



**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

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	05 Dated 10/10/2014	
Version number of this monitoring report	05	
Completion date of this monitoring report	28/11/2018	
Monitoring period number	2 nd Monitoring Period	
Duration of this monitoring period	12/07/2016–30/11/2016	
Monitoring report number for this monitoring period	01 Batch 2 of 3	
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
Sectoral scopes	03: Energy Demand	
Applied methodologies and standardized baselines	AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass (Version 05.0)	
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	7,383 tCO ₂ e
Amount of GHG emission reductions	5,138 tCO ₂ e ¹	

¹ Period 12/07/2016–30/11/2016

or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	
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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 models². The stoves distributed under each CPA will be sold with a subsidised 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.

² Colorado State University, 2013. Emissions and Performance Report CH2200 (provided to DOE during the validation process)

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
Generic CPA included in version 05 of the PoA 9811. 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"	05	Sectoral Scope 03: Energy Demand	<p>(a) Methodology: AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass (Version 05.0)³</p> <p>(b) Tools:</p> <ul style="list-style-type: none"> - General guidelines for SSC CDM methodologies (Version 20.0) - Guidelines on the demonstration of additionality of small-scale 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 04.1) - Guidelines for sampling and surveys for CDM project activities and programme of activities (Version 03.0) - Guidelines on assessment of debundling for SSC project activities (version 03) <p>(c) Standardized baselines: N/A</p>

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Crediting period type and duration	Covered in this monitoring report? (yes/no)
9981-0001, version 05 "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
9981-0002, Registered Component Project Design Document, version 2.1, dated 11/06/2016 and Validated Project Design Document, version 07, dated 24/09/2018 ⁴	Generic CPA of the PoA 9981 version 05	05	Renewable crediting period 12/07/2016 – 11/07/2023	Yes

³ <http://cdm.unfccc.int/methodologies/DB/DCO8WRRQVTGLH1GHQBCL035F5M13R8>

⁴ Post registration correction are presented in PRC ref. PRC-9981-001 with effective approval date on 25th of October 2018.

"Domestic cookstoves in Maputo (Mozambique), phase II"				
9981-0003, version 02 "Improved Cookstoves in Pemba "	Generic CPA of the PoA 9981 version 05	05	Renewable crediting period 01/08/2016 – 31/07/2023	No

A.2. Coordinating/managing entity

The coordinating/managing entity (CME) is Fondazione AVSI.

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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 9981-0002 is described below in detail:

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

b) 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 first CPA of this PoA (CPA 9981-0001) 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:

9-11 October 2016: Three days training for the Usage Survey field team organized by AVSI (Alessandro Galimberti) and Carbonsink (Antonio Guiso). The training included initial theoretical training regarding the survey and its correct filling as well as practical training and follow up during the first days of the Usage Survey implementation in the field. Totally 5 participants (Celso Langa (responsible of the field team), Angela Mbuiangue, Ester Agostinho, Halima Virgilio Cumbana and Jorge Chicavane). The KPT Survey has been made by an experienced external entity and thus no training regarding the KPT has been organized by the CME.

c) A Procedure for technical review of inclusion of CPAs

The CME together with Carbonsink has ensured before the inclusion that the CPA 9981-0002 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 AVSI officiness 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 9981-0002 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.

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 9981-0002 this has included monthly double check of the stove selling database by Carbonsink. The next foreseen improvement for the management system will include the introduction of an new application which enables the monitoring surveys to be filled directly by using a tablet or mobilephone instead of paper forms.

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 9981-0002.

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 of June 2015) until 30th of November 2016 (in other words, until the end of this Monitoring Period) totally 6,705 energy efficient stoves have been distributed.

In the baseline, approximately 94% of the households within the project area cook with stoves based on charcoal usage⁵. The traditionally 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-2200 Charcoal Cookstove. CH-2200 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 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.

⁵ Baseline survey including a sample of 537 households resulted that 94.42% (i.e., 507 households) are using charcoal stoves, 3.17% gas stoves, 1.49% wood stoves and 0.93% electric stoves (Cooperação para o Desenvolvimento e Morada Humana (CDM)_2012)

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



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

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

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
This monitoring period	12/07/2016 – 30/11/2016
- Usage Survey	10/10/2016 – 01/11/2016
- Kitchen Performance Test (KPT)	17/10/2016 – 20/10/2016
Implementation status (number of stoves distributed)	6,705 stoves distributed by the 30/11/2016

(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 7,383 tCO₂e 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: Province of Maputo City

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.

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 or standardized baselines

N/A

C.3.2. Corrections

C.3.3. N/A 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:

- 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
- 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")⁷

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
Carbonsink	<ul style="list-style-type: none"> •Supervises AVSI with the monitoring activities •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 contact details and the GPS coordinates 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

⁷ 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.

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 = $39\% \times 75.2 \text{ kg} + 61\% \times 84.9 = 81.1 \text{ kg}$ 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, 2004.⁸</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>

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

⁸ 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

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>
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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.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>

E.2. Data and parameters monitored

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
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) ⁹
Value(s) of monitored parameter	0.91
Monitoring equipment	N/A

⁹ <http://cdm.unfccc.int/DNA/fNRB/index.html> (site visited 15/12/2016)

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

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) ¹⁰
Value(s) of monitored parameter	1.956
Monitoring equipment	N/A
Measuring/reading/recording frequency	Yearly (or biennially) ¹¹
Calculation method (if applicable)	N/A
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 KPT¹², the required precision was reached. Please refer the KPT Report for further details.</p>
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks

¹⁰ 9981-0002_Project KPT Report 2016

¹¹ 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.

¹² 9981-0002_Project KPT Report 2016

Additional comments	<p>The parameter is applicable only for the ex post calculations. Project KPT will be 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 showed below:</p> <p>The Project KPT 2016 resulted that the annual charcoal consumption is 0.28835 t/year/hh. This value is converted into the charcoal consumption per device using the information that 90% of the households have one project stove and 10% of the households two project stoves:</p> $[(0.10 \times 0.28835 \text{ t/year})/2 + (0.90 \times 0.28835) \text{ t/year}] = 0.27393 \text{ t/year/device}$ <p>This value is converted as woody biomass as follows: $7.14 \times 0.27393 \text{ t/year/device} = 1.9559 \text{ t/year/device}$.</p>
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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 ¹³ and usage survey ¹⁴ on a representative sample																
Value(s) of monitored parameter	<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>3,112</td></tr><tr><td>August</td><td>3,464</td></tr><tr><td>September</td><td>3,845</td></tr><tr><td>October</td><td>4,380</td></tr><tr><td>November</td><td>4,830</td></tr></table> <p>*Please refer to column D of the sub-page “Total CERs” in the ER calculations spreadsheet</p>			Year	Month	Number of operational devices	2016	July	3,112	August	3,464	September	3,845	October	4,380	November	4,830
Year	Month	Number of operational devices															
2016	July	3,112															
	August	3,464															
	September	3,845															
	October	4,380															
	November	4,830															
Monitoring equipment	N/A																
Measuring/reading/recording frequency	At least biennially																
Calculation method (if applicable)	Based on the Usage Survey 83% of the sold devices 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	Calculation of project emissions or actual net GHG removals by sinks																

¹³ 9981-0002_Stove Selling Database 2016

¹⁴ 9981-0002_Usage Survey Database 2016

Additional comments	The number of efficient stoves shall remain within the limit of 180 GWh _{th} for type II CDM project activities.
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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 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”¹⁵. The sample size calculations are presented in the sub-page “Sample size” of the ER Spreadsheet¹⁶.

Monitoring activity	Time	Sample size	Implementer
Usage Survey	10/10/2016– 01/11/2016	53	AVSI
Kitchen Performance Test (KPT)	17/10/2016– 20/10/2016	38 ¹⁷	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 monitoring period, the simple random sampling method is appropriate also for the KPT as only one age vintage is covered (The maximum stove is only 3 months more than 12 months)..

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 2016”. The examples of filled surveys forms are available in the attached document “Scanned examples of Usage Survey Forms 2016”.

KPT

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

(d) Analysis of the collected data

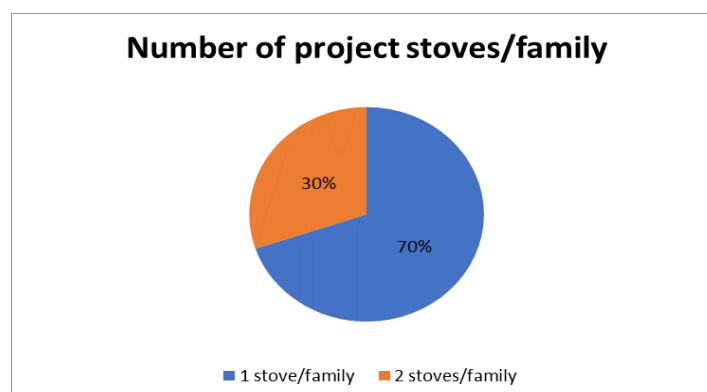
Data analysis of the KPT is described in separate report “Project KPT Report 2016”¹⁸. Here below are described the main findings of the Usage Survey. The raw data together with a more detailed data-analysis is included in the electronic Spreadsheet¹⁹.

¹⁵ Especially the examples presented in Appendix 1, section 2.1.1 of the version 03 of the guidelines has been followed.

¹⁶ ER Spreadsheet has been provided to DOE during the verification process.

¹⁷ The minimum sample size calculated was 37 (as shown in the “sample size” sub-page of ER calculation spreadsheet). In the field survey GIZ selected conservatively to use a sample of 38.

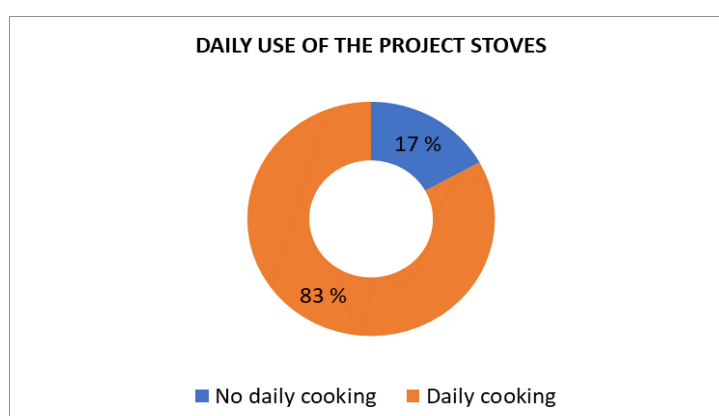
Sampled households and number of stoves: The 53 households interviewed had totally 69 project stoves. 37 of the interviewed households, corresponding 70% of the sample, had 1 project stove and the rest, 30% (16 households), had 2 project stoves per household. This is meaning that within the sample, the percentage of the households with two project stoves (30%) is a bit higher than the average within all the project households 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. Majority (83%) of the households who had two project stoves had bought the both stoves at the same moment. The households had bought the stoves averagely 7 months ago. In average each household was composed of 4.7 standard adults.



Usage rate of the project stoves:

Majority, 98%, of the respondents declared that they are using the project stoves. Daily the project stove/stoves were used by 83%²⁰ of the respondents who indicated to cook 2-3 meals with the project stove/stoves (in average 2.5 meals/day/household which equals to 17.5 meals/week/household). Totally 17% of the respondents (owning in total 12 stoves), indicated to not cook daily with their project stove/stoves.

This usage rate (83%) is applied for the ER calculations ensuring that only the operation devices (i.e. project stoves which are used daily) are included in the ER calculations.



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

¹⁸ 9981-0002_Project KPT Report 2016

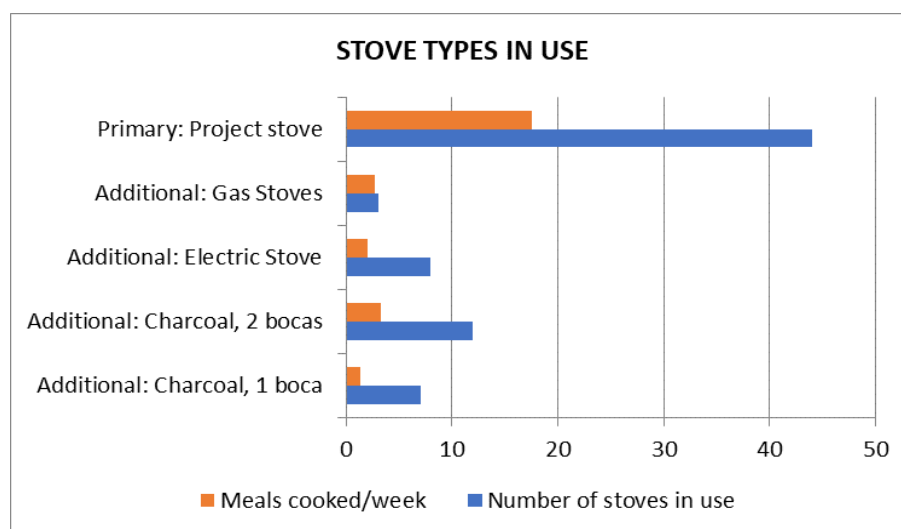
¹⁹ 9981-0002_Usage Survey Database 2016

²⁰ Please refer to cell W59 of the spreadsheet "Usage Survey Database 2016"

the usage of the project stoves. Additional stove are used, for example, during special days, ceremonies or weekends.

The most commonly used additional stove types were one and two fire charcoal stove (71% of the additional stoves). Other mentioned additional cookstove types were gas stove (3 respondents) and electric stove (8 respondents).

Monitoring of the project charcoal consumption with the KPT ensures that the charcoal consumption used for the project situation is including also the consume of the additional use of baseline charcoal consumption (KPT measures the total fuel consumption of the sampled household without making difference if the consumption is made with the project stove or with baseline charcoal stove).



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 the improved stoves has been made. Eventough, the Usage Survey find 2 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 teh project area, it is estimated that the re-selling of their baseline stoves made by part of the project households is not having any significant impact for adding the overall use of the inefficient charcoal stoves, or in general charcoal consumption, within the project area or in the region²¹. Moreover, to account for leakage an adjustment factor of 0.95 has be applied in the emission reduction calculation. In addition, 66% of all the respondents declared that they had recommended the project stoves to their relatives or friends and that at least one peer had bought a new project stove after their recommendation . This is indicating the high satisfaction of the respondents with the project stoves.

(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 to be atleast 53 households as calculated in

²¹ Moreover, the monitoring of ERs is made through the annual Kitchen Performance tests (KPTs) ensuring thus that the impact of the simultaneous usage of the traditional charcoal stoves is accounted. In fact, KPT measures the total daily charcoal consume/houshold and thus accounts also the charcoal consume caused by the eventual simultaneous usage of the traditional stoves.

the separate Excel spreadsheet²². The required confidence/precision level was met as all the 53 households were reached and participated to the survey.

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 error). As described in the separate KPT report the KPT²³, a the requested precision was met. 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.

The minimum sample size is calculated as showed in in the separate Excel spreadsheet²⁴. 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”²⁵.

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 verification²⁶.

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

²² 9981-0002_ERs Calculations 2016, sub-page “Sample size”

²³ Project KPT Report

²⁴ Ex post ER calculations, sub-page “Sample size”

²⁵ CDM-EB67-A06-GUID (Version 03.0). Available at <http://cdm.unfccc.int/Reference/Guidclarif/index.html#pdd> (site visited 09/01/2014)

²⁶ Ex post ER calculations

$EF_{\text{projected_fossilfuel}}$	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

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 reductions.²⁷

Determination of $B_{y,\text{savings}}$

In order to determine ex post $B_{y,\text{savings}}$ equation 2 of Option 1 described in paragraph 12 of AMS-II.G is chosen and therefore, the following equation will be used²⁸:

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

Where:

$B_{y,\text{savings}}$	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
$B_{y,\text{new,KPT}}$	Annual quantity of woody biomass used in year y in tonnes per device, measured as per the Kitchen Performance Test (KPT) protocol

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 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
9981-0002: 12/07/2016 – 30/11/2016	7,948	0	565	N/A	7,383	7,383
Total	7,948	0	565	N/A	7,383	7,383

²⁷ 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.

²⁸ Please refer the Section D.6.1 of registered CPA-DD which states that two different methods for determining of $B_{y,\text{savings}}$ 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.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 (t CO ₂ e)
9981-0002 (12/07/2016–30/11/2016)	7,383 tCO ₂ e	5,138 tCO ₂ e ²⁹
Total	7,383 tCO ₂ e	5,138 tCO ₂ e

F.6. Remarks on increase in achieved emission reductions

Firstly, in ex-ante and ex-post ER calculations two different calculations methods have been applied (in line with Section B.4.1 of the registered CPA-DD). For the ER calculations made at CPA-DD validation stage, in fact, a simplified calculation method based on the baseline cookstove and project cookstove efficiencies was applied. 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.

Secondly, at CPA-DD validation stage it was conservatively assumed that most of the households would buy two project stoves. As evident from the stove selling database instead only 10% of the families purchased two project stoves. Moreover, at CPA-DD validation stage it was conservatively assumed that only 80% of the distributed stoves would be operational. The monitoring survey confirmed instead that 83% of the distributed stoves were operational during the monitoring period.

Document information

Version	Date	Description
02.0	7 June 2017	Revision to: <ul style="list-style-type: none"> Ensure consistency with version 01.0 of the “CDM project standard for programmes of activities (CDM-EB93-A07-STAN); Make editorial improvements.
01.0	1 April 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report, programme of activities		

²⁹ Period 12/07/2016–30/11/2016