



**Monitoring report form for CDM programme of activities
(Version 03.0)**

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

MONITORING REPORT

Title of the PoA	Domestic Cooking Stoves substitution programme in Mozambique	
UNFCCC reference number of the PoA	9981	
Version numbers of the PoA-DD applicable to this monitoring report	09 Dated 22/09/2020	
Version number of this monitoring report	06	
Completion date of this monitoring report	12/04/2021	
Monitoring period number	4 th Monitoring Period	
Duration of this monitoring period	01/01/2018–31/12/2018	
Monitoring report number for this monitoring period	Batch 1 of 2	
Coordinating/managing entity	Fondazione AVSI	
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Mozambique	Yes
	N/A	N/A
Applied methodologies and standardized baselines	AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass (Version 05.0)	
Sectoral scopes	03: Energy Demand	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	N/A	42,170 tCO ₂ e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	25,717 tCO ₂ e	

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 . 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 CO₂ 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.

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
Title: “Domestic Cooking Stoves substitution programme in Mozambique (PoA 9981) – Generic CPA 01” Reference nro: “Generic CPA 01”	Version 09	Sectoral Scope 03: Energy Demand	(a) Methodology: AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass (Version 05.0) ¹ (b) Tools²: <ul style="list-style-type: none"> - General guidelines for SSC CDM methodologies (Version 20.0) - Methodological tool 19: Demonstration of additionality of microscale project activities (Version 09.0) - Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities (Version 03.0) - General guidance on leakage in biomass project activities (attachment C to appendix B) (Version 03) - Standard for sampling and surveys for CDM project activities and programmes of activities (Version 08.0) - Guidelines for sampling and surveys for CDM project activities and programme of activities (Version 04.0) - Guidelines on assessment of debundling for SSC project activities (version 03) (c) Standardized baselines: N/A

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Version of the PoA-DD	Title and reference number of the corresponding generic CPA	Crediting period type and duration	Covered in this monitoring report? (yes/no)
9981-P1-0001-CP1, version 09 “Domestic Cooking Stoves in Maputo (Mozambique)”	Version 07	“Domestic Cooking Stoves substitution programme in Mozambique (PoA 9981) – Generic CPA 01”	Renewable crediting period 01/01/2015 – 31/12/2021	No

¹ <https://cdm.unfccc.int/methodologies/DB/HLXIKEIBAXBE4EHO24H5IAB824MBD8>

² <https://cdm.unfccc.int/Reference/Guidclarif/index.html>

9981-P1-0002-CP1, version 09 "Domestic cookstoves in Maputo (Mozambique), phase II"	Version 09	"Domestic Cooking Stoves substitution programme in Mozambique (PoA 9981) – Generic CPA 01"	Renewable crediting period 12/07/2016 – 11/07/2023	Yes
9981-P1-0003-CP1, version 04 "Improved Cookstoves in Pemba"	Version 09	"Domestic Cooking Stoves substitution programme in Mozambique (PoA 9981) – Generic CPA 01"	Renewable crediting period 01/08/2016 – 31/07/2023	No
9981-P1-0004-CP1³ "Fuel-efficient cooking in Maputo Province, Mozambique by the entity SK Trading International Co., Ltd. (SKTI) in the Republic of Korea"	Version 09	"Domestic Cooking Stoves substitution programme in Mozambique (PoA 9981) – Generic CPA 01"	Renewable crediting period 01/03/2021 – 29/02/2028	No

A.2. Coordinating/managing entity

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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

a) Information on how the management system described in the PoA-DD was implemented

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 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

³ Provisional inclusion made on 23/02/2021 (awaiting guidance from the CMP at CMP 16)

The operationalisation of the management system in case of the CPA 9981-0002 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 9981-0002 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 9981-0002 was validated successfully with the DOE and included under the PoA on 12/07/2016.

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 the webpages of AVSI (www.avsi.org/en/) and Carbonsink (www.carbonsink.it/en/) may be visited.

- **Records of arrangements for training and capacity development for personnel**

The CPA 9981-0002 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 9981-0003) and, therefore, no additional training or capacity development for personnel was 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:

18-20 September 2017: Before implementing the Usage Survey in the field, a three days training for the Usage Survey field team was 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).

19th of November 2018: Before starting the KPT in the field, a training day for the local field personnel was organized by Carbonsink (Aldina Sindique). The training included an initial theoretical training regarding the KPT survey and practical training and follow up during the first KPT implemented in the field. Totally two persons participated this training (Luisa Santaca and Isilda Gabriel Guambe).

- **A Procedure for technical review of inclusion of CPAs**

The CME together with Carbonsink has ensured before the inclusion that the CPA 9981-0002 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 the AVSI's offices and the electronic material of the documents are kept by Carbonsink.

- **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 9981-0002 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.

- **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 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.

- **Measures for continuous improvements of the PoA management system**

Carbonsink, who is 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 the validated CPA-DDs. In case of CPA 9981-0002 this has included, during the period when the cookstove selling has been on-going, monthly double checks of the stove selling database by Carbonsink (i.e. Carbonsink has reviewed the made data entries to ensure that all the necessary data, like contact details and stoves IDs, are filled in the database in correct way). During the current monitoring period no new cookstoves have been sold and thus no further checks on the selling database have been made during this monitoring period.

b) Indication of the sampling approach

A separate sampling approach was applied for monitoring of each CPA separately. Please refer the below Section E.3 for details.

c) Description of the installed technologies, technical processes and equipment for the included CPAs

The technical description together with the information on the implementation and actual operation of the included CPA 9981-0002 is made in the below section C.1.

d) Post-registration changes to the PoA and CPAs

Please refer the below Sections B.2 and C.3.

B.2. Post-registration changes to PoA

B.2.1. Corrections

PRC ref. PRC-9981-002 (Approved 16 July 2019)

The board has accepted the PRCs of the PoA on 15/07/2019. For the originally validated PoA version (ver 05) the following corrections of typo errors have been made:

- In Sections A.1, B and H.3 CPA abbreviation has been corrected to refer to “Component Project Activity” instead to “Programme Activity”
- In Section I.6.1 the word “describes” has been corrected to be “describe”.
- In Section I.7.2. the word “biannual” has been corrected to be “biennial”.

- Moreover, throughout the document the wording “the proposed PoA” has been replaced with “the PoA” or “this PoA”.

Please refer the PoA-DD version 07 dated on 29/03/2019 and the DOE's Validation Report on PoA PRCs dated 12/04/2019 for further details.

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 methodological regulatory documents

PRC ref. PRC-9981-002 (Approved 16 July 2019)

The board has accepted the PRCs of the PoA on 15/07/2019. For the originally validated PoA version (ver 05) the following permanent changes/clarifications to the registered monitoring plan have been made:

- No specifications were given regarding project scenario in which household has two project stoves.

Sections I.6.2 and I.7 have been updated with the following specifications:

To determine B_{old} per device, the approach of dividing $B_{old, hh}$ in two may be applied for the cases where the households are having two project stoves.

To determine $B_{y, new, KPT}$ per device, the approach of dividing $B_{y, new, KPT, hh}$ in two is applied for the cases where the households are having two project stoves.

To determine $B_{new, survey}$ per device, the approach of dividing $B_{new, survey, hh}$ in two may be applied for the cases where the households are having two project stoves.

- The data unit for B_{old} , $B_{y, new, KPT}$, $B_{y, new, survey}$ indicated as t/device/year.

The data unit for B_{old} , $B_{y, new, KPT}$, $B_{y, new, survey}$ has been corrected to be in line with the applied AMS-II.G methodology i.e. t/year throughout the PoA-DD.

- PoA-DD indicates for some parameters the possibility to make the monitoring either annually or biennially. However, it is not very clearly indicated when the biennial monitoring may be chosen and what is its impact on the sampling.

Section I.7.1 added the following specifications:

“According the applied methodology, Footnote 12: Biennial monitoring (i.e. monitoring once every two years) may be chosen, 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”

“When biennial inspection is chosen a 95% confidence interval and a 10% margin of error shall be achieved for the sampling parameter. On the other hand, when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of

error shall be achieved. In cases where survey results indicate that 90/10 precision or 95/10 precision are not achieved, the lower bound of the 90% or 95% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/10 precision.”

Please refer the PoA-DD version 07 dated on 29/03/2019 and the DOE's Validation Report on PoA PRCs dated 12/04/2019 for further details.

PRC ref. PRC-9981-003 (Approved 21 December 2020)

The board has accepted the PRCs of the PoA on 03/12/2020. For the previously validated PoA version (ver 07) the following permanent changes/clarifications to the registered monitoring plan have been made:

- The PoA-DD template version 08.1

The PoA-DD template has been updated for the latest version (Version 09.0).

- Fraction of non-renewable ($f_{NRB,y}$) determined based on the default country specific value endorsed by designated national authority and approved by the CDM Board.

Fraction of non-renewable ($f_{NRB,y}$) calculated using requirements in “TOOL30: Methodological tool: Calculation of the fraction of non-renewable biomass”, version 02.0 and fixed ex-ante.

- Fraction of non-renewable ($f_{NRB,y}$) monitored annually.

Fraction of non-renewable ($f_{NRB,y}$) fixed ex-ante.

- Sampling methods of “Simple random sample on whole population” for determining $N_{y,i}$ and “Simple random sampling on vintage-wise populations” $B_{y,new,KPT}$ presented as only options of the sampling methods.

Added the following specifications:

“Sampling methods of “Simple random sample on whole population” and “Simple random sampling on vintage-wise populations” are foreseen to be used. Alternatively, also other sampling approaches in line with CDM guidelines may be used.”

“In case the monitoring will cover stoves distributed in different years (i.e. different vintages), the target population is not considered homogeneous regarding the stove efficiency as the efficiency is assumed to drop over the years . Therefore, an approach of “Simple random sampling on vintage-wise populations” will be applied for estimating the stove efficiency. Similarly, “simple random sampling on vintage-wise populations” may be used also for estimating the proportion of the stoves operating.”

- The equation to calculate the required sample size for annual determining of for example $B_{y,new,KPT}$ (or other mean value parameter monitored annually) was indicated erroneously

The equation for determining sample size for mean value parameters is corrected to be in line with the CDM guideline “Sampling and surveys for CDM project activities and programmes of activities”.

- No specifications regarding the minimum sample size.

Added the following specification:

"If the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion. If the parameter of interest is a numeric mean value (i.e. not a proportion or percentage) the Student's t-distribution shall be used if the resulting sample size is less than 30."

- "The sampling is foreseen to occur at the end of each monitoring period and all the measurements will be conducted at the latest 6 months after the end of the specific monitoring period. The maximum length of one monitoring period will be two years (duration, not calendar years). Therefore, the measurement will be conducted at the latest 24 + 6 months after the start of the specific monitoring period."

The schedule for implementing the sampling effort shall be done so that the gap between consecutive annual or biennial surveys (i.e. the gap between the start date of the survey and the start date of the consecutive survey) shall not be more than 12 months or 24 months, respectively.

- The below indicated versions of the following standard and guidelines of sampling and surveys are applied:
 - Standard for sampling and surveys for CDM project activities and programmes of activities (Version 08.0).
 - Guidelines for sampling and surveys for CDM project activities and programme of activities (Version 04.0).

Please refer the PoA-DD version 09 dated on 22/09/2020 and the DOE's Validation Report on PoA PRCs dated 30/09/2020 for further details.

B.2.4. Changes to programme design

PRC ref. PRC-9981-002 (Approved 16 July 2019)

The board has accepted the PRCs of the PoA on 15/07/2019. For the originally validated PoA version (ver 05) the following permanent changes to the programme design of the PoA have been made:

- Additionality demonstration made following "Guidelines on the Demonstration of Additionality of Small-Scale Project Activities (Version 09.0)"

Additionality demonstration has been updated to be made following Tool 19 "Methodological tool: Demonstration of additionality of microscale project activities (Version 09.0)".

All the relevant sections of the PoA-DD (Section C, Section I.1 and I.2 and Section K) that referred to the previous guidelines have been updated accordingly with the new applied tool (TOOL19). For example, the eligibility criteria nro 6 has been updated consequently in Table K-1.

- The aggregate energy savings of a single project activity shall not exceed the equivalent of 180 GWh thermal per year in fuel input.

The PoA-DD has been updated, in line with Clarification SSC_732⁴, to apply the para 124 (m) of the CDM Project Standard for Programmes of Activities (Version 02.0). All the relevant sections and tables of the PoA-DD have been updated and, consequently, the references to the requirement of 180 GWh_{th} threshold have been deleted (Section C, Section H.3, Section I.2, Section I.7.1 and Section K). For example, the eligibility criteria nro 11 and the justification method of the eligibility criteria nro 5 have been updated consequently in table K-1.

B.2.5. Changes specific to afforestation or reforestation activities

N/A

PART II Monitoring of CPAs

This report describes the implementation and monitoring of the specific-case CPA no 9981-0002.

SECTION C. Implementation of CPAs

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 9981-0002: “Domestic Cookstoves in Maputo (Mozambique), phase II” is to improve energy efficiency by substituting inefficient traditional cookstoves with more effective ones and at the same improve the conditions of the local population living in spontaneous settlements of Malanga, Minkadjuine, Munhuana, Unidade 7, Chamanculo A, Chamanculo B, Chamanculo D, Aeroporto A, Aeroporto B, Mafalala and Urbanizacao in the district of Nhlamankulu, in Maputo city, Mozambique. From the project start (18th June 2015) until 31th of December 2018 (in other words, until the end of this Monitoring Period) totally 12,413 energy efficient stoves have been distributed⁵.

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 installed technologies, technological processes and equipment for the CPA

Currently the only stove model distributed and included in the project is Envirofit’s CH-2200 Charcoal Cookstove. 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 University⁶. This stove model has been selected based on

⁴ <https://cdm.unfccc.int/methodologies/SSCmethodologies/clarifications/78386>

⁵ 12,413 stoves are referring to the Envirofit stoves distributed under this project. Please note that all the 12,413 cookstoves have been distributed during the years 2015-2017. During the year 2018 new Envirofit cookstoves have not been distributed. In addition, also Mbaula stoves have been distributed but they are not accounted in the ER calculations yet during this monitoring period as a conservative choice.

⁶Colorado State University, 2013. Emissions and Performance Report CH2200. (This document has been provided to DOE during the validation process)

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.



Imagine C-1. CH-2200 Charcoal Cookstove (source: Envirofit)

(c) Relevant dates for the specific-case CPA (e.g. construction, commissioning, start of operation)

Step	Time
LSC process	24/04/2015 – 04/06/2015
Project start date (i.e. stove distribution start)	18/06/2015
Inclusion under the PoA and crediting period start date	12/07/2016
<i>Monitoring activities made during the previous monitoring periods</i>	
•Usage Survey	10/10/2016 – 01/11/2016
•Kitchen Performance Test (KPT)	17/10/2016 – 20/10/2016
•Usage Survey	20/09/2017 – 15/11/2017
•Kitchen Performance Test (KPT)	20/11/2017 – 07/12/2017
<i>Monitoring activities made during the current monitoring period</i>	
Kitchen Performance Test (KPT)	20/11/2018 – 30/11/2018
Implementation status (number of stoves distributed)	12,413 stoves distributed by the 31/12/2018 ⁷

C.2. Location of CPAs

Host Party: The Republic of Mozambique

Province: Maputo

City: Maputo

Physical/geographical location:

The project activity is limited to the neighbourhoods of Malanga, Minkadjuine, Munhuana, Unidade 7, Chamanculo A, Chamanculo B, Chamanculo D, Aeroporto A, Aeroporto B, Mafalala and Urbanizacao in the district of Nhlamankulu within the city of Maputo, Mozambique (Imagine C-2). The GPS coordinates of the project area are available in the registered CPA-DD.

⁷ 12,413 stoves are referring to the Envirofit stoves distributed under this project. In addition, also Mbula stoves have been distributed but they are not accounted in the ER calculations yet during this monitoring period as a conservative choice.

The GPS coordinates of each stove has been recorded (when ever possible) into the Carbon Transfer Forms and in the electronic Stove Selling Database together with the unique serial number of each stove and the user's contact details.



Imagine C-2. CPA 9981-0002 location within the city of Maputo.

C.3. Post-registration changes to CPAs

C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies, standardized baselines or other methodological regulatory documents

N/A

C.3.2. Corrections

Post registration corrections of CPA 9981-0002 are presented in PRC ref. PRC-9981-001 with effective approval date on 25th of October 2018⁸ and in PRC ref. PRC-9981-005 with effective approval data on 4th of April 2021.

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

N/A

⁸ Please note that this same PRC includes post registration changes also for another CPA (CPA 9981-0001) included under the same PoA.

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 methodological regulatory documents

Post registration changes of CPA 9981-0002 are presented in PRC ref. PRC-9981-005 with effective approval data on 04/04/2021.

C.3.6. Changes to project design

Post registration changes of CPA 9981-0002 are presented in PRC ref. PRC-9981-001 with effective approval date on 25th of October 2018.⁹

C.3.7. Changes specific to afforestation or reforestation CPA

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")¹⁰

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 9981-0002

Table D-1. The organization of the project monitoring

Actor	Responsibilities and roles
Fondazione AVSI (local desk Mozambique)	<ul style="list-style-type: none"> •Coordinates the monitoring activities on the project site •Responsible on the data entries into the project database •Stores the original distribution and monitoring documents •Hires, trains and supervises the distribution and monitoring teams on their work

⁹ Please note that this same PRC includes post registration changes also for another CPA (CPA 9981-0001) included under the same PoA.

¹⁰ For this CPA the annual monitoring is chosen. 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.

Carbonsink	<ul style="list-style-type: none"> •Supervises AVSI with the monitoring activities (surveys and stove efficiency testing) •Responsible on the distribution and monitoring data assessment •Prepares the monitoring report to be provided to the DOE for verification of emission reductions •Administrator of the electronic monitoring database
Distribution team	<ul style="list-style-type: none"> •Works under the supervision of AVSI •Reports the results to AVSI on the stove distribution
Monitoring team	<ul style="list-style-type: none"> •Works under the supervision of AVSI •Implements the monitoring surveys •Reports the results to AVSI

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 or in another appropriate ways. 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 _{biomass}
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 _{biomass}).
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 _{projected_fossilfuel}
Unit	tCO ₂ /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 ₂ /TJ is to be used as emission factor for the substitution of non-renewable woody biomass by similar consumers (EF _{projected_fossilfuel}).

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_{old}
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
Value(s) applied	6.601
Choice of data or measurement methods and procedures	<p>As per the baseline survey conducted in 2012, the following derived:</p> <p>Number of baseline households surveyed = 537 Number of households surveyed and considered for the baseline calculation = 507 Percentage of households that used single mouth charcoal stove = 39% Percentage of households that used double mouth charcoal stove = 61% Charcoal consumption in baseline households which used single mouth stove = 75.2 kg of charcoal /household/month Charcoal consumption in baseline households which used double mouth stove = 84.9 kg of charcoal /household/month</p> <p>So, on average, charcoal consumption in baseline households = 39% x 75.2 kg + 61% x 84.9 = 81.1 kg of charcoal/household/month or 973.2 kg of charcoal/ household/year</p> <p>Accordance to paragraph 14 of the methodology, the quantity of woody biomass (B_{old}) is determined by using a credible local conversion factor determined from literature. Here the conversion factor of 7.14 is chosen based on the study of Brouwer and Falcão, 2004.¹¹</p> <p>So on average, wood consumption in baseline households = 6.9486 tonnes of wood per household per year</p> <p>Wood consumption in baseline households = 6.9486 tonnes of wood per baseline device per year for the hhs who have one project stove. For the hhs having two project stoves, the approach of dividing B_{old, hh} in two is applied for determining the B_{old} per device.</p> <p>As 10% of the project households have bought 2 project stoves and 90% of the project households have bought 1 project stove, the weighted average to be used in ER calculations can be calculated thus as follows: $(0.10 \times (0.5 \times 6.9486 \text{ t/device/year})) + (0.90 \times 6.9486 \text{ t/device/year}) = 6.6012 \text{ t/device/year}$. Please refer cell C40 in the 9981-0002_ER Calculations, sub-page "ERs per device".</p>
Purpose of data/parameter	Calculation of project emissions or actual net GHG removals by sinks
Additional comments	<p>This parameter is fixed at CPA level. This parameter is fixed for entire crediting period of the CPA.</p> <p>B_{old} will be multiplied by a net to gross adjustment factor (LAF) to account for leakages.</p>

¹¹ 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

Data/parameter	η_{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	<p>This parameter has been used only in ER calculations made at the validation of CPA-DD.</p> <p>In line with the registered CPA-DD (Section B.4.1) 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).</p>

Data/parameter	$\eta_{new,y}$
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 in line with the registered PoA-DD.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	<p>This parameter has been used only in ER calculations made at the validation of CPA-DD. The value 0.423 refers to the cookstove model Envirofit CH-2200.</p> <p>In line with the registered CPA-DD (Section B.4.1) 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).</p>

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_{old} will be multiplied by a net to gross adjustment factor to account for leakages. In this case surveys are not required.
Purpose of data/parameter	Calculation of leakage
Additional comments	<p>This parameter is fixed at PoA level.</p> <p>This parameter is fixed for entire crediting period of each CPA.</p>

Data/Parameter	$f_{NRB,y}$
Unit	Fraction
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
Source of data	A country specific fraction of non-renewable woody biomass (f_{NRB}) value calculated using requirements in "TOOL30: Methodological tool: Calculation of the fraction of non-renewable biomass", version 02.0.
Value(s) applied	0.91
Choice of data or measurement methods and procedures	TOOL30: Methodological tool: Calculation of the fraction of non-renewable biomass", version 02.0.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	This parameter is fixed at PoA level. This parameter is fixed for entire crediting period of each CPA.

E.2. Data and parameters monitored

Data/parameter	$B_{y,new,KPT}$
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) ¹²
Value(s) of monitored parameter	VINTAGE 1: 2.773 VINTAGE 2: 2.884
Monitoring equipment	N/A
Measuring/reading/recording frequency	Yearly (or biennially) ¹³
Calculation method (if applicable)	N/A

¹² 9981-0002_Project KPT Report 2018

¹³ According the applied methodology, Footnote 12: Biennial monitoring (i.e. monitoring once every two years) may be chosen, 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. For this monitoring period annual monitoring has been chosen.

QA/QC procedures	<ul style="list-style-type: none"> •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 cases where the results indicate that 90/10 precision is not achieved, the lower bound of a 90 % confidence interval of the parameter value will be chosen as an alternative in repeating the survey efforts to achieve the 90/10 precision. •The sample size will be chosen for a 95/10 precision (95% confidence interval and 10 % margin of error) when biennial inspection is chosen. In cases where the results indicate that 95/10 precision is not achieved, the lower bound of a 95 % confidence interval of the parameter value will be chosen as an alternative in repeating the survey efforts to achieve the 95/10 precision •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. •The KPT is conducted by trained monitoring personal. <p>For this CPA the annual monitoring has been chosen and, therefore, the the required precision needs to be at least 90/10. As described in the separate KPT report the KPT¹⁴, the requested precision was reached. Please refer the KPT Report for further details.</p>
Purpose of data/ parameter	Calculation of project emissions or actual net GHG removals by sinks
Additional comments	<p>The parameter is applicable only for the ex post calculations. Project KPT are conducted at the household level.</p> <p>To determine $B_{y,new,KPT}$ per device, the approach of dividing $B_{y,new,KPT}$ in two is applied for the cases where the households are having two project stoves as follows:</p> <p>The KPT resulted that the annual charcoal consumption is 0.4088 t/year/hh for the vintage 1 and 0.4271 t/year/hh for the vintage 2. These values are covered to the charcoal consumption per device using the information that 90% of the families have one project stove and 10% of the families two project stoves:</p> <p>For the Vintage 1: $[(0.10 \times 0.4088 \text{ t/year})/2 + (0.90 \times 0.4088) \text{ t/year}] = 0.3884 \text{ t/year/device}$ This value is converted as woody biomass ¹⁵ as follows: $7.14 \times 0.3884 \text{ t/year/device} = 2.773 \text{ t/year/device}$.</p> <p>For the Vintage 2: $[(0.10 \times 0.4252 \text{ t/year})/2 + (0.90 \times 0.4252) \text{ t/year}] = 0.4040 \text{ t/year/device}$ This value is converted as woody biomass as follows: $7.14 \times 0.4040 \text{ t/year/device} = 2.884 \text{ t/year/device}$.</p>

Data/parameter	$N_{y,i}$
Unit	Number
Description	Number of project devices of type i operating in year y
Measured/calculated/default	Measured
Source of data	Project database records ¹⁶ and usage survey ¹⁷ on a representative sample

¹⁴ 9981-0002_Project KPT Report 2018

¹⁵ 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

Value(s) of monitored parameter	VINTAGE 1: 3.412 ¹⁸ VINTAGE 2: 7.711 ¹⁹
Monitoring equipment	N/A
Measuring/reading/recording frequency	At least biennially
Calculation method (if applicable)	Based on the Usage Survey made in 2017 for “vintage 1” 91% of the sold devices and for “vintage 2” 89% are considered operational. 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"> • 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. • 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. • Usage survey on a representative sample to confirm the share of the devices still operating the efficient stoves will be made by trained monitoring team. • 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.
Purpose of data/ parameter	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 _{th} for type II CDM project activities. N _y represents households who are using charcoal in the baseline.

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 9981-0002.

(b) Description of implemented sampling design

To determine the values of the parameters $N_{y,i}$ and $B_{y,new,KPT}$ two separate field surveys have been conducted: The Usage Survey was conducted in 2017 and is the same survey which have been applied for the previous monitoring period. The KPT instead was conducted during November 2018 specifically for this monitoring period. In both cases 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”²⁰. The sample size calculations are presented in the sub-page “Sample size” of the ER Spreadsheet²¹.

¹⁶ 9981-0002_Stove Selling Database 2015-2017

¹⁷ 9981-0002_Usage Survey Database 2017

¹⁸ Please refer to the column C of the sub-page “Total CERs” in the ER calculation spreadsheet

¹⁹ Please refer to the column Q of the sub-page “Total CERs” in the ER calculation spreadsheet

²⁰ Especially the examples presented in Appendix 1, section 2.1.1 of the version 04 of the guidelines has been followed.

²¹ 9981-0002_ER Calculations 2018

Monitoring activity	Time	Sample size	Implementer
Usage Survey	20/09/2017 – 15/11/2017	106	AVSI
Kitchen Performance Test (KPT)	20/11/2018 – 30/11/2018	48	Carbonsink

Separate samples were determined for both of the surveys through “Simple random sample on vintage wise population”. Totally two vintages were chosen to be used for this monitoring period. Vintage 1 covering the stoves distributed between June 2015 – June 2016 and Vintage 2 the stoves distributed between July 2016 – July 2017²². (no new stoves have been distributed later than this).

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

The data collected by the Usage Survey are shown in a separate document “Usage Survey Database 2017”²³. The data was collected using a tablet application designed for this project. The survey questions are presented in a separate documents “Usage Survey Questions 2017”²⁴.

KPT

The applied KPT procedure and its results are described in a separate report “Project KPT Report 2018”²⁵.

(d) Analysis of the collected data

Data analysis of the KPT is described in separate report “Project KPT Report 2018”²⁶. 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 Spreadsheet²⁷.

Sampled households and number of stoves: In both age-groups 53 randomly selected households were interviewed, and thus totally 106 households were interviewed. From the interviewed households 16 households (15% of the sample) stated to have two project stoves and the rest 90 families (85% of the sample) to have one project stove. This is meaning that within the sample, the percentage of the families with two project stoves (15%) is a bit higher than the average within all the project families which is being averagely 10% as evidenced by the selling database. The difference in the percentages can be estimated to be purely casual as the sample was selected randomly within the project stoves. In average each family was composed of 4.7 standard adults.

The households of age-group 1 auto-estimated to have bought the stoves averagely 23 months ago and the households of age-group 2 instead average 9 months ago.

²² All the stoves included in this CPA have been distributed between June 2015 and July 2017. No new stoves have been distributed during the year 2018.

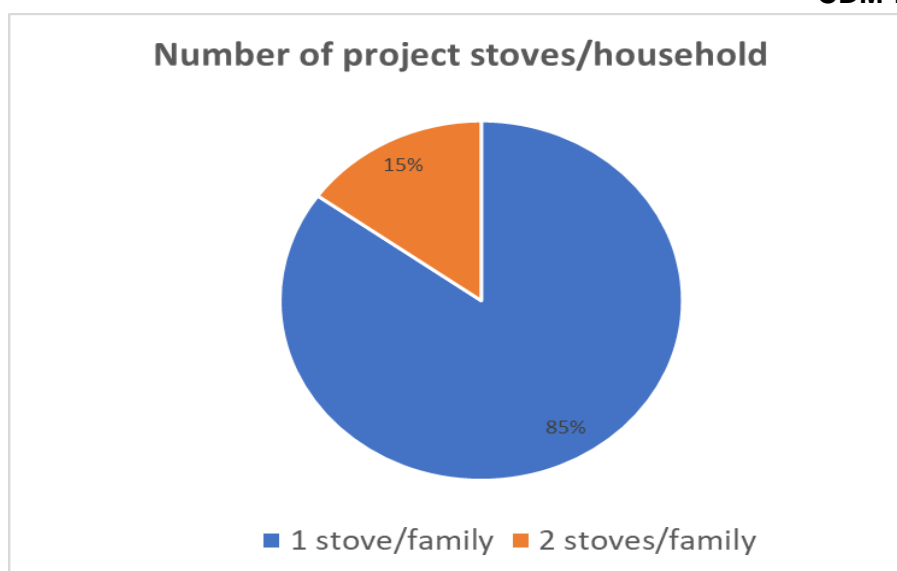
²³ 9981-0002_Usage Survey Database 2017

²⁴ 9981-0002_Usage Survey Questions 2017

²⁵ 9981-0002_Project KPT Report 2018

²⁶ 9981-0002_Project KPT Report 2018

²⁷ 9981-0002_Usage Survey Database 2017

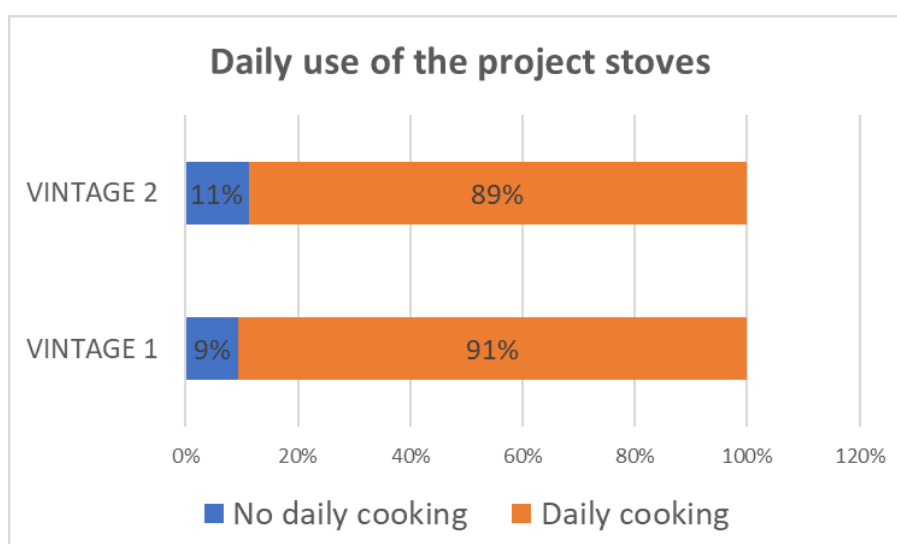


Usage rate of the project stoves:

Majority, averagely 90%, of the respondents in both of the age-vintages declared that they are using the project stoves. Daily the project stove/stoves were used by 91% of the respondents of the age-group 1 who indicated to cook with it average 2.2 meals/day/household (equals to 15.6 meals/week/household) and by 89% of the respondents of the age-group 2 who indicated to cook with it averagely 2.3 meals/day/household (equals to 16.1 meals/week/household).

These usage rates are applied for the ER calculations which ensured that only the operation devices (i.e. project stoves which are used daily) are included in the ER calculations.

	AGE VINTAGE 1	AGE VINTAGE 2
Households cooking daily with the project stoves	91% ²⁸	89% ²⁹
Average number of meals/day cooked with the project stove	2.2 meals/day	2.3 meals/day



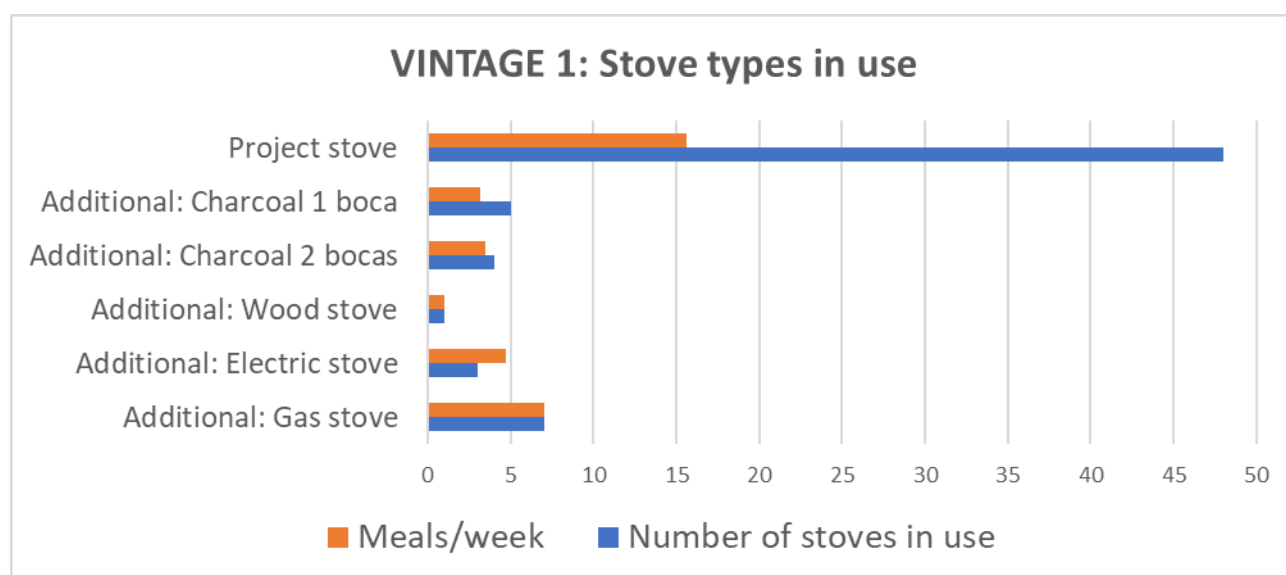
²⁸ Refer to cell K121 of the sub-page “Data Analysis” in the spreadsheet “9981-0002 Usage Survey Database 2017”

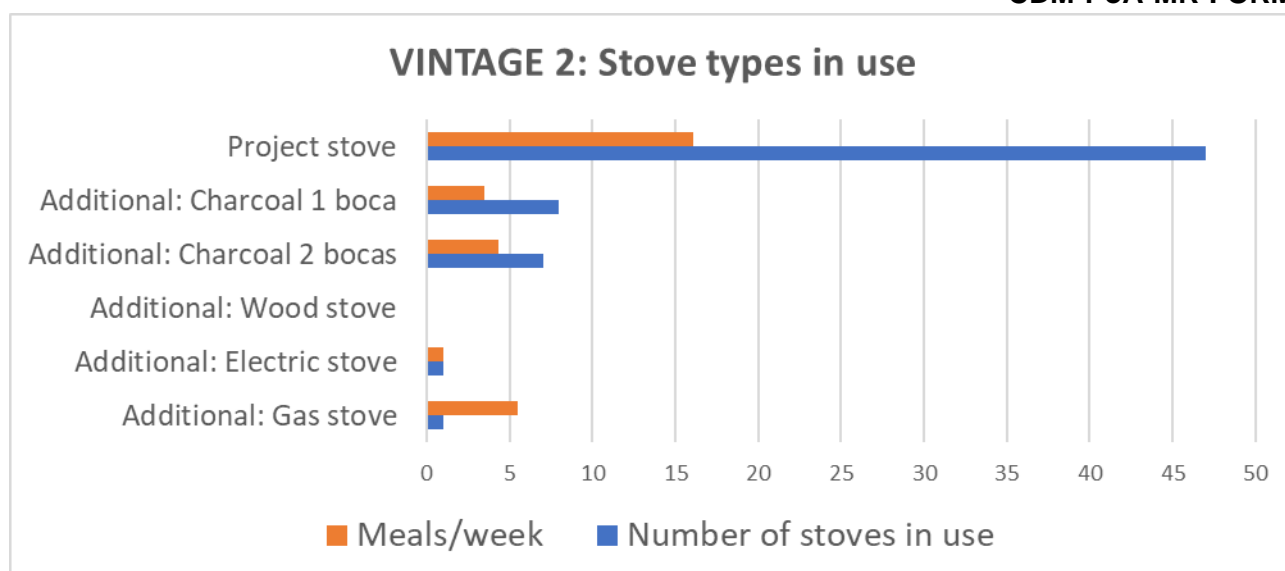
²⁹ Refer to cell L121 of the sub-page “Data Analysis” in the spreadsheet “9981-0002 Usage Survey Database 2017”

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 type is one or two-fire charcoal stove (66% of the additional stoves). Other additional stove types mentioned by the respondents were gas stove (8 respondents), electric stove (4 respondents) and wood stove (1 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 and thus not accounted in ER calculations.

	AGE VINTAGE 1	AGE VINTAGE 2
Families using project stoves and additional stoves	42%	38%
Average number of meals/day cooked with the additional stoves	4.7 meals/week	3.6 meals/week
Average number of meals/day cooked with the additional stoves	0.7 meals/day	0.5 meals/day





Re-selling/donating of old stoves to third parties: The households were encouraged to dispose their old inefficient stove at the moment of boughing the project stove and awareness raising by informing the local population on the benefits of the usage of the improved stoves has been made. In fact, this Usage Survey find only 4 respondents (representing 4% 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 all district of Nhamaculo, 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 be applied in the emission reduction calculation. In addition, some respondents (3% of all the respondents) declared to have promoted the project technology to at least one peer.

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

Usage Survey

In line with the applied CDM methodology the Usage Survey is requires to be made as least biennially and therefore the required precision 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 calculated ex-ante to be at least 53 households for both age vintages (see the sample size calculations in the separate Excel spreadsheet)³⁰. The calculation (in line with the example shown in Appendix 4 of the Sampling Guideline of UNFCCC ³¹) to confirm the achievement of the required confidence/precision was made after the implementing the monitoring activities in the field. The received precisions were 8.6% and 9.6% respectively for Vintage 1 and Vintage 2, and thus confirmed that the 95/10 was respected for both of the vintages³². Consequently, the value of 91% for Vintage 1 and the value 89% for Vintage 2 are used as the values of the usage rates in the emission reduction calculations.

KPT

KPT is made as an annual survey for this CPA 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

³⁰ 9981-0002_ER calculations 2018, sub-page "Sample size"

³¹ Guideline: Sampling and surveys for CDM project activities and programmes of activities (Version 04.0)

³² Please refer the cells C82 and D82 in sub-page "ERs per device" of 9981-0002_ER calculations 2018. Full data analysis of Usage Survey results is shown in the document 9981-0002_Usage Survey Database 2017.

error). As described in the separate KPT report the KPT³³, the precisions were 7.7% and 9.8% respectively for Vintage 1 and Vintage 2, and thus confirmed that the required 90/10 precision was respected for both of the vintages. Please refer the KPT Report for further details.

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

Target population is all the efficient cookstoves included in the CPA project activity. 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 was drawn at random from the sampling frame using a computerized randomizer and is representative of the vintage wise population. For this monitoring period two age vintages were identified: Age vintage 1 including the stoves distributed during June 2015 – June 2016 and age vintage 2 including the stoves distributed during July 2016 – July 2017 (note that no new stoves have been distributed after July 2017).

The minimum sample size to be selected for this survey was estimated in line with the applied methodology and equations provided in “Guidelines for sampling and surveys for CDM project activities and programme of activities”³⁴.

³³ 9981-0002_Project KPT Report 2018

³⁴ CDM-EB67-A06-GUID (Version 04.0). Available at <http://cdm.unfccc.int/Reference/Guidclarif/index.html#pdd> (site visited 05/03/2020)

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 verification³⁵.

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 ₂ 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 ³⁶
$NCV_{biomass}$	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 ₂ /TJ
$N_{y,i}$	Number of project devices of type i operating in year y

Here below is provided, as an example, the use of the above equation for determining the ERs regarding one vintage 1 stove in the year 2018³⁷.

$$\begin{aligned}
 ER_y &= B_{y,savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel} * N_{y,i} \\
 &= 3.828 \text{ t/device/year} * 0.91 * 0.015 \text{ TJ/t} * 81.6 \text{ tCO}_2/\text{TJ} * 1 \\
 &= 4.23 \text{ tCO}_2/\text{device/year}
 \end{aligned}$$

Moreover, to consider the impact of the possible transfer of the households (and the consequent mobility of the project stoves) outside the project boundary, an additional correction factor of 0.5% has been applied for the calculated emission reductions³⁸.

³⁵ 9981-0002_ER calculations 2018

³⁶ For all the CPAs under the CDM PoA 9981, the country specific fraction of non-renewable woody biomass is defined using requirements in "TOOL30: Methodological tool: Calculation of the fraction of non-renewable biomass", version 02.0

³⁷ Please refer the cells D11-D15 in the tab "ERs per device" in the Excel spreadsheet "9981-0002_ER calculations 2018" for the full calculations.

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-II.G is chosen and therefore, the following equation will be used³⁹:

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

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

Here below is provided, as an example, the use of the above equation for determining the $B_{y,savings}$ regarding one vintage 1 stove in the year 2018.⁴⁰

$$\begin{aligned}
 B_{y,saving} &= B_{old} - B_{y,new,KPT} \\
 &= 6.601 \text{ t/device/year} - 2.773 \text{ t device/year} \\
 &= 3.828 \text{ t/device/year}
 \end{aligned}$$

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.

³⁸ According the survey on mobility of households conducted in the neighbourhoods of Maputo on February 2013 (Anexo II – Selagem Censitária dos domicílios (Mobility of the project households survey, AVSI Foundation 2013) there is some mobility of persons and families. The survey shows that averagely 5% of the surveyed persons had transferred their housing. Based on the survey it is anyhow more common the mobility of individuals than the mobility of entire families. Moreover, in case of mobility of the entire family this happens often changing the house within the same Bairro. The CPA2 is composed of 11 adjacent bairros and therefore it is assumed that the mobility occurs mostly within the geographical project boundary of CPA2. To take into account the the mobility of the families outside the project boundary, the PP has applied a correction factor of 0.5% in the emission reduction calculations.

³⁹ Please refer the Section B.4.1 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.

⁴⁰ Please refer the cells D9, D10 and D11 in the tab “ERs per device” in the Excel spreadsheet “9981-0002_ER calculations 2018” for the full calculations.

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

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
9981-P1-0002-CP1 (year 2018)	81,781	35,310	4,089	N/A	42,170 ⁴¹	42,170
Total	81,781	35,310	4,089	N/A	42,170	42,170

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 ₂ e)	Amount estimated ex ante for this monitoring period in the CPA-DD (t CO ₂ e)
9981-P1-0002-CP1 (year 2018)	42,170	25,717
Total	42,170	25,717

F.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the CPA-DD”

In line with Section B.4.1 of the CPA-DD (ver 09), ex ante estimation of emission reductions is made using a different calculation method than applied later for the ex post ER calculations. For the ER calculations made ex ante (i.e. at CPA-DD validation stage), in fact, a simplified calculation method based on the baseline cookstove and project cookstove efficiencies was applied (please refer the section B.4.1 of the CPA-DD). The ex post calculations are based instead on a more precise calculation method applying the monitored values of average daily charcoal consumption in the project scenario (please refer the above sections F.1, F.2. and F.3).

F.6. Remarks on increase in achieved emission reductions

The main reason for difference between the ERs estimated ex ante and ex post is the conservative estimation regarding the usage rate which was selected to be used in ex ante calculations. In fact, it was conservatively assumed that only 60% of the distributed stoves would be operational during this monitoring period. The monitoring survey confirmed instead that 91% of the distributed “vintage 1” stoves and 89% of the “vintage 2” stoves were operational during the monitoring period.

In addition to this, there are two other factors explaining the difference between ex ante and ex post ERs.

Firstly, in ex ante and ex post ER calculations two different calculations methods have been applied as described in above section F.5.1.

⁴¹ A correction has been applied in line with the footnote 33 (i.e. $45,382 \times 0.995 = 42,170$).

Secondly, at CPA-DD validation stage it was conservatively assumed that most of the households (77%) would buy two project stoves. As evident from the stove selling database instead only 10% of the families purchased two project stoves.

F.7. Remarks on scale of small-scale CPAs

The thermal energy savings achieved by the CPA during the year 2018 (i.e. during this monitoring period) are estimated to be 173 GWh_{th} which is under the limit (180 GWh_{th}) of small-scale project activities and non of the cooking stove (i.e. unit) achieve energy savings at a scale of no more than 20 GWh per year as demonstrated within the ER calculation spreadsheet⁴².

Moreover, as this CPA consists solely of units that qualify as “microscale CDM units” as defined in the “Methodological tool: Demonstration of additionality of microscale project activities” and thus, in line with the para 124 (m) of the CDM Project Standard for Programmes of Activities (Version 02.0), the conditions to ensure that the CPA meets the small-scale threshold and remain within this threshold throughout the crediting period of the CPA are not in fact required.

⁴² Please refer the sub-page “Energy Savings” within the document “9981-0002_ER calculations 2018”

Document information

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03.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN); • Add a section on remarks on the observance of the scale limit of small-scale CPAs during the crediting periods; • Add "changes specific to afforestation or reforestation activities/CPA" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R PoAs between two commitment periods; • Make structural and editorial improvements.
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