



**Proposed standardized baseline submission form  
(Version 02.0)**

*To be used by a designated national authority (DNA) when submitting a proposed standardized baseline in accordance with the "Procedure: Development, revision, clarification and update of standardized baselines" (CDM-EB63-A28-PROC).*

**INFORMATION TO BE COMPLETED BY THE DNA**

|  |  |
|--|--|
| <b>Title of the proposed standardized baseline:</b>  | Standardised Baselines for cookstoves in Senegal                       |
| <b>Name(s) of the Party or Parties to which the proposed standardized baseline applies:</b>  | Senegal  |
| <b>DNA submitting this form:</b>   | Direction de l'Environnement et des Etablissements Classés<br>Senegal  |
| <b>Is this one of the first three submissions for a Party with 10 or fewer than 10 registered CDM project activities as of 31 December 2010?</b><br><i>(For such a Party, the submission of an assessment report may be omitted. Not required to check Yes or No if the submission is for a group of Parties.)</i> | <input checked="" type="checkbox"/> Yes<br><input type="checkbox"/> No |

**Attachments:**

- ☒ Additional documentation supporting the submission (e.g. relevant data, documentation, statistics, studies, calculation tables, etc.), where applicable (Please specify below \_\_\_\_\_)
- Calculation of the emission factors (Excel file)*
- ☐ Data used to establish the proposed standardized baseline
- ☐ An assessment report on the quality of the data collection, processing and compilation prepared by a designated operational entity (DOE)
- ☐ Letters of approval of all the DNAs of the Parties to which the proposed standardized baseline applies, where the standardized baseline applies to a group of Parties

|   |  |
|---|--|
| <b>Name of authorized officer signing for the DNA:</b>  | Mme Madeleine DIOUF SARR   |
| <b>Date (DD/MM/YYYY) and signature for the DNA:</b>   |  |
| <b>Contact information of the focal point(s) of the DNA:</b><br><i>(Names, email-addresses and phone contacts for procedural and technical communication on the submission)</i> | Direction de l'Environnement et des Etablissements Classés<br>106, Rue Carnot<br>Dakar<br>BP 6557 Dakar Etoile<br>Sénégal<br>Tél: (221) 821 07 25<br>Fax: (221) 822 62 12<br>env@sentoo.sn |

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|  |   |
|--|---|
|  | Représentante de l'AND du Sénégal<br>Mme Madeleine DIOUF SARR<br>Mobile: (221) 770682533<br>madodioufsarr@yahoo.fr  |
| <b>Name(s) of the proponent(s) of the proposed standardized baseline:</b>  | The Designated National Authority of Senegal  |
| <b>Affiliation of the proponent(s):</b><br><i>(The definition of "admitted observer organization" can be found at <a href="http://unfccc.int/resource/ngo/art7_6.pdf">http://unfccc.int/resource/ngo/art7_6.pdf</a>)</i>   | <input checked="" type="checkbox"/> Party<br><input type="checkbox"/> Project Participant (PP)<br><input type="checkbox"/> International Industry Organization<br><input type="checkbox"/> Admitted Observer Organization |
| <b>Contact information of the focal point(s) of the proponent (s):</b><br><i>(Names, email-addresses and phone contacts for procedural and technical communication on the submission. Not required to complete this section if the DNA(s) is(are) the proponent(s) of the proposed standardized baseline.)</i> | N/A   |

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**Proposed standardized baseline submission form  
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**Title: “Standardised Baselines for cookstoves in Senegal”**

**Submission date:** ~~1523/0602/2015~~2016

**Version number:** ~~1-22~~0

**Approach**

*The standardised baselines were developed using an approach contained in the following approved small-scale methodologies:*

- *AMS-II.G Energy efficiency measures in thermal applications of non-renewable biomass (version ~~6~~7.0)*
- *AMS-I.E Switch from non-renewable biomass for thermal applications by the user (version 6.0)*

*For demonstration of additionality, the following guidelines are applied:*

- *Guidelines on the demonstration of additionality of small-scale project activities (version 9.0)*
- *Guidelines for sampling and surveys for CDM project activities and programme of activities (version 3.0).*

**Elements to be standardized**

*Please check below all the elements to be standardized by the proposed standardized baseline.*

- ☒ Additionality demonstration
- ☒ Baseline identification
- ☒ Baseline emission/removal estimation
- ☐ Land eligibility demonstration (applicable only to afforestation and reforestation project activities).

**Further inputs requested to the DNA (To be completed by the secretariat)**

*Please provide a list of additional information and/or modifications that are required.*

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**SECTION A: PROPOSED STANDARDIZED BASELINE DEVELOPED USING THE  
“GUIDELINES FOR THE ESTABLISHMENT OF SECTOR SPECIFIC STANDARDIZED  
BASELINES”**

*Please complete this section only when the proposed standardized baseline is developed using the  
“Guidelines for the establishment of sector specific standardized baselines”.*

**Applicability of the proposed standardized baseline**

N/A

**Additionality demonstration**

N/A

**Baseline identification**

N/A

**Baseline emission factor estimation**

N/A

**Use of the proposed standardized baseline with an approved methodology**

N/A

**Validity of the proposed standardized baseline**

N/A

**Deviations from the guidelines (if applicable)**

N/A

**References and any other information**

N/A

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**SECTION B: PROPOSED STANDARDIZED BASELINE DEVELOPED USING A  
METHODOLOGICAL APPROACH CONTAINED IN AN APPROVED METHODOLOGY**

**Applicability of the proposed standardized baseline**

The proposed standardized baselines are applicable under the following conditions:

- Host country(ies) or region(s) within a host country to which the standardized baselines are applicable: **Senegal**
- Sector(s) to which the standardized baselines are applied: **Households Energy Supply**
- Output(s) to which standardized baselines are applied: **Households Cooking**
- The standardized values are not applicable to standalone renewable energy based water treatment technologies under AMS-IE.
- The measure(s) to which the proposed standardized baselines are applicable is/are:
  - ☒ Fuel and feedstock switch;
  - ☒ Switch of technology with or without change of energy source (including energy efficiency improvement);

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**Additionality demonstration (if applicable)**

For demonstration of additionality, the proposed standardised baselines have followed the “Guidelines on the demonstration of additionality of small-scale project activities”, version 09.0. Clause 2 of the guideline declares that documentation of barriers is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW).

Clause 2 part c of this guideline states that “*Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds*”.

Cook stoves are isolated units, where the users are households. The size of each unit is less than 5% of the small-scale thresholds:

- For type I projects (introduction of renewable energy technologies), the capacity threshold is 5% of 45MW<sub>th</sub> per year, i.e., 2.25 MW<sub>th</sub>.
- For Type II projects (energy efficiency improvement project activities which reduce energy consumption), the generation threshold is equal to 5% of 180 GWh<sub>th</sub> per year, i.e., 9 GWh<sub>th</sub> per year.

The tables below provide the calculation of the maximum capacity of cookstove and the energy savings due to the introduction of improved cookstove. For type I projects, the maximum capacity is equal to

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8kW<sub>th</sub>, which is below the threshold of 2.25 MW<sub>th</sub>. For type II projects, the energy savings is equal to 0.0125 GWh<sub>th</sub>, which is below the threshold of 9 GWh<sub>th</sub> per year.

**Table 1 Demonstration of the 5% rule for type I projects**

| Parameter  | Unit                  | Value        | Source                 |
|--|-----------------------|--------------|------------------------|
| Fuelwood consumption per year per capita                                 | tonnes/pers/year      | 0.53         | WB survey              |
| Number of persons per household  | pers/household        | 8.0          | Grand recensement 2013 |
| Fuelwood consumption per year per household                              | tonnes/household/year | 4.2          | Calculated             |
| NCV of fuelwood  | TJ/tonne              | 0.015        | AMS-I.E                |
| Energy consumption stove   | MWh-th per year       | 17.67        | Calculated             |
| <b>Maximum capacity</b> (assuming the stove is used for 6 hours per day) | <b>MW-th</b>          | <b>0.008</b> | <b>Calculated</b>      |

**Table 2. Demonstration of the 5% rule for type II projects**

| Parameter                                   | Unit                  | Value         | Source                  |
|---|-----------------------|---------------|-------------------------|
| Fuelwood consumption per year per capita    | tonnes/pers/year      | 0.53          | WB survey               |
| Number of persons per household             | pers/household        | 8.0           | Grand Recensement 2013  |
| Fuelwood consumption per year per household | tonnes/household/year | 4.2           | Calculated              |
| Efficiency of traditional cookstove         | Fraction              | 0.12          | Standardized baseline   |
| Efficiency of ICS                           | Fraction              | 0.40          | Conservative estimation |
| NCV of fuelwood                             | TJ/tonne              | 0.015         | AMS-II.G                |
| Fuel savings                                | tonnes/CS/year        | 3.00          | Calculated              |
| <b>Energy savings per appliance</b>         | <b>GWhth/CS/year</b>  | <b>0.0125</b> | <b>Calculated</b>       |

Therefore, it can be concluded that household improved cook stoves projects in Senegal are automatically additional and no further demonstration of additionality is required.

**Baseline identification (if applicable)**

According to AMS-I.E paragraph 10 and AMS-II.G paragraph 4210, it is assumed that in the absence of the project activity, the baseline scenario would be the projected use of fossil fuels to meet similar thermal energy needs as those provided by the project devices.

**Table 3. Baseline identification**

| Measure  | Baseline Description (as per methodology)  | Identified Baseline   |
|--|--|---|
| Measure: Fuel Switch<br>Methodology: AMS-I.E         | <i>This category comprises of thermal applications of non-renewable biomass.</i>                       | As per the SIE Report <sup>1</sup> , the energy sector is predominantly dependent on wood fuel, which accounts for up to 56% of the country total energy needs. The high demand for fuel wood has resulted into depletion of forests leading to land degradation. |
| Measure: Energy Efficiency<br>Methodology: AMS-II.G. | <i>It is to be demonstrated that non-renewable biomass has been used since 31 December 1989, using</i> | The other sources of energy are petroleum and electricity and accounting for 36% and 8% respectively. Biomass contributes to 85% of the   |

<sup>1</sup> Système d'Information Energétique du Sénégal, SIE Sénégal, Rapport 2010.  
[http://www.compagnie3e.com/images/stories/documentation/energie-conventionnelle/Rapport\\_SIE\\_Senegal.pdf](http://www.compagnie3e.com/images/stories/documentation/energie-conventionnelle/Rapport_SIE_Senegal.pdf)

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|  | <p><i>survey methods or referring to published literature, official reports or statistics.</i></p> | <p>energy needs for households.</p> <p>According to FAO data, non-renewable biomass has been in use in all the host countries since 31 December 1989<sup>2</sup>. Use of non-renewable biomass can be demonstrated when there is a depletion of biomass stock in forests or a reduction of forest coverage, which means that there has been an unsustainable use of the biomass resources. Between 1990 and 2000, Senegal lost an average of 45,000 hectares of forest per year<sup>3</sup>. Degradation in many classified forests is reportedly severe. Protected areas, including national parks, nature reserves, and special reserves are frequently degraded by pressures such as cutting of timber, poaching, bushfires and encroachment of human populations<sup>4</sup>.</p> |
|--|--|---|

Therefore, these standardised baselines will follow the baseline scenario as identified in AMS-I.E and AMS-II.G – thus *the baseline scenario would be the use of fossil fuels to meet similar thermal energy needs as those provided by the project devices.*

**Baseline emission estimation (if applicable)**

In the following section, the relevant equations and parameters of the AMS-II.G and AMS-I.E are detailed.

The data used comes from a survey realised by the World Bank in 2013 on the fuels used by the households and their consumption uses: “SEMIS, 2013. *Enquête Nationale sur les combustibles domestiques et les pratiques des ménages*. Deuxième Projet de Gestion Durable et Participative des Énergies Traditionnelles et de Substitution (PROGEDE 2), Banque Mondiale. Dakar, Sénégal” (World Bank Survey).

AMS-II.G: Energy efficiency measures in thermal applications of non-renewable biomass

The methodology AMS-II.G is applicable to technologies and measures that include the introduction of high efficiency cook stoves to replace the existing devices and/or energy efficiency improvements in existing woody biomass and charcoal fired cookstoves.

The proposed standardized baselines approach is built upon the framework described in the paragraphs [43-11](#) and [44-12](#) of AMS-II.G. The emission reductions are calculated as per the following formula:

<sup>2</sup> Page 230, Table 3, Global Forest Resources Assessment 2010, <http://www.fao.org/docrep/013/i1757e/i1757e.pdf>

<sup>3</sup> <http://rainforests.mongabay.com/deforestation/archive/Senegal.htm>

<sup>4</sup> CODIT. 2008. Senegal biodiversity and tropical forests assessment. Prosperity, livelihoods and conserving ecosystems. USAID Programme, Senegal. Available from: [http://pdf.usaid.gov/pdf\\_docs/PNADL464.pdf](http://pdf.usaid.gov/pdf_docs/PNADL464.pdf).

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$$ER_y = \sum_i ER_{y,i}$$

Where:

- $i$  = Indices for the situation where more than one type of project device is introduced to replace the pre-project devices<sup>5</sup>
- $ER_y$  = Emission reductions during year  $y$  in t CO<sub>2</sub>e
- $ER_{y,i}$  = Emission reductions by project device of type  $i$  during year  $y$  in t CO<sub>2</sub>e

For cook stoves:

$$ER_{y,i} = \sum_{a=1}^{a=y} B_{y,savings,i,a} \times N_{y,i,a} \times \frac{\mu_{y,i}}{365} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel} - LE_y$$

Where:

- $ER_y$  Emission reductions during year  $y$  in t CO<sub>2</sub>e
- $a$  'a' is the indices for the age (in years) of the cook stoves that are operating in the year  $y$  of the crediting period. At any year  $y$  of the crediting period (e.g.  $y=1,2,3,\dots,7$  or 10) there will be a population  $N_{y,i,a}$  operational devices of the type  $i$  with age varying from  $a=1$  (the cook stoves installed during the current year  $y$ ) to  $a=y$  (the cook stoves installed during the first year of the crediting period). Since the lifetime of cook stoves is often shorter than the length of the crediting period and cookstoves are likely to show significant efficiency losses over time, this aspect needs to be captured through the monitoring plan.
- $B_{y,savings,i,a}$  Quantity of woody biomass that is saved in tonnes per cook stove device of type  $i$  and age  $a$  in year  $y$
- $f_{NRB,y}$  Fraction of woody biomass saved by the project activity in year  $y$  that can be established as non-renewable biomass
- $NCV_{biomass}$  Net calorific value of the non-renewable woody biomass that is substituted
- $EF_{projected\_fossilfuel}$  Emission factor for the fossil fuels projected
- $N_{y,i,a}$  Number of project devices of type  $i$  and age  $a$  operating in year  $y$
- $\mu_{y,i}$  Number of days of utilization of the project devices of type  $i$  operating in year  $y$
- $LE_y$  Leakage emissions in the year  $y$

<sup>5</sup>. For example, in some instances, full replacement of the pre-project device would require the implementation of more than one project device (e.g. one stove suitable for cooking and the other stove suitable for cooking/boiling water).



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$B_{y,savings,i,a}$  can be estimated using several methods, which require annual sampling of project devices to determine the efficiency of each batch of project devices. Alternatively, the result of a sampling of the first batch may be used as proxy to the subsequent batches.

Option 2-3 (water boiling test, WBT), which is already the most standardized option, described in the paragraph 17 of the methodology, is used to calculate  $B_{y,savings,i,a}$  for these standardized baselines as followed:

$$B_{y,savings,i,a} = B_{old,i} * (1 - \frac{\eta_{old}}{\eta_{new,i,a=1} * \Delta\eta_{y,i,a}})$$

Where:

|                      |   |
|----------------------|---|
| $B_{old,i}$          | Annual quantity of woody biomass that would be used in the absence of the project activity to generate thermal energy equivalent to that provided by the project device type $i$ , if the project device operates throughout the year $y$ .   |
| $\eta_{old}$         | Efficiency of the pre-projects device (fraction), determined using the option (b) of the methodology: default value of 0.10 for three stone fire using firewood, or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be used. Use weighted average values taking the amount of woody biomass consumed by each device as the weighting factor if more than one type of device is being replaced. |
| $\eta_{new,i,a=1}$   | Thermal efficiency of the device of the type $i$ being deployed as part of the project activity (fraction), using the WBT protocol carried out in accordance with national standards (if available) or international standards or guidelines, for the initial efficiency determined in the year of its installation ( $a=1$ )   |
| $\Delta\eta_{y,i,a}$ | Factor to consider the efficiency loss of the project device type $i$ due to its aging at the year $y$ .  |

As per methodology, para 4932,  $B_{old,i}$  can be determined, in the following manner:

- (a) Estimated as the annual consumption of woody biomass (tonnes/year) derived from historical data or a sample survey of local usage;

~~(b) Calculated from thermal energy generated.~~

~~(c)(b)~~ Default Value of 0.5 tonne per capita per year

To simplify the calculation approach,  $B_{old,i}$  is determined on per ~~capita household~~ basis. ~~7~~

$$B_{old,i} = B_{old,capita,i} * N_{capita,household}$$

~~Where,~~

~~$B_{old,i}$  Annual quantity of woody biomass that would be used in the absence of the project activity to generate thermal energy equivalent to that provided by the project device type  $i$ , if the project device operates throughout the year  $y$ .~~

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$B_{old, capita, i}$  Annual quantity of woody biomass consumed per person in the year y

$N_{capita\_household}$  Number of people per household

AMS-IE Switch from non-renewable biomass for thermal application by the user

This methodology is applicable to activities to displace the use of non-renewable biomass by introducing renewable energy technologies.

Emission reductions are calculated as per Paragraph 11 of the methodology:

$$ER_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel} - PE_{BC,y}$$

Where:

$ER_y$  Emission reductions during the year y in tCO<sub>2</sub>e

$B_y$  Quantity of woody biomass that is substituted or displaced in tonnes

$f_{NRB,y}$  Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods or government data or approved default country specific fraction of non-renewable woody biomass ( $f_{NRB}$ ) values available on the CDM website<sup>6</sup>

$NCV_{biomass}$  Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)

$EF_{projected\_fossilfuel}$  Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO<sub>2</sub>/TJ<sup>7</sup>

$PE_{BC,y}$  Project emissions due to cultivation of biomass

The proposed standardised baselines will build *inter alia* on the following parameters that have already been standardized in the current version of the approved methodologies AMS-II.G and AMS-IE.

<sup>6</sup> Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/DNA/fNRB/index.html>.

<sup>7</sup> This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. It is assumed that the mix of present and future fuels used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression over solid fuel in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices). Thus a 50% weight is assigned to coal as the alternative solid fossil fuel (96 tCO<sub>2</sub>/TJ) and a 25% weight is assigned to both liquid and gaseous fuels (71.5 tCO<sub>2</sub>/TJ for kerosene and 63.0 tCO<sub>2</sub>/TJ for liquefied petroleum gas (LPG)).

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**Table 4. Parameters already standardized in the methodologies**

| Parameters                     | Description  | Values                    | Source  |
|--------------------------------|--|---------------------------|---|
| $f_{NRB,y}$                    | Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass | 85%                       | Default values endorsed by Senegal DNA and approved by the EB. CDM website <sup>8</sup> .   |
| $NCV_{biomass}$                | Net calorific value of the non-renewable woody biomass that is substituted   | 0.015 TJ/tonne            | AMS-II.G version 6-7 para 13-11 and IPCC values for wood fuel, based on the gross weight of the wood that is “air-dried”. IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 1. |
| $EF_{projected\_fossil\ fuel}$ | Emission factor for the fossil fuels projected   | 81.6 tCO <sub>2</sub> /TJ | AMS-II.G version 6-7 para 13-11. The value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis.  |
| $L_y$                          | Net to gross adjustment factor to account leakage  | 0.95                      | Default value as per AMS-II.G version 6-7 para 30-28. $B_{y,savings,i,a}$ should be multiplied by a net to gross adjustment factor of 0.95 to account for leakages.   |

In addition, the following parameters are standardized in the proposed standardized baselines for Senegal.

**Table 5. Proposed parameters to be standardized**

| Parameter                    | Description  | Value                                 | Source   |
|------------------------------|--|---------------------------------------|--|
| $\eta_{old}$                 | Efficiency of the pre-project device (fraction) for woody biomass stove replacement projects | 0.12                                  | Calculated based on the WB Survey (weighted average)   |
|                              | Efficiency of the pre-project device (fraction) for charcoal stove replacement projects      | 0.20                                  |  |
| $B_{old,household/capita,i}$ | Woody biomass consumption per capita household per year                                      | 0.534.68 tons/capita household / year | Calculated based on the WB Survey (weighted average). The value is adopted for both woody biomass stoves and charcoal stoves replacement projects. |
| $N_{capita\_household}$      | Household occupancy  | 8                                     | 2013 Population and Housing Census. Agence Nationale de la Statistique et de la Démographie (ANSD)   |

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<sup>8</sup> <http://cdm.unfccc.int/DNA/fNRB/index.html>

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The subsequent paragraphs will explain the calculation of these standardized values in more detail.

**Establishment of the efficiency of the pre-project device**

Paragraph 12 of the methodology AMS.I.E provides guidance on the establishment of the baseline efficiency. It states that “a default value of 0.10 may be optionally used if the pre- project device is a three stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be optionally used”.

Assuming that any device, which is currently used, could be replaced, the weighted average value needs to be calculated.

The following cookstoves using woody biomass are being used in Senegal:

**Table 6. Types of cookstoves used in Senegal and their efficiency**

| Traditional / Improved | Name of the stove | Description   | Default efficiency as per AMS.II.G |
|------------------------|-------------------|---|------------------------------------|
| Traditional            | Three stones      | Simple stove, widely used, with a base of three stones  | 0.10                               |
|                        | OS                | Metal stove, which has the form of a circle and three iron feet <sup>9</sup>  | 0.10                               |
| Improved               | Sakkanal/Sakhanal | Made with a steel sheet, with a grid <sup>10</sup>  | 0.20                               |
|                        | Ban Ak Suuf       | Clay and sand stove. Thick circular shield enclosing a single pot resting on three supports with a front opening in the shield to feed the fire <sup>11</sup> | 0.20                               |

The following cookstoves using charcoal are being used in Senegal:

<sup>9</sup> *Energies et Femmes au Sahel. Cas de Sénégal*. Programme Régional de Promotion des Energies Domestiques et Alternatives au Sahel (PREDAS).

<sup>10</sup> P.Laura. *Mise au point d'une gamme de foyers améliorés et réchauds et préparation de la diffusion*. AEDE, Mars 2001. [http://www.aede-ped.org/rapports/rapp\\_laura0301.pdf](http://www.aede-ped.org/rapports/rapp_laura0301.pdf)

<sup>11</sup> L.A. Kristofferson, V.Bokalders. *Renewable Energy Technologies : Their applications in developing countries*. Potts Point, Australia, 1986.

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**Table 7. Types of cookstoves used in Senegal and their efficiency**

| Traditional / Improved | Name of the stove | Description   | Default efficiency |
|------------------------|-------------------|---|--------------------|
| Traditional            | Malgache          | Simple stove, widely used, made of metal with open air gate <sup>12</sup> . | 0.18               |
| Improved               | Sakkanal/Sakhanal | Made with a steel sheet, with a grid <sup>13</sup> .                        | 0.30               |
|                        | Diambar           | Clay stove. <sup>14</sup>   | 0.30               |

The weighting factors are calculated based on a survey realized by the World Bank in 2013. Among other data, the survey reported the annual consumption of wood and of charcoal of the households per cookstoves types. The consumption of charcoal is converted using a default conversion factor wood to charcoal of 6 kg of firewood per kg of charcoal, as per the methodology AMS.II-G, version 67, paragraph 2019.

For the purpose of these standardized baselines, the sampling size was determined using methods described in the “Guidelines for sampling and surveys for CDM project activities and programmes of activities”, version 03.

Five common types of sampling methods are described in the standard: simple random sampling, stratified random sampling, systematic sampling, cluster sampling and multi-stage sampling.

In the case of the WB National survey, a simple random sampling of households was done by region.

**Sampling size calculations**

The sampling size calculations are described below, as seen in the Guidelines for Sampling and surveys for CDM project activities and programmes of activities<sup>15</sup>.

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1) \times 0.1^2 + 1.645^2 p(1-p)}$$

Where:

p=expected proportion

n = Sampling size

N = Number of households

The total number of households in Senegal is estimated at 1,526,794 according to the most recent national census of Senegal conducted in 2013<sup>16</sup>.

<sup>12</sup> The efficiency is taken from the registered CPA 9666-0001: Promoting Efficient Stove Dissemination Use in West Africa – CPA 001 Togo. The Malgache stove was tested by the University of Lomé and an efficiency of 18% was obtained.

<sup>13</sup> P.Laura. *Mise au point d'une gamme de foyers améliorés et réchauds et préparation de la diffusion*. AEDE, Mars 2001. [http://www.aede-ped.org/rapports/rapp\\_laura0301.pdf](http://www.aede-ped.org/rapports/rapp_laura0301.pdf)

<sup>14</sup> Programme Régional de promotion des Energies Domestiques et Alternatives au Sahel (PREDAS) [http://www.cilss.bf/predas/scripts\\_php/equipements/detailsequip.php?code=14](http://www.cilss.bf/predas/scripts_php/equipements/detailsequip.php?code=14)

<sup>15</sup> [https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20131010103828368/meth\\_guid48.pdf](https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20131010103828368/meth_guid48.pdf)

<sup>16</sup> ANSD, National Census 2013. Agence Nationale de la Statistique et de la Démographie (ANSN). *Recensement Général de la Population et de l'Habitat, de l'Agriculture et de l'Elevage (RGPHAE) 2013*. Mars 2014. [http://www.gouv.sn/IMG/pdf/Rapport\\_provisoire\\_RGPHAE\\_2013.pdf](http://www.gouv.sn/IMG/pdf/Rapport_provisoire_RGPHAE_2013.pdf)

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The parameter  $p$  used in the Standard for sampling is the retention rate that can be replaced by the expected proportion of households using a wood stove. According to the latest report of the Energy Information System of Senegal (SIE: Système d'information énergétique du Sénégal), the main energy consumption of households come from firewood (59%) and charcoal (26%), which are mainly used for cooking purpose<sup>17</sup>. A conservative value of 50% is thus chosen for  $p$ .

Using the formula above and the following values of  $N$  and  $p$ , we get the following sampling size.

**Table 8. Determination of the sampling size**

| $N$<br>Number of households | $p$<br>Expected proportion of cook<br>stoves using wood | $n$<br>Sampling size |
|-----------------------------|---|----------------------|
| 1,526,794                   | 50%   | 271                  |

The minimum value of the sampling size is 271. However, in order to be conservative a higher number has been chosen and the number of questionnaires randomly extracted from the World Bank survey is equal to 656, which is above the minimum sampling size calculated. The extraction of data was conducted by Papa Lamine Diouf and Denis Valliere on June 5<sup>th</sup>, 2014 in Dakar, Senegal. The selection of the questionnaires was done randomly and based on the regions in order to cover all Senegal and the urban/rural areas.

The woody biomass consumption and the charcoal consumption per type of stoves was calculated for each household in order to get the following weighting factors:

**Table 9. Woody biomass consumption per types of stoves**

| Annual woody consumption per types of<br>stoves | Total | Efficiency<br>(fraction) | % of total<br>households |
|---|-------|--------------------------|--------------------------|
| 3 stones (tonnes/yr)                            | 628.5 | 0.10                     | 66%                      |
| Ban Ak souf (tonnes/yr)                         | 33.1  | 0.20                     | 3%                       |
| Sakhanal (tonnes/yr)                            | 158.6 | 0.20                     | 17%                      |
| OS (tonnes/yr)                                  | 135.1 | 0.10                     | 14%                      |

**Table 10. Charcoal consumption per types of stoves**

| Annual charcoal consumption per types of<br>stoves | Total | Efficiency<br>(fraction) | % of total<br>households |
|--|-------|--------------------------|--------------------------|
| Malgache (tonnes/yr)                               | 270.7 | 0.18                     | 83%                      |
| Sakhanal (tonnes/yr)                               | 10.6  | 0.30                     | 3%                       |
| Diambar (tonnes/yr)                                | 43.9  | 0.30                     | 14%                      |

A conservative value of 30% is used for the efficient stoves Sakhanal and Diambar.

Applying these weighting factors, the standardized efficiencies are calculated and are equal to:

**Table 11. Baseline stoves efficiency**

|  | Woody biomass stoves | Charcoal stoves |
|--|----------------------|-----------------|
|--|----------------------|-----------------|

<sup>17</sup> SIE Sénégal, Rapport 2010. [http://www.compagnie3e.com/images/stories/documentation/energie-conventionnelle/Rapport\\_SIE\\_Senegal.pdf](http://www.compagnie3e.com/images/stories/documentation/energie-conventionnelle/Rapport_SIE_Senegal.pdf)

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|                   |              |      |      |
|-------------------|--------------|------|------|
| <b>Efficiency</b> | $\eta_{old}$ | 0.12 | 0.20 |
|-------------------|--------------|------|------|

**Establishment of the wood consumption per ~~capita~~household**

The wood consumption per ~~capita~~household value is calculated based on the World Bank Survey, and is equal to ~~0.534.68~~ tons/~~household per annum~~person. This value was calculated by adding the wood and charcoal consumption (converted into wood) of each household and by then dividing it by the number of ~~persons in the~~ household.

The same sampling technique as the one used to calculate the efficiency has been used. For more details, please refer to the spreadsheet.

Further, the comparison with wood consumption value(s) as cited in other literature too has been performed, as follows:

- As per the registered PoA 9007: Distribution of Improved Cook Stoves in Sub-Saharan Africa<sup>18</sup>, the baseline firewood consumption is estimated to be 14.29 kg/household/day. Accounting for seasonal variation and multiple stove usage, the mean baseline household firewood consumption across the whole of Senegal is estimated to be 13.87 kg/stove/day. This would roughly translate to around ~~0.635.06~~ tons/~~householdperson (with 8 persons per household)~~ per year.

- The urban and peri-urban households in the region of Dakar mainly use the traditional Malgache stove and the average consumption of charcoal is cited as 2.5 kg/household/day<sup>19</sup>. This would roughly translate to around ~~0.685.475~~ tons/~~householdperson (with 8 persons per household and~~ charcoal/wood conversion factor as 6).

- The stoves that dominate rural kitchens in Senegal are open fires and traditional metal stoves with firewood consumption around 88.45 kg per week<sup>20</sup>. This would translate to annual consumption of around ~~0.574.6~~ tons/~~householdperson (with 8 persons per household)~~.

**Establishment of the household occupancy**

~~The household occupancy has been determined based on a national Population and Housing Census realized in Senegal in 2013. According to the National Agency of Statistics and Demography (Agence Nationale de la Statistique et de la Démographie—ANSD), the average number of inhabitants per household is 8<sup>21</sup>.~~

**Use of the proposed standardized baseline with the approved methodology**

These standardized baselines will replace the following aspects of the approved methodologies.

<sup>18</sup> PoA Design Document, page 150, Senegal Baseline Report 2012, HED Consulting, [http://cdm.unfccc.int/ProgrammeOfActivities/poa\\_db/XFNYUSZ7QV3L28649RPEJKWMT05HB1/view](http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/XFNYUSZ7QV3L28649RPEJKWMT05HB1/view)

<sup>19</sup> Page 52 of 94, Synthesis report on case studies of 6 African countries, Feb 2007, <http://deafira.net/Reports/Case%20Study%20Synthesis%20Report.pdf>

<sup>20</sup> Table 6, A recipe for success? Randomized free distribution of improved cooking stoves in Senegal, [http://cleancookstoves.org/resources\\_files/a-recipe-for-success.pdf](http://cleancookstoves.org/resources_files/a-recipe-for-success.pdf)

<sup>21</sup> Agence Nationale de la Statistique et de la Démographie (ANSD), *Recensement Général de la Population et de l'Habitat, de l'Agriculture et de l'Elevage (RGPHAE) 2013*, Mars 2014, [http://www.gouv.sn/IMG/pdf/Rapport\\_provisoire\\_RGPHAE\\_2013.pdf](http://www.gouv.sn/IMG/pdf/Rapport_provisoire_RGPHAE_2013.pdf)

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AMS-II.G

**1. Baseline:**

- It is established that woody biomass is used for cooking needs in baseline.
- It is established that non-renewable biomass has been used in Senegal since 31 December 1989.

**2. Additionality:** Implementation of household improved cookstoves is deemed to be automatically additional.

**3. Emission Reduction:** The following parameters are fixed.

**Table 12. Standardized parameters**

| Parameters                             | Value  |
|--|--|
| NCV: Net Calorific Value               | 0.015 TJ/tonne   |
| Emission Factor                        | 81.6 t CO <sub>2</sub> /TJ   |
| Leakage Net to Gross Adjustment Factor | 0.95   |
| Fraction of non-renewable Biomass      | 85%  |
| $\eta_{old, wood}$                     | 0.12   |
| $\eta_{old, charcoal}$                 | 0.20   |
| $B_{old,i}$                            | <u>0.534.68</u> tonnes per <u>household</u> <u>capita</u> per year |

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AMS-I.E.

**1. Baseline:**

- It is established that woody biomass is used for cooking needs in baseline.
- It is established that non-renewable biomass has been used in Senegal since 31 December 1989.

**2. Additionality:** Implementation of renewable energy projects for cooking needs in institutional setups households is deemed to be automatically additional.

**3. Emission Reduction:** The following parameters are fixed.

**Table 13. Standardized parameters**

| Parameters                             | Value  |
|--|--|
| NCV: Net Calorific Value               | 0.015 TJ/tonne   |
| Emission Factor                        | 81.6 t CO <sub>2</sub> /TJ   |
| Leakage Net to Gross Adjustment Factor | 0.95   |
| Fraction of non-renewable Biomass      | 85%  |
| $B_{y,old}$                            | <u>0.534.68</u> tonnes per <u>household</u> <u>capita</u> per year |
| $\eta_{old, wood}$                     | 0.12   |
| $\eta_{old, charcoal}$                 | 0.20   |

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**Validity of the proposed standardized baseline**

These standardized baselines shall be valid for a period of 3 years from the date of approval by the EB. These standardized baselines thereafter will be updated every three years, based on the most recent available data at the time of making the updates, as well as the relevant methodological tool and guidelines.

**Deviations from the approved methodology (if applicable)**

Not applicable.

**References and any other information**

1. SEMIS, 2013. *Enquête Nationale sur les combustibles domestiques et les pratiques des ménages*. Deuxième Projet de Gestion Durable et Participative des Énergies Traditionnelles et de Substitution (PROGEDE 2), Banque Mondiale. Dakar, Sénégal.
2. L.A. Kristofferson, V. Bokalders. *Renewable Energy Technologies : Their applications in developing countries*. Potts Point, Australia, 1986.
3. *Energies et Femmes au Sahel. Cas de Sénégal*. Programme Régional de Promotion des Energies Domestiques et Alternatives au Sahel (PREDAS).
4. P. Laura. *Mise au point d'une gamme de foyers améliorés et réchauds et préparation de la diffusion*. AEDE, Mars 2001. [http://www.aede-ped.org/rapports/rapp\\_laura0301.pdf](http://www.aede-ped.org/rapports/rapp_laura0301.pdf)
5. Programme Régional de promotion des Energies Domestiques et Alternatives au Sahel (PREDAS) [http://www.cilss.bf/predas/scripts\\_php/equipements/detailsequip.php?code=14](http://www.cilss.bf/predas/scripts_php/equipements/detailsequip.php?code=14)
6. Agence Nationale de la Statistique et de la Démographie (ANSD). *Recensement Général de la Population et de l'Habitat, de l'Agriculture et de l'Elevage (RGPHAE) 2013*. Mars 2014. [http://www.gouv.sn/IMG/pdf/Rapport\\_provisoire\\_RGPHAE\\_2013.pdf](http://www.gouv.sn/IMG/pdf/Rapport_provisoire_RGPHAE_2013.pdf)
7. Système d'Information Énergétique du Sénégal, SIE Sénégal, Rapport 2010. [http://www.compagnie3e.com/images/stories/documentation/energie-conventionnelle/Rapport\\_SIE\\_Senegal.pdf](http://www.compagnie3e.com/images/stories/documentation/energie-conventionnelle/Rapport_SIE_Senegal.pdf)

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**SECTION C: PROPOSED STANDARDIZED BASELINE DEVELOPED USING A  
METHODOLOGICAL APPROACH CONTAINED IN AN APPROVED TOOL**

*Please complete this section only when the proposed standardized baseline is developed using a methodological approach contained in the latest version of an approved tool. An example for this is the application of the “Tool to calculate the emission factor for an electricity system” to estimate the emission factor for an electric grid.*

**Applicability of the proposed standardized baseline**

N/A

**Baseline emission factor estimation**

N/A

**Validity of the proposed standardized baseline**

N/A

**Deviations from the approved tool (if applicable)**

N/A

**References and any other information**

N/A

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**SECTION D: PROPOSED STANDARDIZED BASELINE DEVELOPED USING THE  
“GUIDELINE: ESTABLISHMENT OF STANDARDIZED BASELINES FOR  
AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES UNDER THE CDM”**

*Please complete this section only when the proposed standardized baseline is developed using the guideline “Establishment of standardized baselines for afforestation and reforestation project activities under the CDM”.*

**Applicability of the proposed standardized baseline**

N/A

**Additionality demonstration**

N/A.

**Baseline identification**

N/A

**Baseline removals estimation (if applicable)**

N/A.

**Land eligibility demonstration (if applicable)**

N/A

**Validity of the proposed standardized baseline**

N/A

**Deviations from the guideline (if applicable)**

N/A

**References and any other information**

N/A

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**Document information**

| <i>Version</i>  | <i>Date</i>     | <i>Description</i>  |
|---|-----------------|---|
| 02.0  | 1 December 2013 | <p>The document title has changed from “Proposed standardized baseline form” (F-CDM-PSB) to “Proposed standardized baseline submission form” (CDM-PSB-FORM).</p> <p>Revision to:</p> <ul style="list-style-type: none"><li>• Reflect updated requirements in the “Procedure: Development, revision, clarification and update of standardized baselines”</li><li>• Include editorial improvement</li></ul> |
| 01.0  | 23 March 2012   | Initial publication.  |
| Decision Class: Regulatory<br>Document Type: Form<br>Business Function: Methodology<br>Keywords: standardized baselines |                 |   |