	1.17	0.55	Ségou	0.72	0.79	Kidal	1.34	0.48	Gao	0.49	1.03	Bamako	0.53	0.65	Mopti	0.74	0.68	Kayes	0.96	0.68	Tombouctou and Koulikoro	0.90	0.73	National average ⁴	0.63	0.72	See appendix
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$BC_{BL,PP,y}$ under AMS-I.E	tonnes/ person/ year	Average annual consumption of woody biomass per person before the start of the project activity	<p>(b) The national average value in the table above may be used only if project participants can demonstrate that the regions where the project devices are going to be deployed cannot be precisely identified (e.g. at the time of PDD preparation).</p> <p>(c) Use the classification included in official documents or government publications to identify regions, and urban or rural areas.</p>																															

⁴ See paragraph 5 of Appendix.

Appendix. Rationale and justifications for the standardized value for baseline woody biomass consumption

1. Introduction

1. This appendix provides the rationale and justification for the standardized values of baseline woody biomass consumption per person in Mali ($B_{old,p}$ under AMS-II.G and $BC_{BL,PP,y}$ under AMS-I.E). The relevant data quality objectives of the “Guidelines for quality assurance and quality control of data used in the establishment of standardized baselines” have been followed while developing the proposed standardized baselines.
2. The standardized values can be used to determine the parameter $BC_{BL,PP,y}$ under AMS-I.E (Average annual consumption of woody biomass per person before the start of the project activity) and the parameter $B_{old,p}$ under AMS-II.G (annual quantity of woody biomass that would have been used per person in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device).

2. Standardization of baseline woody biomass consumption - Analysis

3. Taking into account national circumstances in Mali, the DSB has defined a country-specific default value for baseline woodfuel consumption per person, according to the usage of fuels and the location of households (i.e. regions and urban areas or rural areas), based on a review of literature and project design documents (PDDs) and programme design documents (PoA-DDs) available for the country.
4. The registered PDDs and PoA-DDs from the country as well as literature such as national studies and reports were reviewed. The values reported in the registered PDDs and PoA-DDs and in the literature are shown in Table 1 and 2. A detailed explanation of values reported in the literature, PDDs and PoA-DDs is included in paragraphs below.

Table 1. Average annual consumption of woody biomass per person reported in literature reviewed for Mali

Source	Region (Basin)	Ref. year	Standardized values in tonnes air-dry per capita				
			Urban areas		Rural areas		
			Total population (million)	Annual total woodfuel (wood eq.)	Total population (million)	Annual total woodfuel (wood eq.)	
Master Plan of Woodfuel Supply (Schéma directeur d’approvisionnement en bois énergie) for 7 regions (basins) in Mali	Sikasso	2005	0.17	1.17	0.72	0.55	
	Ségou	2007	0.10	0.72	2.10	0.79	
	Kidal	2007	0.01	1.34	0.02	0.48	
	Gao	2009	0.06	0.49	0.48	1.03	
	Bamako	2006	1.39	0.53	1.15	0.65	
	Mopti	2009	0.09	0.74	1.84	0.68	
	Kayes	2009	0.08	0.96	0.35	0.68	
	Tombouctou and Koulikoro	-	-	-	0.90	-	0.73
	National average	-	-	-	0.63	-	0.72

5. Among the available sources, the Master Plan of Woodfuel Supply (Schéma directeur d'approvisionnement en bois energie) for 7 regions (basins) in Mali was more reliable than others. The study was conducted by Ministry of Environment in Mali. The reports of 7 regions contain the information related to the "supply basin", including the stock of wood in the basin, the annual production of woodfuel and the consumption of woodfuel in the city and in the rural parts of the basin. As shown in the table above, the reports provide data on average firewood and charcoal consumption per capita for rural and urban households in the different regions of Mali. These data cover about 65% of the population in Mali (only two regions are not covered: Tombouctou and Koulikoro) and show some variability from one region to another, and between urban and rural households which is to be expected due to income and geographic factors. For the two missing regions (i.e. Tombouctou and Koulikoro), the population weighted average of the 6 regions (i.e. Sikasso, Ségou, Kidal, Gao, Mopti, and Kayes; Bamako was left out because it is more urbanized) was applied due to lack of data. For the national average value, the population weighted average of the 7 regions (i.e. Sikasso, Ségou, Kidal, Gao, Bamako, Mopti, and Kayes) was calculated.
6. The values from the study mentioned above are comparable to the value used in a registered/included **CPA 9941-001**⁵: The baseline charcoal consumption in urban areas reported in the CPA-DD is 2.46 kg/household-day i.e. 0.898 tonnes/household-year. The value has been assessed through Kitchen Performance Test carried out by GERES⁶ according to PCIA guidelines in 2012-2013 and baseline user survey. The value has been further converted to annual per capita charcoal consumption i.e. 0.898 tonnes/person-year (wood equivalent), using average household occupancy rate (6 persons per household) and a default value (6 kg of wood input per kg of charcoal) mentioned below.

Table 2. Average annual consumption of woody biomass per person reported in PoA-DD and other national studies reviewed for Togo

Source	remarks	Ref. year	Standardized values for main users in tonnes air-dry per capita					
			Urban areas			Rural areas		
			Annual firewood consumption	Annual charcoal consumption (wood eq.)	Annual total woodfuel (wood eq.)	Annual firewood consumption	Annual charcoal consumption (wood eq.)	Annual total woodfuel (wood eq.)
CPA 9941-001	GERES 2012-2013	2013		0.898				
I.O. Toure 2001		2000	0.669			0.669		
		2000		0.524			0.524	
J. Morton, 2008	One rural village in SW Mali (Low: 0.291, Mean: 0.380, High: 0.574)	2007				0.380		
Benjaminsen, 1997	Rural villages in SE Mali	1997				0.380		
PREDAS-BEAGGES - Consommations de Combustibles Domestiques au Mali – 2004		2004			0.631			0.292

⁵ CPA 9941-0001 Project Activity for Local Improved Cookstoves in Bamako

⁶ <http://www.geres.eu/en/>

7. The other in-country studies such as those below were also assessed, but they are not recommended due to limited coverage and/or data used is old.
- (a) **I.O. Toure 2001⁷**: The study “Revue des données du bois énergie au Mali (Mali wood energy data review) (FAO 2001)” provides a trend in the development of wood energy consumption from 1995 to 2005. According to this study, firewood and charcoal consumption in 2000 are 7,879,228 m³ and 124,407 tonnes respectively. These values have been converted to annual per capita consumption value, using wood density (0.725 tonnes/m³) and the penetration information of firewood and charcoal (See table 6 for the penetration data).
 - (b) **J. Morton, 2008⁸**: In this study, firewood consumption was estimated by recording the firewood use of several households in Dafela, Mali. The average amount of firewood consumed per person annually is 380 kg. However, as this is the data from the rural village’s population of 986 only, this may not represent the situation of the whole country.
 - (c) **Benjaminsen, 1997⁹**: In this study, firewood consumption data was collected in a village in southern Mali. 67 households were sampled out of 220 in that village. The average consumption of firewood was found to be 1.04 kg/capita/day, which indicates annual per capita firewood consumption of 0.380 [tonnes/person-year]. As this is an old data from one village, it may not be suitable to be used as the basis for standardized values.
 - (d) **CILSS, 2004**: The study “PREDAS-BEAGGES - Consommations de Combustibles Domestiques au Mali – 2004” was conducted by Permanent Interstate Committee for Drought Control in the Sahel (CILSS). The report provides the results of a survey of the fuel consumption of households in different cities and villages.
8. To convert the charcoal consumption value into the woody biomass equivalent of charcoal consumed, a default value (6 kg of wood input per kg of charcoal) provided by the methodology is used¹⁰.
9. In addition, international data sources like FAO and UN Energy statistics were also reviewed, and their summary is described in the attachment. It was considered that these

⁷ Ismail O. Toure, 2001. Revue des données du bois énergie au Mali (Mali wood energy data review) (FAO 2001). Accessed on 18 April 2017 from

<http://www.fao.org/docrep/004/X6794F/X6794F05.htm>

⁸ Jeff Morton. Fuelwood Consumption and Woody Biomass Accumulation in Mali, West Africa. Ethnobotany Research and Applications 04/2008; 5. DOI: 10.17348/era.5.0.37-44. Accessed on 18 April 2017 from

<http://journals.sfu.ca/era/index.php/era/article/view/8>

⁹ Benjaminsen, Tor A. Is there a fuelwood crisis in rural Mali? GeoJournal 43: 163–174. 1997 (October) Kluwer Academic Publishers. Accessed on 18 April 2017 from

http://www.academia.edu/2522911/Is_there_a_fuelwood_crisis_in_rural_Mali

¹⁰ The methodology AMS-II.G provides two options: i) a default wood to charcoal conversion factor of 6 kg of firewood (wet basis) per kg of charcoal (dry basis); ii) credible local conversion factors determined from a field study or literature.

sources are associated with large uncertainties due to various assumptions made and may be disregarded.

3. Recommendation

10. In analysing all available data sources, it was considered that the most reliable data source should be selected, taking into account several factors such as i) whether it is primary or secondary data, ii) what is the geographical coverage of the survey, iii) what is the vintage of the survey, iv) whether it is conservative.
11. The Master Plan of Woodfuel Supply (Schéma directeur d'approvisionnement en bois energie) for 7 regions (basins) in Mali, conducted by Ministry of Environment, was considered as the most reliable source. This comprehensive study provided the data on average consumption of firewood and charcoal in respective regions. While this study was carried out some time ago in 2005 to 2009, the reported values still may be considered relevant, as surveys carried out by recent studies and the CPA-DD cited above have reported comparable values.
12. Based on the above analysis, the following values are recommended as standardized values for the baseline woody biomass consumption per person in Mali based on the study cited in paragraph 11 above:
 - (a) Use values in table 3 below, according to the location of households (i.e. regions, and urban areas or rural areas);

Table 3. Annual per capita consumption values [tonnes/person-year]

Region	Urban area	Rural areas
Sikasso	1.17	0.55
Ségou	0.72	0.79
Kidal	1.34	0.48
Gao	0.49	1.03
Bamako	0.53	0.65
Mopti	0.74	0.68
Kayes	0.96	0.68
Tombouctou and Koulikoro	0.90	0.73
National average	0.63	0.72

- (a) The national average value in the table above may be used only if project participants can demonstrate that the regions where the project devices are going to be deployed cannot be precisely identified (e.g. at the time of PDD preparation).
- (b) Use the classification included in official documents or government publications to identify regions, and urban or rural areas.

Attachment. The values reported in international data sources

- The following paragraphs provides more details of international data sources listed in table 4.

Table 4. Average annual consumption of woody biomass per person reported in international data sources reviewed for Togo

Source	remarks	Ref. year	Standardized values for main users in tonnes air-dry per capita					
			Urban areas			Rural areas		
			Annual firewood consumption	Annual charcoal consumption (wood eq.)	Annual total woodfuel (wood eq.)	Annual firewood consumption	Annual charcoal consumption (wood eq.)	Annual total woodfuel (wood eq.)
FAOstat 2016 [1]		2014	0.464			0.464		
		2014		0.428			0.428	
Energy Statistic Database (2016) of the United Nations Statistic Division. [2]		2013	0.678			0.678		
		2013		1.282			1.282	

References and notes:

- FAOstat. Accessed on 31 August 2016 from <http://faostat3.fao.org/download/F/FO/E>
- Energy Statistic Database (2016) of the United Nations Statistic Division. Accessed on 31 August 2016 from <http://data.un.org/Explorer.aspx?d=EDATA>
- The data for firewood and for charcoal are presented in terms of woody biomass equivalent (air-dry) per person per year. The data is representative of main users of biomass fuel. Per capita consumption values relative to the total population were transformed to the values relative to main users, based on the information on the penetration (i.e. the main source of fuels used for cooking in urban and rural areas) from the UNDP and WHO (2009)¹¹. See the table below for the values used for conversion.
- Conversion factors and assumptions applied in transformation of consumption values are as follows:

¹¹ The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa (New York: UNDP and WHO, 2009)

Table 5. Conversion factors and assumptions applied in transformation of consumption values

Assumed moisture fraction of air-dry wood	Assumed air-dry wood t/ m ³	Assumed fraction of hh consumption to total consumption	Assumed kg ad wood / kg of charcoal
0.2 ^a	0.725 ^a	0.95	6 ^a

a Default value

Table 6. Population data, firewood and charcoal penetration

	Rural population ^a ('000)	Urban population ('000)	Total population ('000)	Rural firewood penetration ^b	Urban firewood penetration	Rural charcoal penetration	Urban charcoal penetration
2014	9,596	6,172	15,768	92.5	59.9	4.5	37.6
2013	9,431	5,870	15,302	92.5	59.9	4.5	37.6
2000	7,351	2,910	10,261	92.5	59.9	4.5	37.6

a Population data is from UN population statistics. World Urbanization Prospects: The 2014 revision

b WHO and UNDP, The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa (New York: UNDP and WHO, 2009)

4. It was considered that the above calculated values are associated with large uncertainties due to various assumptions made and therefore less reliable. Therefore, these values were not selected considering that superior information was available through other sources.

Document information

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