



**Monitoring report form for CDM programme of activities  
(Version 02.0)**

*Complete this form in accordance with the instructions attached at the end of this form.*

**MONITORING REPORT**

<b>Title of the PoA</b>	Domestic Cooking Stoves substitution programme in Mozambique	
<b>UNFCCC reference number of the PoA</b>	9981	
<b>Version numbers of the PoA-DD applicable to this monitoring report</b>	05 Dated 10/10/2014	
<b>Version number of this monitoring report</b>	06	
<b>Completion date of this monitoring report</b>	11/01/2019	
<b>Monitoring period number</b>	2 <sup>nd</sup> Monitoring Period	
<b>Duration of this monitoring period</b>	12/07/2016–30/11/2016	
<b>Monitoring report number for this monitoring period</b>	Batch 3 of 3	
<b>Coordinating/managing entity</b>	Fondazione AVSI	
<b>Host Parties</b>	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Mozambique	Yes
<b>Sectoral scopes</b>	03: Energy Demand	
<b>Applied methodologies and standardized baselines</b>	AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass (Version 05.0)	
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period</b>	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	N/A	788 tCO <sub>2</sub> e
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs</b>	1,940 tCO <sub>2</sub> e	

covered in this monitoring report

## PART I Monitoring of programme of activities (PoA)

### SECTION A. Description of PoA

#### A.1. General description of PoA

The aim of the small-scale PoA “Domestic Cooking Stoves substitution programme in Mozambique” is to improve energy efficiency by substituting inefficient traditional cookstoves with more effective ones improving the conditions of the local population living in Mozambique and reducing the greenhouse gas emissions. The PoA and the CPAs under it are type II projects (Energy efficiency improvement project activities that reduce energy consumption) and implemented and monitored in accordance with the methodology AMS-II.G version 05.0.

The stove technology applied in each CPA may vary based on the different locations, climates and traditions and therefore the details concerning stove performance, distribution, and possible assembly will be provided at the CPA level. One example of the used stove models is CH-2200 Charcoal Cookstove which is one of the world’s most fuel-efficient charcoal cookstove models<sup>1</sup>. The stoves distributed under each CPA will be sold with a subsidized price and distributed for users in exchange for the rights to the CERs.

This PoA contributes to the sustainable development in a number of ways:

- i. Environmental
  - The efficient stoves reduce the consumption of charcoal or other biomass based fuel for cooking and thus reduce CO<sub>2</sub> emissions.
  - The potential decrease in charcoal production will also reduce greenhouse gas emissions as charcoal production is responsible for example for the emission of methane (one of the most dangerous GHGs).
  - The project activity will lead to a decrease in the use of woody biomass discouraging the deforestation with consequent decrease of biodiversity loss.
- ii. Social
  - Especially women and children’s overall health will be improved as the amount of indoor air pollutants from the burning of biomass in the family home will be reduced. Less carbon dioxide, carbon monoxide and particulate matter will be emitted. Thus there is a potentiality of reducing the number of deaths from poisoning as well as the respiratory tract infection.
  - Considerably less time will be needed for cooking which has implications on livelihoods and on social relations.
- iii. Economic
  - Costs for fuel purchase will be reduced through increased thermal efficiency, the saved money can be used for other basic needs and therefore reduce poverty.
  - The project activity will also give the opportunity to increase employment. There will be some local people hired for the distribution of the new stoves and the removal of the inefficient traditional stoves.

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<sup>1</sup> Colorado State University, 2013. Emissions and Performance Report CH2200. (Provided to DOE during the validation).

## A.1.1. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
<p>Generic CPA included in version 05 of the PoA 9811.</p> <p>Generic CPA has no title, identification or reference number. It will be henceforth be referred to as "Generic CPA of the PoA 9981 version 05"</p>	05	Sectoral Scope 03: Energy Demand	<p><b>(a) Methodology:</b> AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass (Version 05.0)<sup>2</sup></p> <p><b>(b) Tools:</b></p> <ul style="list-style-type: none"> <li>- General guidelines for SSC CDM methodologies (Version 20.0)</li> <li>- Guidelines on the demonstration of additionality of small-scale project activities (Version 09.0)</li> <li>- Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities (Version 03.0)</li> <li>- General guidance on leakage in biomass project activities (attachment C to appendix B) (Version 03)</li> <li>- Standard for sampling and surveys for CDM project activities and programmes of activities (Version 04.1)</li> <li>- Guidelines for sampling and surveys for CDM project activities and programme of activities (Version 03.0)</li> <li>- Guidelines on assessment of debundling for SSC project activities (version 03)</li> </ul> <p><b>(c) Standardized baselines:</b> N/A</p>

<sup>2</sup> <http://cdm.unfccc.int/methodologies/DB/DCO8WRRQVTGLH1GHQBCL035F5M13R8>

**A.1.2. CPAs included in the PoA**

<b>Title and UNFCCC reference number of the CPA</b>	<b>Title and reference number of the corresponding generic CPA</b>	<b>Version of the PoA-DD</b>	<b>Crediting period type and duration</b>	<b>Covered in this monitoring report? (yes/no)</b>
<b>9981-0001, version 09</b> “Domestic Cooking Stoves in Maputo (Mozambique)”	Generic CPA of the PoA 9981 version 05	05	Renewable crediting period 01/01/2015 – 31/12/2021	No
<b>9981-0002, version 07</b> “Domestic cookstoves in Maputo (Mozambique), phase II”	Generic CPA of the PoA 9981 version 05	05	Renewable crediting period 12/07/2016 – 11/07/2023	No
<b>9981-0003, version 02</b> “Improved Cookstoves in Pemba”	Generic CPA of the PoA 9981 version 05	05	Renewable crediting period 01/08/2016 – 31/07/2023	Yes

**A.2. Coordinating/managing entity**

The coordinating/managing entity (CME) is Fondazione AVSI.  
Via Legnone 4 Milano 20158 Italy  
tel. +39 02 6749881  
email. areaprogetti@avsi.org, giorgio.capitanio@avsi.org, francesca.oliva@avsi.org

**SECTION B. Implementation of PoA****B.1. Description of implemented PoA**

The management system of the PoA is designed to ensure that real, measurable and long term GHG emission reductions for the project activity are monitored and reported. As described in the validated PoA-DD, the management system covers the following:

- A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies
- Records of arrangements for training and capacity development for personnel
- A Procedure for technical review of inclusion of CPAs
- A procedure to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another PoA)
- Records and documentation control process for each CPA under the PoA
- Measures for continuous improvements of the PoA management system

The operationalisation of the management system in case of the CPA 9981-0003 is described below in detail:

- A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies**

The CPA 9981-0003 is implemented by Fondazione AVSI who is the CME of this PoA. In line with the validated management system Carbonsink was responsible of the CPA-DD preparation and for the practical issues during the validation process with the DOE. The CPA 9981-0003 was validated successfully with the DOE and included under the PoA on 01/08/2016.

Both AVSI and Carbonsink are experienced on the carbon project development and are working together in the sector since 2014. Carbonsink is moreover a member of ICROA (international Carbon Reduction and Offset Alliance) and the quality of the Carbonsink's services is thereafter audited annually by an external entity. For more information on the the webpages of AVSI ([www.avsi.org/en/](http://www.avsi.org/en/)) and Carbonsink ([www.carbonsink.it](http://www.carbonsink.it)) may be visited.

**b) Records of arrangements for training and capacity development for personnel**

The CPA 9981-0003 is implemented by CME of the PoA, Fondazione AVSI, who is moreover the implementer of the other two CPA of this PoA (CPA 9981-0001 and CPA 9981-0002) and, therefore, no additional training or capacity development for personnel was not required. Fondazione AVSI has been in charge for the training of the field staff responsible of the stove distribution and monitoring activities and the following training has been organized:

7-8 November 2017: Three days training for the Usage Survey field team organized by AVSI (Anna Benetello) and Carbonsink (Antonio Guiso). The training including initial theoretical training regarding the survey and practical training and follow up during the first days of the Usage Survey implementation in the field. Totally 3 participants (Jose Vintane Malingana Paolo, Antonio Jordao and Marcelino Marques). The KPT Survey has been made by an experienced external entity and thus no training regarding the KPT has been organized by CME.

**c) A Procedure for technical review of inclusion of CPAs**

The CME together with Carbonsink has ensured before the inclusion that the CPA 9981-0003 met all the eligibility criteria. The documents related to the CPA are kept, organized and referred with the clear manner: Hard copies of the original monitoring documents are kept in AVSI officeness and the electronic material of the documents are kept by Carbonsink.

**d) A procedure to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another PoA)**

The CPA 9981-0003 meets the eligibility criteria number 2 of the PoA ("The CPA ensures that double counting of emission reductions is avoided, through the identification of each stove with a unique identification number) as evidenced by the Stove Selling Database which includes the serial number of each distributed efficient cookstove together with the contact details of the user. In addition, it has been cross-checked with other CPAs of this PoA and with voluntary carbon activities operating in the same geographic area and it has been ensured that the CPA is not included in any other CDM project activity or voluntary carbon activity.

**e) Records and documentation control process for each CPA under the PoA**

Carbonsink is maintaining the general database of the CPAs included under the PoA and the separate electronic databases for each CPAs. All data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever is later.

**f) Measures for continuous improvements of the PoA management system**

Carbonsink, who is in responsible for the coordination of the monitoring activities of the current CPAs, is frequently in contact with the CPA implementers working in the field

regarding the stove sellings as well as the monitoring issues to ensure that the work is proceeding and managed following validated CPA-DDs. In case of CPA 9981-0003 this has included monthly double check of the stove selling database by Carbonsink.

## **B.2. Post-registration changes to PoA**

### **B.2.1. Corrections**

N/A

### **B.2.2. Inclusion of monitoring plan**

N/A

### **B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools**

N/A

### **B.2.4. Changes to programme design**

N/A

## **PART II Monitoring of CPAs**

### **SECTION C. Implementation of CPAs**

This section describes the implementation and monitoring of the specific-case CPA nro 9981-0003.

#### **C.1. Description of implemented CPAs**

##### **(a) Purpose of the specific-case CPA and the measures taken for GHG emission reductions or net GHG removals by sinks**

The goal of the small-scale CPA “CPA No. 3: Improved Cookstoves in Pemba” is to improve energy efficiency by substituting inefficient traditional cookstoves with more effective ones and at the same improving the conditions of the local population living in the poor settlements of the city of Pemba in Mozambique. From the project start 15th of July 2015) until the 30<sup>th</sup> of November 2016 (in other words, until the end of this Monitoring Period) totally 955 energy efficient stoves have been distributed.

In the baseline situation most of the households within the project area cook with stoves based on charcoal usage. The used charcoal stoves are characterized by low energy efficiency and as a consequence they are leading to unsustainable usage of non-renewable biomass in the cooking process. The project will thereafter reduce the consumption of charcoal as its substituting inefficient traditional cookstoves with more effective ones.

##### **(b) Description of the technology employed and installed equipment and/or infrastructure, including information requested by the eligibility criteria**

The currently only stove model distributed in the project is Envirofit's CH-2300 Charcoal Cookstove (which is a corresponding model with the CH-2200 stove model)<sup>3</sup>. This Charcoal Cookstove has been tested in accordance with the "Emissions and Performance Test Protocol", with emissions measurements based on the stove testing protocol developed by Colorado State University<sup>4</sup>. This stove model has been selected based on its significant efficiency and the characteristics that match the need and cooking practices of the local population. The stoves are sold with a subsidized price and distributed for the users in exchange for the rights to the CERs. The project activity will be financed with the revenues from the sale of CERs.



Image C-1. CH-2300 Charcoal Cookstove (source: Envirofit)

**(c) Relevant dates for the specific-case CPA (e.g. construction, commissioning, continued operation periods, etc.)**

Step	Time
LSC process	15/07/2015 – 26/04/2016
Project start date (i.e. stove distribution start)	15/07/2015
Inclusion under the PoA and crediting period start date	01/08/2016
This monitoring period	12/07/2016 – 30/11/2016
- Usage Survey	07/11/2017 – 01/12/2017 <sup>5</sup>
- Kitchen Performance Test (KPT)	21/11/2016 – 24/11/2016
Implementation status (number of stoves distributed)	955 stoves distributed by the 30/11/2016

<sup>3</sup> The technical design and consequently the thermal efficiency of the model CH-2300 is completely equal with the initially foreseen CH-2200 model. The only difference between these two models is the small design change in the cooking pot holder which is making it more robust in the usage and more suitable for cooking with different types of pots. The pot holder is made from rugged cast in both models and it is a separate item which can be taken off or changed by the stove users. Therefore, for the stove users the CH-2200 and CH-2300 are totally equal in their daily usage and all the same dishes can be cooked with both models.

<sup>4</sup> Envirofit, 2018

<sup>5</sup> Usage Survey made in 2017 is applied both for the 1<sup>st</sup> Monitoring period and the 2<sup>nd</sup> Monitoring period.

**(d) Total GHG emission reductions or net GHG removals by sinks achieved in this monitoring period for the specific-case CPA, including information on how double counting is avoided.**

During this monitoring period (12/07/2016–30/11/2016), totally 788 tCO<sub>2</sub>e has been achieved. The double counting is avoided as each energy efficient stove included under this project has an unique identification number which has been recorded on the project database to demonstrate that the stove is a part of the project activity.

## **C.2. Location of CPAs**

**Host Party:** The Republic of Mozambique

**Province:** Cabo Delgado

**City:** Pemba

### **Physical/geographical location:**

The project activity is limited within the borders of the community of Pemba located in Province of Cabo Delgado, Mozambique (Imagine C-2).

The address of each project stove owner has been recorded into the Carbon Transfer Forms and in the electronic Stove Selling Database together with the unique serial number of each stove and, when ever possible, with the user's telephonic contact details.



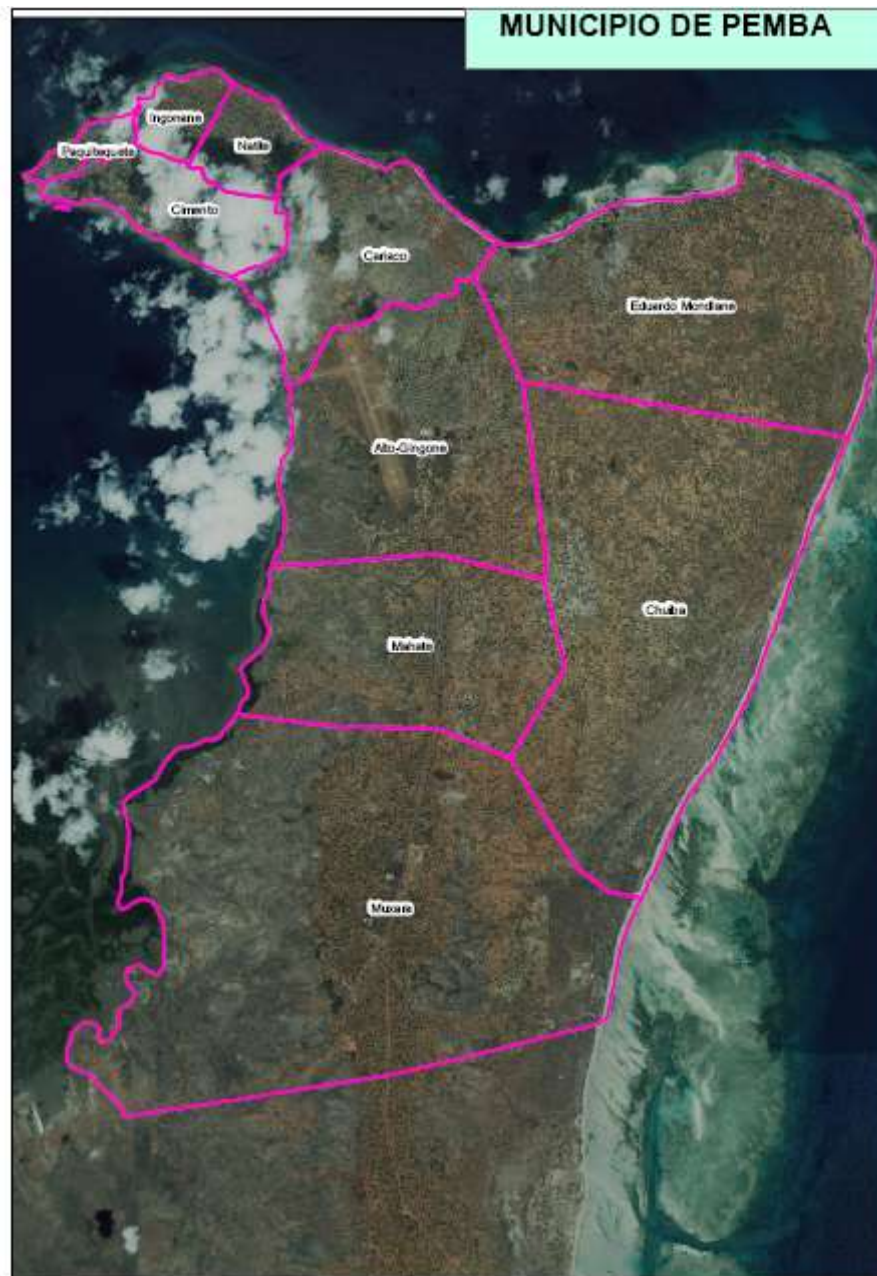


Image C-2. CPA 9981-0003 location within the community of Pemba.

**C.3. Post-registration changes to CPAs****C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies or standardized baselines**

N/A

**C.3.2. Corrections**

N/A

**C.3.3. Changes to the start date of the crediting period**

N/A

**C.3.4. Inclusion of monitoring plan**

N/A

**C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools**

N/A

**C.3.6. Changes to project design**

N/A

**SECTION D. Description of monitoring system of CPAs**

In line with the AMS-II.G the monitoring of the CPAs include the following activities:

- a) Checking of a representative sample of the operating devices at least once in every two years (biennial) to determine if they are still operating (called later on as "Usage Survey") and
- b) Kitchen Performance Test Protocol to determine the fuel consumption per operating device of representative sample of all operating devices annually (called later on as "KPT")

Moreover, monitoring will ensure that:

- Either the replaced low efficiency appliances are disposed of and not used within the boundary or within the region; or
- If baseline stoves continue to be used, monitoring shall ensure that the fuel-wood consumption of those stoves is excluded from  $B_{old}$ .

To account for leakage a net to gross adjustment factor of 0.95 will be applied and therefore the monitoring of leakage is not required.

## The organization of the project monitoring for CPA 9981-0003

Table D-1. The organization of the project monitoring

Actor	Responsibilities and roles
Fondazione AVSI (local desk Mozambique)	<ul style="list-style-type: none"> <li>Coordinates the monitoring activities on the project site</li> <li>Responsible on the data entries into the project database</li> <li>Stores the original distribution and monitoring documents</li> <li>Hires, trains and supervises the distribution and monitoring teams on their work</li> </ul>
Carbonsink	<ul style="list-style-type: none"> <li>Supervises AVSI with the monitoring activities (surveys and stove efficiency testing)</li> <li>Responsible on the distribution and monitoring data assessment</li> <li>Prepares the monitoring report to be provided to the DOE for verification of emission reductions</li> <li>Administrator of the electronic monitoring database</li> </ul>
Distribution team	<ul style="list-style-type: none"> <li>Works under the supervision of AVSI</li> <li>Reports the results to AVSI on the stove distribution</li> </ul>
Monitoring team	<ul style="list-style-type: none"> <li>Works under the supervision of AVSI</li> <li>Implements the monitoring surveys</li> <li>Reports the results to AVSI</li> </ul>

### Record keeping system and data archiving

The purpose of record keeping and data archiving is to provide enough information to enable full monitoring for each monitoring period. The electronic project database of CPA includes the information from the signed Carbon Transfer Forms (unique stove IDs, selling data, end user's address and telephonic contact details when possible) and the data obtained during the monitoring surveys (survey date and answers together with the user's contact details and unique stove IDs).

The administrator of the database is Carbonsink and the data entries has be operated by AVSI. A back-up of the database is made regularly and stored in a hard-copy form like CDs. The original copies of the field documents are stored by AVSI. All data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever is later.

## SECTION E. Data and parameters

### E.1. Data and parameters fixed ex ante

Data/parameter	NCV <sub>biomass</sub>
Unit	TJ/t
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	IPCC default value for wood fuel
Value(s) applied	0.015
Choice of data or measurement methods and procedures	According to the applied methodology (AMS-II.G, paragraph 11) IPCC default for wood fuel, 0.015 TJ/tonne can be used for net calorific value of the non-renewable woody biomass that is substituted (NCV <sub>biomass</sub> ).
Purpose of data/parameter	Calculation of project emissions or actual net GHG removals by sinks
Additional comments	This parameter is fixed at PoA level. This parameter is fixed for entire crediting period of the CPA.

Data/parameter	EF <sub>projected_fossilfuel</sub>
Unit	tCO <sub>2</sub> /TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers
Source of data	AMS-II.G default value
Value(s) applied	81.6
Choice of data or measurement methods and procedures	According the applied methodology (AMS-II.G, paragraph 11) the value of 81.6 tCO <sub>2</sub> /TJ is to be used as emission factor for the substitution of non-renewable woody biomass by similar consumers (EF <sub>projected_fossilfuel</sub> ).
Purpose of data/parameter	Calculation of project emissions or actual net GHG removals by sinks
Additional comments	This parameter is fixed at PoA level. This parameter is fixed for entire crediting period of the CPA.

Data/parameter	B <sub>old</sub>
Unit	t/device/year
Description	Quantity of woody biomass used in the absence of the project activity in tonnes per device
Source of data	Survey on local usage (Baseline KPT)
Value(s) applied	5.9680
Choice of data or measurement methods and procedures	Based on the Baseline KPT the average baseline charcoal consumption per device is to be 835.85 kg/device/year.  Accordance to paragraph 14 of the methodology, the quantity of woody biomass (B <sub>old</sub> ) is determined by using a credible local conversion factor determined from literature. In line with the registered CPA-DD the conversion factor of 7.14 has been chosen based on the study of Brouwer and Falcão, 2004. <sup>6</sup> This same is supported also by recent studies like National Directorate of New and Renewable Energy to elaborate Mozambique's Biomass Energy Strategy (2012): Mozambique Biomass Energy Strategy and Cuvilas et. al. (2010): Energy situation in Mozambique: A review.
Purpose of data/parameter	Calculation of project emissions or actual net GHG removals by sinks
Additional comments	This parameter is fixed at CPA level. This parameter is fixed for entire crediting period of the CPA.  B <sub>old</sub> will be multiplied by a net to gross adjustment factor (LAF) to account for leakages.

Data/parameter	LAF
Unit	Fraction
Description	Leakage adjustment factor to account for leakages
Source of data	AMS-II.G default value
Value(s) applied	0.95
Choice of data or measurement methods and procedures	To account for leakage a net to gross adjustment factor of 0.95 (option c of the paragraph 29 of the AMS-II.G methodology) will be applied: B <sub>old</sub> will be multiplied by a net to gross adjustment factor to account for leakages. In this case surveys are not required.

<sup>6</sup> Brouwer, R. and Falcão, M. P., 2004. Wood fuel consumption in Maputo, Mozambique. Biomass and Bioenergy. Volume 27, Issue 3, September 2004, Pages 233–245. Available at [www.sciencedirect.com](http://www.sciencedirect.com)

Purpose of data/parameter	Calculation of leakage
Additional comments	This parameter is fixed at PoA level. This parameter is fixed for entire crediting period of each CPA.

<b>Data/parameter</b>	$\eta_{old}$
Unit	Fraction
Description	Efficiency of the device being replaced
Source of data	AMS-II.G Default Value
Value(s) applied	0.10
Choice of data or measurement methods and procedures	The baseline charcoal stoves are unimproved models without an improved combustion air supply or flue gas ventilation system. Stoves that lack these types of design characteristics can be assumed to have a low efficiency and thus in accordance to the applied methodology (AMS-II.G, paragraph 12) a default value of 0.10 may be used.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	This parameter has been used only in ER calculations made at the validation of CPA-DD. In line with the registered CPA-DD (Section D.6.1) this parameter is not required for the ex-post calculations as $B_{y,savings}$ is determined using equation 2 of Option 1 of the paragraph 12 of the applied methodology i.e. through the results of the project KPT (and not through the stove efficiencies).

<b>Data/parameter</b>	$\eta_{new,y}$
Unit	Fraction
Description	Efficiency of the device being deployed as part of the project activity in year y
Source of data	Manufacturers' specification
Value(s) applied	0.423
Choice of data or measurement methods and procedures	According the methodology for the <i>ex ante</i> estimations the efficiency of the project systems can be determined as certified by a national standards body or an appropriate certifying agent recognized by that body. Alternatively, manufacturers' specifications may be used.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	This parameter has been used only in ER calculations made at the validation of CPA-DD. In line with the registered CPA-DD (Section D.6.1) this parameter is not required for the ex-post calculations as $B_{y,savings}$ is determined using equation 2 of Option 1 of the paragraph 12 of the applied methodology i.e. through the results of the project KPT (and not through the stove efficiencies).

## E.2. Data and parameters monitored

<b>Data/parameter</b>	$f_{NRB,y}$
Unit	Fraction
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
Measured/calculated/default	Default
Source of data	A default country specific fraction of non-renewable woody biomass ( $f_{NRB}$ ) value available on the CDM website (site visited 15/12/2016) <sup>7</sup>
Value(s) of monitored parameter	0.91
Monitoring equipment	N/A
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	N/A
QA/QC procedures	N/A
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comments	N/A

<b>Data/parameter</b>	$B_{y,new,KPT}$
Unit	t/device/year
Description	Annual quantity of woody biomass used during the project activity in tonnes per device, determined through a survey
Measured/calculated/default	Measured
Source of data	Kitchen performance test (KPT) <sup>8</sup>
Value(s) of monitored parameter	2.5905
Monitoring equipment	N/A
Measuring/reading/recording frequency	Yearly (or biennially) <sup>9</sup>
Calculation method (if applicable)	N/A
QA/QC procedures	<ul style="list-style-type: none"> <li>The sample size will be chosen for a 90/10 precision (90% confidence interval and 10 % margin of error) when annual inspection is chosen in line with the applied methodology</li> <li>The results will be stored for the crediting period of the project activity and an additional two years or until the last issuance of CERs for the project activity, whichever is later.</li> <li>The KPT is conducted by trained monitoring personal</li> </ul>
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks

<sup>7</sup> <http://cdm.unfccc.int/DNA/fNRB/index.html> (site visited 15/12/2016)

<sup>8</sup> 9981-0003\_Project KPT Report 2016

<sup>9</sup> For this monitoring annual monitoring is chosen and thus 90/10 confidence/precision is applied. In fact, according the applied methodology (Footnote 12) Biennial monitoring (i.e. monitoring once every two years) may be chosen, only if the project proponents are able to demonstrate that the efficiency of the cook stove does not drop significantly as compared to the initial efficiency of the new device, over a time period of two years of typical usage.

Additional comments	The KPT resulted that the annual charcoal consumption is 0.36281 t/year. This value is converted as woody biomass <sup>10</sup> as follows: $7.14 \times 0.36281 \text{ t/year/device} = 2,5905 \text{ t/year/device}$ .
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Data/parameter	N <sub>y,i</sub>																			
Unit	Number																			
Description	Number of project devices of type i operating in year y																			
Measured/calculated/default	Measured																			
Source of data	Project database records <sup>11</sup> and usage survey <sup>12</sup> on a representative sample																			
Value(s) of monitored parameter	<div>689</div> <table><tr><th>Year</th><th>Month</th><th>Number of operational devices*</th></tr><tr><td rowspan="5">2016</td><td>July</td><td>689</td></tr><tr><td>August</td><td>689</td></tr><tr><td>September</td><td>689</td></tr><tr><td>October</td><td>689</td></tr><tr><td>November</td><td>689</td></tr><tr><td></td><td></td><td></td></tr></table> <div>*Please refer to the column D of the sub-page “Total CERs” in the ER calculation spreadsheet</div>			Year	Month	Number of operational devices*	2016	July	689	August	689	September	689	October	689	November	689			
Year	Month	Number of operational devices*																		
2016	July	689																		
	August	689																		
	September	689																		
	October	689																		
	November	689																		
Monitoring equipment	N/A																			
Measuring/reading/recording frequency	At least biennially																			
Calculation method (if applicable)	Based on the Usage Survey 82% of the sold devices are considered operational, however the lower bound (72.17%) was used, as reported in Section E.3. (e) Each sold stove recorded in the Selling Database is included in the emission reduction calculations from the beginning of the next month respecting the effective selling date.																			
QA/QC procedures	<ul style="list-style-type: none"><li>• The unique reference number of each stove is transferred to the project database. The date of distribution is utilized to determine the number of stoves in operation.</li><li>• The database entries of the distributed fuel efficient stoves are made by AVSI based on the Carbon Transfer forms signed by the stove users. Part of the data-base entries will be re-checked by Carbonsink. In case of inconsistencies, the appropriate corrective actions will be taken.</li><li>• Usage survey on a representative sample to confirm the share of the devices sill operating the efficient stoves will be made by trained monitoring team.</li><li>• The data will be stored for the crediting period of the project activity and an additional two years or until the last issuance of CERs for the project activity, whichever is later.</li></ul>																			

<sup>10</sup> Brouwer, R. and Falcão, M. P., 2004. Wood fuel consumption in Maputo, Mozambique. Biomass and Bioenergy. Volume 27, Issue 3, September 2004, Pages 233–245. Available at [www.sciencedirect.com](http://www.sciencedirect.com)

<sup>11</sup> 9981-0003\_Stove Selling Database 2015-2016

<sup>12</sup> 9981-0003\_Usage Survey Database 2017

Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comments	The number of efficient stoves shall remain within the limit of 180 GWh <sub>th</sub> for type II CDM project activities.

### E.3. Implementation of sampling plan

#### (a) List of CPAs to which the sampling plan was applied

This sampling plan was implemented separately for the CPA 9981-0003.

#### (b) Description of implemented sampling design

To determine the parameters  $N_{y,i}$  and  $B_{y,new,KPT}$  two separate field surveys (Usage Survey and KPT) were conducted. The sample sizes were determined, in line with the registered CPA-DD, following the “Guidelines for sampling and surveys for CDM project activities and programme of activities”<sup>13</sup>. The sample size calculations are presented in the sub-page “Sample size” of the ER Spreadsheet<sup>14</sup>.

Monitoring activity	Time	Sample size	Implementer
Usage Survey	07/11/2017 – 01/12/2017 <sup>15</sup>	51	AVSI
Kitchen Performance Test (KPT)	21/11/2016 – 24/11/2016	37 <sup>16</sup>	GIZ

Separate samples were determined for both of the surveys through “Simple random sample on whole population”. As described in the registered CPA-DD this sampling method is appropriate method for Usage Survey as it is assumed that the population living in the area is homogenous compared to the continued use of the efficient cookstoves based on the fact that the target population shares similar socioeconomic circumstances and similar baseline cooking habits. Moreover, for this first monitoring period, the simple random sampling method is appropriate also for the KPT as only one age vintage is covered (All the 955 stoves were distributed within 7 months in fact). Later, when the monitoring will cover stoves distributed in different years (i.e different vintages), the approach of “Simple random sampling on vintage-wise populations” is will be adapted.

All the samplers were hired locally and spoke the local language which enabled fully understanding of any responses given by users.

#### (c) Collected data

##### Usage Survey

<sup>13</sup> Especially the examples presented in Appendix 1, section 2.1.1 of the version 03 of the guidelines has been followed.

<sup>14</sup> ER Spreadsheet has been provided to DOE during the verification process.

<sup>15</sup> Usage Survey made in 2017 is applied for this Monitoring period. Please note that the total sample size of this survey was 104 including 2 age-vintages (51 stoves of vintage 1 and 53 stoves of vintage 2). For this monitoring period only the vintage 1 stoves are relevant.

<sup>16</sup> The minimum sample size calculated was 36 (as shown in the “sample size” sub-page of ER calculation spreadsheet). In the field survey GIZ selected conservatively to use a sample of 37.



The raw data collected by the Usage Survey is shown in a separate document "Usage Survey Database 2016". The survey questions are presented in a separate documents "Usage Survey Questions 2016"<sup>17</sup>.

### **KPT**

The applied KPT procedure and its results are described in a separate report "Project KPT Report 2016".

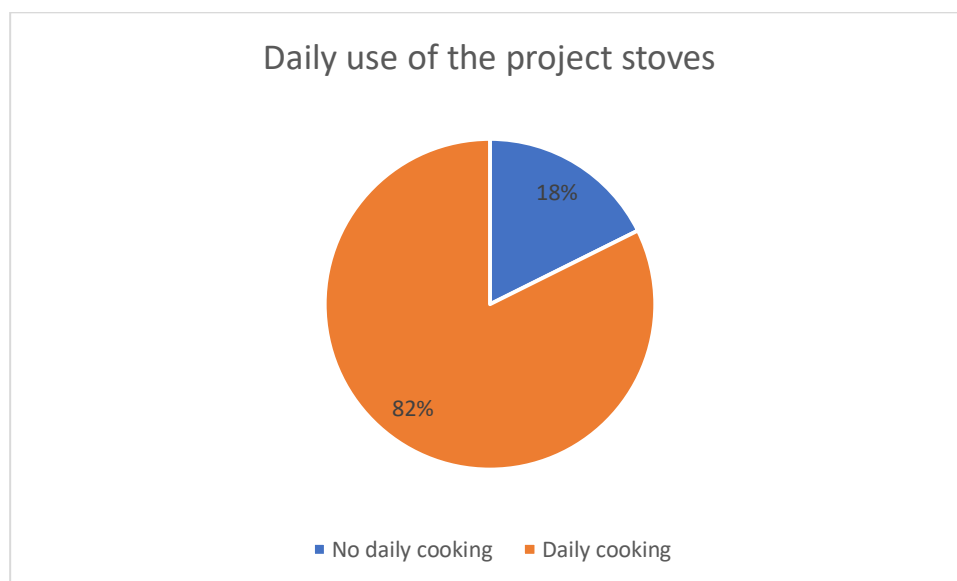
#### **(d) Analysis of the collected data**

Data analysis of the KPT is described in separate report "Project KPT Report 2016"<sup>18</sup>. Here below are described the main findings of the Usage Survey. The raw data together with a more detailed data-analysis is included in the electronic Spreadsheet<sup>19</sup>.

**Sampled households and number of stoves:** The 51 randomly selected project households had each one project stove. The households had bought the stoves averagely 16 months ago. In average each households was composed of 4.7 standard adults.

#### ***Usage rate of the project stoves:***

Majority of the respondents declared that they are using the project stoves. Daily the project stove/stoves were stated to be used by 82%<sup>20</sup> of the respondents who indicated to cook averagely 1.8 meals with the project stoves. However, in the emission reduction calculations it has been selected to use the lower bound of the 95% confidence interval (in this case 72.17%) to be conservative and to respect the statical requirements of the applied methodology<sup>21</sup>.



<sup>17</sup> 9981-0003\_Usage Survey Questions 2017

<sup>18</sup> 9981-0003\_Project KPT Report 2016

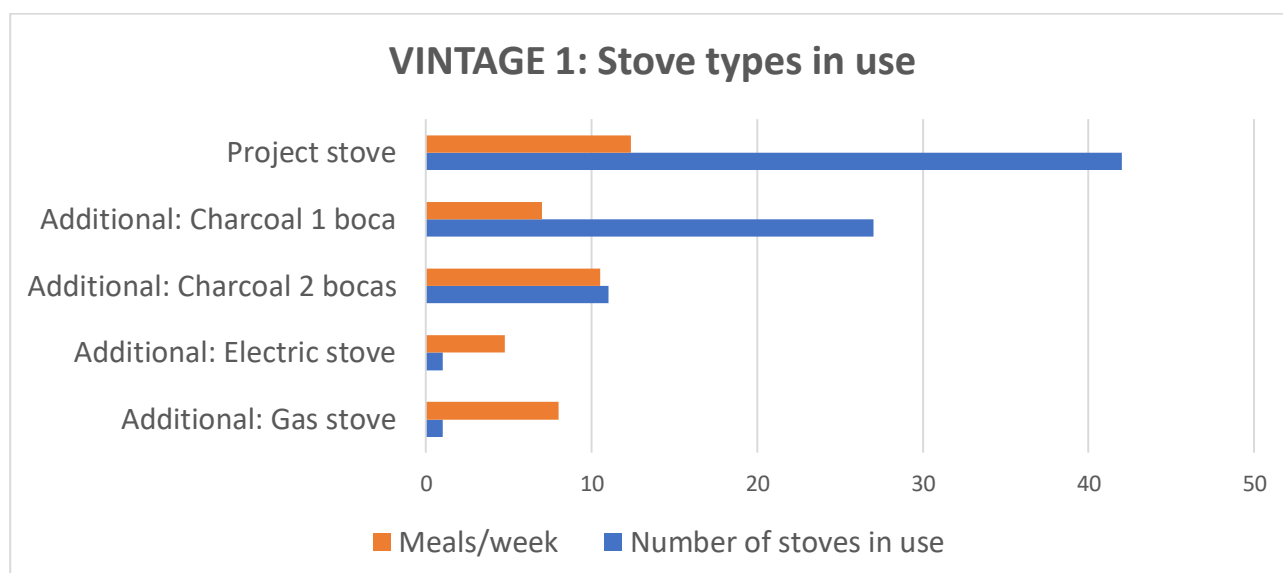
<sup>19</sup> 9981-0003\_Usage Survey Database 2017

<sup>20</sup> Please refer the cell K123 in the spreadsheet "ER Calculations 2016"

<sup>21</sup> Please refer the Section E.3 for further details.

**Simultaneous use of additional technologies:** Part of the households using the project cookstoves have continued to use the traditional stoves as a secondary cooking method. Based on Usage Survey it is anyhow clear that the usage of the traditional stoves is marginal compared to the usage of the project stoves. Additional stove are used, for example, during special days like festivities when also more food may be cooked. The most commonly used additional stove types are the traditional one and two-fire charcoal stoves (92% of the households using the additional stoves are using traditional charcoal stoves). Other additional stove types mentioned by the respondents were gas stoves (mentioned to be used by two respondents) and electric stoves (mentioned by only one respondent).

To be conservative in the ER calculations, **only the project stoves which are used daily** are included in the calculations. Moreover, estimation of ERs is made through the results of the annual Kitchen Performance tests (KPTs) ensuring that the impact of the simultaneous usage of the traditional charcoal stoves is accounted. In fact, KPT measures the total daily charcoal consume and thus accounts also the charcoal consume caused by the eventual simultaneous usage of the traditional stoves, being thus optimal monitoring method for the project situation. The impact of gas and electronic stoves as additional stoves is instead considered marginal (as used only by 3 households within the sample) and thus not accounted in ER calculations.



**Re-selling/donating of old stoves to third parties:** The households were encouraged to dispose their old inefficient stove at the moment of purchasing the project stove and awareness raising by informing the local population on the benefits of the usage of improved stoves has been made. In fact, this Usage Survey find only 4 respondents (representing 8% of the sample) stating to have re-sold their old stoves to a peer. The baseline charcoal stoves being the most common cooking method in the project area and easily available in the project area, it is not estimated that the possible re-selling of the project stove would have any significant impact for adding the overall use of the inefficient charcoal stoves, the charcoal consumption in general, in the project area or in the region. Moreover, to account for leakage an adjustment factor of 0.95 has been applied in the emission reduction calculation. In addition, around 50% of the respondents declared to have promoted the project technology to a peer.

**(e) Demonstration of whether the required confidence/precision level has been met**

## **Usage Survey**

The Usage Survey is a biennial survey and therefore the required precision, in line with the applied methodology, is at least 95/10 (a 95% confidence interval and a 10% margin of error). Based on this the sample size for this monitoring period was set ex-ante to be at least 51 households as calculated in the separate Excel spreadsheet<sup>22</sup>. The calculation (in line with the example shown in Appendix 4 of the Sampling Guideline of UNFCCC<sup>23</sup>) to confirm the achievement of the required confidence/precision was made after the implementing the monitoring activities in the field. From this calculation it turned out that the 95/10 was not respected<sup>24</sup>, and therefore, in line with the applied methodology<sup>25</sup> and Sampling and Survey Standard<sup>26</sup> it was selected to apply conservatively the value of the lower bound of the 95% confidence interval in the Emission Reduction calculations. In particular, the value of 72.17% instead 82% was used as the value of the usage rate in the emission reduction calculations.

## **KPT**

As KPT is made as an annual survey for this CPA<sup>27</sup> and therefore the required precision, in line with the applied methodology, needs to be at least 90/10 (a 90% confidence interval and a 10% margin of error). As described in the separate KPT report the KPT<sup>28</sup>, the required confidence/precision level was met and, in fact, even the 95/10 confidence/precision (which is more robust in comparison with the methodology requirement) was met. Please refer the KPT Report for further details.

## **(f) Demonstration that the samples were randomly selected and are representative of the population**

The sample was drawn at random from the sampling frame using a computerized randomizer and is representative of the population.

Target population is all the efficient cookstoves included in the CPA project activity at the end of the monitoring period. The sampling frame for all monitored parameters is the list of all the devices under the project activity i.e. all the efficient cookstoves listed in the stove selling database of this CPA. The sample is drawn at random from the sampling frame using a computerized randomizer.

The minimum sample size is calculated as showed in in the separate Excel spreadsheet<sup>29</sup>. The calculation were made in line with the applied methodology and equations provided in "Guidelines for sampling and surveys for CDM project activities and programme of activities"<sup>30</sup>.

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<sup>22</sup> 9981-0003\_ER calculations 2016, sub-page "Sample size"

<sup>23</sup> Guideline: Sampling and surveys for CDM project activities and programmes of activities (Version 04.0)

<sup>24</sup> Please refer the cell C65 in sub-page "ERs per device" of 9981-0003\_ER calculations 2016. Full data analysis of Usage Survey results is shown in the document 9981-0003\_Usage Survey Database 2017.

<sup>25</sup> AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass (Version 05.0)

<sup>26</sup> Sampling and surveys for CDM project activities and programmes of activities (Version 07.0)

<sup>27</sup> Please note that according the applied methodology the annual monitoring is chosen. In fact, as per the footnote 12 of the applied methodology: Biennial monitoring (i.e. monitoring once every two years) may be chosen only if the project proponents are able to demonstrate that the efficiency of the cook stove does not drop significantly as compared to the initial efficiency of the new device, over a time period of two years of typical usage.

<sup>28</sup> 9981-0003\_Project KPT Report 2016

<sup>29</sup> 9981-0003\_ER calculations, sub-page "Sample size"

<sup>30</sup> CDM-EB67-A06-GUID (Version 03.0). Available at <http://cdm.unfccc.int/Reference/Guidclarif/index.html#pdd> (site visited 09/01/2014)

## SECTION F. Calculation of emission reductions or net anthropogenic removals

### F.1. Calculation of baseline emissions or baseline net removals

The calculation of baseline emission is described in the following paragraph F.2. together with the calculation of the project emission reductions.

### F.2. Calculation of project emissions or actual net removals

Below are presented the used equations for calculating the emission reductions for this monitoring period. The full calculations are included in the separate electronic spreadsheet available for verification<sup>31</sup>.

#### Emission reductions

$$ER_y = B_{y,savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel} * N_{y,i}$$

Where:

$ER_y$	Emission reductions during the year y in tCO <sub>2</sub> e
$B_{y,savings}$	Quantity of woody biomass that is saved in tonnes per device
$f_{NRB,y}$	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass using survey methods or government data or default country specific fraction of non-renewable woody biomass ( $f_{NRB}$ ) values available on the CDM website
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, wet basis)
$EF_{projected\_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO <sub>2</sub> /TJ
$N_{y,i}$	Number of project devices of type i operating in year y

#### Determination of $B_{y,savings}$

In order to determine ex post  $B_{y,savings}$  equation 2 of Option 1 described in paragraph 12 of AMS-IL.G is chosen and therefore, the following equation will be used<sup>32</sup>:

$$B_{y,saving} = B_{old} - B_{y,new,KPT}$$

Where:

$B_{y,savings}$	Quantity of woody biomass that is saved in tonnes per device
$B_{old}$	Quantity of woody biomass used in the absence of the project activity in tonnes per device
$B_{y,new,KPT}$	Annual quantity of woody biomass used in year y in tonnes per device, measured as per the Kitchen Performance Test (KPT) protocol

<sup>31</sup> 9981-0003\_ER calculations 2016

<sup>32</sup> Please refer the Section D.6.1 of registered CPA-DD which states that two different methods for determining of  $B_{y,savings}$  are used: one method is used for ER calculations made in CPA-DD validation stage and another for the ER calculations made for CPA-DD validation.

**F.3. Calculation of leakage emissions**

To account for leakage a net to gross adjustment factor of 0.95 has been applied in line with the registered CPA-DD and therefore the  $B_{old}$  has been multiplied by a net to gross adjustment factor to account for leakages.

**F.4. Calculation of emission reductions or net anthropogenic removals**

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (t CO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2</sub> e)		
				Before 01/01/2013	From 01/01/2013	Total amount
<b>9981-0003:</b>						
2016 (12/07/2016–30/11/2016) <sup>33</sup>	864	0	76	N/A	788	788
<b>Total</b>	864	0	76	N/A	788	788

**F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs**

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO <sub>2</sub> e)	Amount estimated ex ante (t CO <sub>2</sub> e)
<b>9981-0003</b>	788 tCO <sub>2</sub> e	1,940 tCO <sub>2</sub> e <sup>34</sup>
<b>Total</b>	788 tCO <sub>2</sub> e	1,940 tCO <sub>2</sub> e

<sup>33</sup> Note that the monitoring period is 12/01/2016-30/11/2016, the crediting period is anyhow starting only from 01/08/2016 which is the CPA inclusion date

<sup>34</sup> Note that the monitoring period is 12/07/2016-30/11/2016, the crediting period is anyhow starting only from 01/08/2016 which is the CPA inclusion date, and thus here presented ex-ante value is referring the period 01/08/2016-30/11/2016.

**F.6. Remarks on increase in achieved emission reductions**

N/A

**Document information**

<i>Version</i>	<i>Date</i>	<i>Description</i>
02.0	7 June 2017	Revision to: <ul style="list-style-type: none"><li>• Ensure consistency with version 01.0 of the “CDM project standard for programmes of activities (CDM-EB93-A07-STAN);</li><li>• Make editorial improvements.</li></ul>
01.0	1 April 2015	Initial publication.

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