



**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 | Improved Cooking Stoves Programme of Activities in Africa | |
| UNFCCC reference number of the PoA | 5341 | |
| Version numbers of the PoA-DD applicable to this monitoring report | Version 3.2 dated 27/11/2012 | |
| Version number of this monitoring report | 1.0 | |
| Completion date of this monitoring report | 16/05/2020 | |
| Monitoring period number | Sixth monitoring period | |
| Duration of this monitoring period | 01/07/2019 – 31/03/2020 both days inclusive | |
| Monitoring report number for this monitoring period | 1 | |
| Coordinating/managing entity | Envirofit International Ltd. | |
| Host Parties | Host Party of the PoA | Is this the host Party of a CPA covered in this monitoring report? (yes/no) |
| | Kenya | Yes |
| | South Africa | No |
| Applied methodologies and standardized baselines | AMS-II.G.: Energy efficiency measures in thermal applications of non-renewable biomass, version 03.0 Standardized baseline: NA | |
| Sectoral scopes | Sectoral scope: 3: 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 |
| | 0 | 72,837 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 | 97,965 tCO ₂ e | |

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

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The purpose of the Programme of Activities (PoA) is dissemination of high efficiency improved cook stoves (ICS) in Kenya and South Africa. The PoA promotes improved cookstove (ICS) technologies that replace existing, less efficient cooking stoves using woody-biomass (charcoal or wood-fuel).

The ICS distributed under the PoA are portable and use charcoal or woodfuel as fuel. These ICSs are more efficient in transferring heat from the fuel to the pot, thus saving charcoal/woodfuel compared to the traditional charcoal/woodfuel stoves currently used by the project households. Furthermore, these ICSs have been designed not only to increase heat transfer, but also to match traditional utensils and cooking habits of project households.

In accordance with version 3.0 of the small-scale CDM methodology AMS-II.G, in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs. Therefore, by reducing the amount of fuel required for cooking and thus the use of non-renewable woody biomass, the replacement of less efficient stoves with more efficient ICS reduces the amount of greenhouse gases (GHG) emitted into the atmosphere.

Envirofit International Ltd (Envirofit) is the coordinating/managing entity (CME) for this PoA and coordinates the efforts of different Distribution Organizations (DOs) who are involved in distribution of ICS within the boundary of the PoA and comply with the requirements of this PoA. Each DO sells ICSs either directly or through retailers, entrepreneurs or other agents sub-contracted by the DO. The CME provides training and guidance on the correct distribution and monitoring procedures to each DO. Each DO acts individually, implementing the CPA(s) in accordance with local circumstances and the requirements prescribed by CME.

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: Improved Cooking Stoves Programme of Activities in Africa – CPA No. ##### Identification: Generic CPA-DD Reference: https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/T0ZKV3S1F2JH8RL75D9GQ6AMO4XNIC/view Version: 1.0 | 3.2 | 3: Energy Demand | AMS-II.G., version 03: Energy efficiency measures in thermal applications of non-renewable biomass https://cdm.unfccc.int/UserManagement/FileStorage/MLDN960OH41VWJPCZ23ERFUQT5BAGX |

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) |
|---|-----------------------|---|------------------------------------|---|
| Improved Cooking Stoves Programme of Activities in Africa – CPA No. 00001 (Kenya) Version: 3.2 5341-P1-0001-CP1 | 3.2 | Title: Improved Cooking Stoves Programme of Activities in Africa – CPA No. ##### Identification: Generic CPA-DD Reference: https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/T0ZKV3S1F2JH8RL75D9GQ6AMO4XNIC/view | Fixed 15/12/2012 – 14/12/2022 | No |
| Improved Cooking Stoves Programme of Activities in Africa – CPA No. 00002 (Kenya) Version: 2.0 | | | Fixed 01/01/2014 – 31/12/2023 | No |

| | | | | |
|--|--|--|--|-----|
| 5341-P1-0002-CP1 | | nt/ProgrammeOfActivities/poa_db/T0ZKV3S1F2JH8RL75D9GQ6AMO4XNIC/v | | |
| Improved Cooking Stoves Programme of Activities in Africa – CPA No. 00003 (Kenya) Version: 2.1 5341-P1-0003-CP1 | | Version: 1.0 | Fixed 01/01/2014 – 31/12/2023 | No |
| Improved Cooking Stoves Programme of Activities in Africa – CPA No. 00004 (Kenya) Version: 1.0 5341-P1-0004-CP1 | | | Fixed 01/04/2014 – 31/03/2024 | No |
| Improved Cooking Stoves Programme of Activities in Africa – CPA No. 00005 (Kenya) Version: 3.0 5341-P1-0005-CP1 | | | Fixed 06/11/2017 – 05/11/2027 | No |
| Improved Cooking Stoves Programme of Activities in Africa – CPA No. 00006 (Kenya) Version: 3.0 5341-P1-0006-CP1 | | | Fixed 06/11/2017 – 05/11/2027 | No |
| Improved Cooking Stoves Programme of Activities in Africa – CPA No. 00007 (Kenya) Version: 3.0 5341-P1-0007-CP1 | | | Fixed 06/11/2017 – 05/11/2027 | No |
| Improved Cooking Stoves Programme of Activities in Africa – CPA No. 00008 (Kenya) supported by Republic of Korea Version: 4.0 5341-P1-0008-CP1 | | | Fixed 22/03/2019 – 21/03/2029 | Yes |
| Improved Cooking Stoves Programme of Activities in Africa – CPA No. 00009 (Kenya) supported by Republic of Korea Version: 4.0 5341-P1-0009-CP1 | | | Fixed 22/03/2019 – 21/03/2029 | Yes |
| Improved Cooking Stoves Programme of Activities in Africa – CPA No. 00010 (Kenya) supported by Republic of Korea Version: 4.0 5341-P1-0010-CP1 | | | Fixed 22/03/2019 – 21/03/2029 | Yes |

A.2. Coordinating/managing entity

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Envirofit International Limited is the CME for the PoA. The responsible person for completing the CDM-PoA-MR-Form is as follows:

Rohit Lohia
Carbon Projects Development Manager
Envirofit International
rohit.lohia@envirofit.org

SECTION B. Implementation of PoA

B.1. Description of implemented PoA

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1. Operational and Management Framework

The CPAs (5341-P1-0008-CP1, 5341-P1-0009-CP1, 5341-P1-0010-CP1) covered in this monitoring report follow same management system as given below:

1. The CME / CPA implementer (CPAI) provided instructions to DOs to collect the end user information at the time of sales to make the stove eligible under the PoA. The CME / CPAI made them aware of requirements of end user data collection. Guidance was provided to them on the correct procedures to be followed during distribution.
2. The CME / CPAI maintains a PoA Distribution and Monitoring database. This database is a compilation of CPA distribution records. The database includes CPA wise list of stoves sales, based on following information, received from DOs (collected this information at the time of sale):
 - a. Name of customer
 - b. Address / location of the customer
 - c. Stove unique serial ID number
 - d. Stove Model
 - e. Stove distribution date
 - f. Type of old / baseline stove replaced by ICS, i.e. the fuel type used in the old / baseline stove.
3. The CME / CPAI performed cross-checks on the ICS sales information received from the DOs. The CME's logo is clearly displayed on the CPA Distribution Record, with a copy retained by CME / CPAI. A unique stove ID is punched on each stove and the same serial ID is mentioned on the CPA distribution record. Therefore, it is possible to identify each stove in the PoA with its unique serial ID number. The unique serial number linked to each stove and its association with a unique CPA bearing a CPA ID number eliminates any risk of double-counting of ICSs between CPAs.
4. The CPAI obtained the customer's approval during distribution to exclusively assign carbon rights to the CPAI as per the disclaimer specified on CPA distribution records / stove boxes.
5. The CME / CPAI coordinated all ex-post monitoring activities in the PoA as follows:
 - a. Implemented the monitoring plan,
 - b. Determined the sample size as per sampling plan and identified the samples to be monitored (the sampling plan has been applied across group of CPAs as detailed in section E.3 below)
 - c. Ensured the quality of monitoring data (QA/QC)
 - d. Used this data for emissions reduction calculations.
6. The monitoring team checked and recorded the following key parameters in a CPA Monitoring Record. Key monitored parameters were:
 - a. Efficiency of project stoves ($\eta_{new,y}$)
 - b. Check if project stoves are operational and in use (SOF)
 - c. Check fraction of end users continuing to use replaced stoves (f_{old})
 - d. If replaced stoves are being used, the consumption accounted for by the old stoves (μ_{old})
7. The CME / CPAI calculated emission reductions based on monitoring data collected and prepared monitoring report

Thus, by carrying out the aforesaid, CME / CPAI ensured that the PoA Operational and Management plan as given in section A.4.4.1 of registered PoA-DD is duly implemented for concerned CPAs.

2. Sampling Approach

A single sampling plan has been applied to CPAs (5341-P1-0008-CP1, 5341-P1-0009-CP1 and 5341-P1-0010-CP1) covered in this monitoring report. For details, refer section E.3 below.

B.2. Post-registration changes to PoA**B.2.1. Corrections**

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NA

B.2.2. Inclusion of monitoring plan

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NA

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

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NA

B.2.4. Changes to programme design

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NA

B.2.5. Changes specific to afforestation or reforestation activities

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NA

PART II Monitoring of CPAs

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This Monitoring Report covers three CPAs (5341-P1-0008-CP1, 5341-P1-0009-CP1, 5341-P1-0010-CP1) in Kenya, as listed in section A.1.2 above. These CPAs are homogeneous as they have the same project boundary/country (i.e. Kenya) and follow a common generic CPA as identified in section A.1.1, Part I of this monitoring report and implement the same technology/measure (improved biomass cookstoves). Thus, these CPAs have been sub-grouped for monitoring purposes. The following sections therefore represent these three CPAs.

SECTION C. Implementation of CPAs**C.1. Description of implemented CPAs**

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

The purpose of the CDM Programme Activities (CPAs) is dissemination of improved cooking stoves (ICS) in the Republic of Kenya. The CPAs replace cooking stoves using charcoal / woodfuel with more efficient stoves using charcoal / woodfuel.

The project ICS are more efficient in transferring heat from the fuel to the pot, thus saving fuel compared to the baseline stoves which would have been used in the absence of the project activity. Furthermore, the ICSs applied in these CPAs have been designed not only to increase heat transfer, but also to match traditional utensils and cooking habits of people in Kenya.

The CPAI / DO for the CPAs included in this monitoring report are as follows:

| CPA Ref No. | CPA Implementer | CPA Distributing Organization | Status of CPA Implementation |
|------------------|-----------------|-------------------------------|------------------------------|
| 5341-P1-0008-CP1 | CERPD Co., Ltd. | Envirofit Kenya | Implemented |
| 5341-P1-0009-CP1 | CERPD Co., Ltd. | Envirofit Kenya | Implemented |
| 5341-P1-0010-CP1 | CERPD Co., Ltd. | Envirofit Kenya | Implemented |

CERPD Co., Ltd. (CERPD) a company based in the Republic of Korea, has provided all implementation costs for these CPAs. CERPD has fully sponsored the ICS to make ICS affordable to beneficiary households, as well covered the cost of operation and management of the CPAs in a financially sustainable condition. As the ICS are being fully sponsored, it is ensured at the time distribution, that only one ICS unit is given to a household, no household in the CPA database owns more than one ICS unit.

(b) **Description of the technology employed and installed equipment and/or infrastructure**

The Envirofit stoves have been designed with the specific intention of maximizing thermal efficiency while simultaneously minimizing the production of toxic emissions. While many interrelated factors need to be considered in order to achieve these goals, primary aspects of stove performance were explored during the development of the stoves: 1) fuel and air mixing 2) heat transfer to the pot. In order to maximize temperature, the combustion chamber shape, fuel amount, and air flow through the stove all need to be considered and correctly coordinated. In order to use the available thermal energy in the most efficient manner possible, specific stove geometry and configuration choices were made; including reducing stove thermal mass and minimizing heat flux through the sides and bottom of the stove. In order to minimize emissions, the combustion chamber shape, fuel amount, and air flow rate through the stove all need to be considered and correctly coordinated in order to maintain a proper air to fuel mixture.

The following table details the implementation status of the CPAs along with technology involved:

| CPA Ref No. | Type of Project stoves eligible | Stove models installed ¹ |
|------------------|---------------------------------|---|
| 5341-P1-0008-CP1 | Woodfuel, Charcoal | Woodfuel- Econofire /SmartSaver Wood, M5000 |
| 5341-P1-0009-CP1 | | Charcoal - Econochar /SmartSaver Charcoal, CH5300, CH5200 |
| 5341-P1-0010-CP1 | | |

The stove models referred above are shown below:



Figure 1: Econofire /SmartSaver Wood



Figure 2: M5000 /SuperSaver Wood



Figure 3: CH5300 - Charcoal



Figure 4: CH5200 - Charcoal



Figure 5: Econochar /SmartSaver Charcoal

Stove Specifications:

¹ As per footnote 6 of the registered CPA-DD, the stove models listed in the CPA-DDs are merely illustrative and new ICS models may be added in the CPA during the crediting period.

| Parameter description | Econofire /SmartSaver Wood | M5000/SuperSaver Wood | CH5300 | CH5200 | Econochar /SmartSaver Charcoal |
|-----------------------|---|---|---|---|---|
| Thermal Efficiency | 30.2 % | 29.7% | 35.7% | 36.1% | 34.3 % |
| Unit Size | 25.5 x 40 x 35.5 cm (height x width x depth) | 28.0 x 26.5 x 26.5 cm (height x width x depth) | 36.6x31.5x26 cm (height x width x depth) | 16.2x37.5x31 cm (height x width x depth) | 28 x 37 x 42 cm (height x width x depth) |
| Unit Weight | 2.7 kg | 4.2 kg | 5.0 kg | 3.5 kg | 3.7 kg |
| Type | Portable | Portable | Portable | Portable | Portable |
| Grate/ Chimney | Grate | Grate | Grate | Grate | Grate |

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

| | |
|----------------------------|--------------------------------------|
| CPA Reference number | 5341-P1-0008-CP1 to 5341-P1-0010-CP1 |
| Start date of the CPA | 03/10/2018 |
| Continued operation period | Since 03/10/2018 |

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

| CPA | Emission Reductions tCO ₂ e |
|------------------|--|
| 5341-P1-0008-CP1 | 23,936 |
| 5341-P1-0009-CP1 | 23,142 |
| 5341-P1-0010-CP1 | 25,759 |
| Total | 72,837 |

Each stove bears a unique serial ID punched on the stove. The same is recorded to trace the stove later and avoid double counting. Further, for each stove included under each CPA, information on the location of the stove has been collected by collecting address of the user at the time of sale in CPA Distribution Record. Thus, location of each stove in CPA distribution database can be traced. Please refer the ER calculator, worksheet 'CPA Distribution Summary' in which the sales information i.e. Stove unit details for each stove is mentioned. The system of recording the unique serial on each stove along with its location serves toward avoiding double counting of stoves amongst various CPAs.

C.2. Location of CPAs

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All the CPAs have a common project boundary as follows:

Host Party(ies): Republic of Kenya

The geographical reference of the CPAs is determined by the location of the individual ICS households where the ICSs are distributed which is limited to the territorial area of the host country, Kenya. The capital of Kenya, Nairobi, is located at -1.283249, 36.816663. The distribution commenced in and around Nairobi and has expanded to further regions throughout Kenya.



Figure: Map of Kenya

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

NA

C.3.2. Corrections

NA

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

NA

C.3.4. Inclusion of monitoring plan

NA

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

NA

C.3.6. Changes to project design

>>
NA

C.3.7. Changes specific to afforestation or reforestation CPA

NA

SECTION D. Description of monitoring system of CPAs

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Stoves were distributed to end-users by CME / CPAI or via the DO. DO was trained by CME / CPAI for ensuring correct procedures according to the PoA are fulfilled.

At the CPA level, DO ensured that necessary data was correctly obtained from the customer and recorded in the CPA Distribution Record, firstly to avoid double counting and secondly to enable tracking of the ICS for monitoring purposes. This data captured included:

- Name of customer
- Address / location of the customer
- Stove unique serial ID number
- Stove Model
- Stove distribution date
- Type of old / baseline stove replaced by ICS, i.e. the fuel type used in the old / baseline stove.

All other monitoring activities have been carried out at the PoA level, single stage sampling plan.

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

(Copy this table for each data or parameter.)

| Data/Parameter | Q_{biomass} |
|--|--|
| Unit | Tonnes/year |
| Description | Annual average biomass consumption per appliance |
| Source of data | Historical data from literature, as allowed by the methodology |
| Value(s) applied | 5.706 for charcoal 2.014 for woodfuel |
| Choice of data or measurement methods and procedures | As per registered CPA-DDs |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | Used for calculation of B_{old} |

| Data/parameter | $f_{\text{NRB},y}$ |
|--|---|
| 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 | Value from CPA 5341-P1-0001-CP1 for Kenya |
| Value(s) applied | 0.92 |
| Choice of data or measurement methods and procedures | As per registered CPA-DDs |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | - |

| Data/parameter | NCV_{biomass} |
|--|--|
| Unit | TJ/tonne |
| Description | Net calorific value of the non-renewable biomass that is substituted |
| Source of data | 2006 IPCC guidelines for National Greenhouse Gas Inventories |
| Value(s) applied | 0.015 |
| Choice of data or measurement methods and procedures | As per registered CPA-DDs |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | - |

| | |
|--|--|
| Data/parameter | EF_{projected_fossilfuel} |
| Unit | tCO ₂ /TJ |
| Description | Emission factor for the substitution of non-renewable biomass by similar consumers |
| Source of data | 2006 IPCC guidelines for National Greenhouse Gas Inventories |
| Value(s) applied | 81.6 |
| Choice of data or measurement methods and procedures | As per registered CPA-DDs |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | - |

| | |
|--|--|
| Data/parameter | η_{old} |
| Unit | Efficiency (fraction) |
| Description | Efficiency of the system being replaced |
| Source of data | AMS-II.G version 03 |
| Value(s) applied | 0.1289 for charcoal stoves 0.1081 for firewood stoves |
| Choice of data or measurement methods and procedures | As per registered CPA-DDs |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | |

| | |
|--|--|
| Data/parameter | LAF |
| Unit | Fraction |
| Description | Net to gross adjustment factor to account for leakages |
| Source of data | AMS-II.G version 03 |
| Value(s) applied | 0.95 |
| Choice of data or measurement methods and procedures | As per registered CPA-DDs |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | - |

E.2. Data and parameters monitored

| | |
|---------------------------------------|--|
| Data/Parameter | $\eta_{new,y}$ |
| Unit | % |
| Description | Efficiency of the system being deployed as part of the project activity |
| Measured/calculated/default | Measured |
| Source of data | As determined through sample testing of stoves by performing WBTs |
| Value(s) of monitored parameter | 34.0% |
| Monitoring equipment | The equipment was either externally calibrated or were newly purchased at the time of use so measurements were done with the necessary guarantees. |
| Measuring/reading/recording frequency | WBTs were carried out for a sample of installed ICSs in operation in line with the PoA Sampling Plan on an annual basis. |

| | |
|------------------------------------|---|
| Calculation method (if applicable) | n/a |
| QA/QC procedures | WBTs were conducted in line with the guidance provided by the CME |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | Weighted average efficiency has been calculated as more than one stove model has been distributed |

| | |
|---------------------------------------|---|
| Data/parameter | N_{all} |
| Unit | Number |
| Description | Total number of stoves installed |
| Measured/calculated/default | Calculated |
| Source of data | CPA Distribution Records and logbooks |
| Value(s) of monitored parameter | 29,987 |
| Monitoring equipment | N/A |
| Measuring/reading/recording frequency | The CPA Distribution Records which provided the data used to calculate this parameter. This data was uploaded to the PoA Distribution and Monitoring Database maintained by the CME. The recording of the sales was done in a regular basis during the crediting period and the monitoring in a yearly basis. |
| Calculation method (if applicable) | Sum of all stove records in the CPA Distribution Database |
| QA/QC procedures | The CME will supervise the activities of each DO, and provide training, guidelines and distribution templates to facilitate accurate record keeping during the ICS distribution. The CME will also maintain a record of the stove serial numbers supplied to each DO and will be able to cross-check these against the CPA Distribution Reports it receives back from the DO. |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | It is ensured that only one ICS is credited per beneficiary household. At the time of sale of the ICS, the "CPA Distribution Record" confirms if the stove is for self-use by the recipient or for use by someone else. In case the recipient reports buying stove for someone else, the name and address of the actual stove user is recorded. This ensures that all ICS are listed on the name of their actual end users. Additionally, another question in the CPA distribution record confirms if the user already has an existing Envirofit ICS. Any user reporting having an existing Envirofit ICS is not included in CPA distribution database and hence is not included in the ER calculations. Besides, the ex-post monitoring involves a cross check of presence of more than one project ICS in the sampled household. The ICS population is discounted accordingly (if 5% of samples report using two units of project ICS, the entire population is discounted by 5%) to ensure that only one ICS is credited per household. |

| | |
|---------------------------------|--|
| Data/parameter | SOF |
| Unit | Fraction |
| Description | Stove Operation Fraction – used to determine the share of distributed stoves that are still operating, measured ex-post through sampling |
| Measured/calculated/default | Measured |
| Source of data | Survey of end user behaviour as part of the PoA Sampling Plan |
| Value(s) of monitored parameter | 0.985 |
| Monitoring equipment | No specific monitoring equipment has been used for the surveys. |

| | |
|---------------------------------------|--|
| Measuring/reading/recording frequency | Measured ex-post by investigation of the number of operational ICS installations within the sampled ICS. This was done on an annual basis as per the PoA monitoring requirements |
| Calculation method (if applicable) | $SOF = n_{\text{Operational}} / n_{\text{Total}}$, where n = number of samples |
| QA/QC procedures | The CME provided training, guidelines and monitoring templates to ensure that the Monitoring Organization responsible for monitoring followed appropriate procedures. |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | |

| | |
|---------------------------------------|--|
| Data/parameter | μ_{old} |
| Unit | kg/year |
| Description | The amount of woody biomass consumption that is consumed through the continued use of old stoves |
| Measured/calculated/default | Measured as per option A of CPA-DDs |
| Source of data | Data from survey of end user behaviour as part of PoA Sampling Plan combined with the same source of data as for Q_{biomass} |
| Value(s) of monitored parameter | 650 |
| Monitoring equipment | Parameter determined through monitoring survey using a questionnaire, no specific monitoring equipment has been used for the surveys. |
| Measuring/reading/recording frequency | <p>The actual value applied for emissions reduction calculations and request for issuance of CERs was measured ex-post by estimation of a representative sample of end users using the deployed ICS, as conducted in line with the PoA Sampling Plan.</p> <p>During the survey, the interviewer conducted an interview with the end user to identify how much the baseline (replaced) stove as being used. The value of μ_{old} will be estimated by comparing the number of meals before and after buying ICS.</p> <p>This was done on an annual basis as per the PoA monitoring requirements</p> |
| Calculation method (if applicable) | Based on the registered CPA-DDs, this parameter has been calculated by multiplying the baseline Fuel Consumption, Q_{biomass} , by the ratio of meals cooked by the traditional stove in operation before and after purchasing the Envirofit Stove as reported by households with continued usage of baseline stoves. |
| QA/QC procedures | The CME provided training, guidelines and monitoring templates to ensure that the Monitoring Organization responsible for monitoring followed appropriate procedures |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | - |

| | |
|---------------------------------|---|
| Data/parameter | f_{old} |
| Unit | Fraction |
| Description | The fraction of end users that are still using baseline (replaced) stoves |
| Measured/calculated/default | Measured |
| Source of data | Survey of end user behaviour as part of the PoA Sampling Plan |
| Value(s) of monitored parameter | .055 |
| Monitoring equipment | Parameter determined through monitoring survey using a questionnaire, no monitoring equipment has been used |

| | |
|---------------------------------------|--|
| Measuring/reading/recording frequency | The actual value applied for emissions reduction calculations and request for issuance of CERs was measured ex-post by estimation of a representative sample of end users using the deployed ICS, as conducted in line with the PoA Sampling Plan. Sampling estimated the value of this parameter through monitoring the fraction of end users not using baseline stoves ($f_{\text{non,old}}$), This was done on an annual basis as per the PoA monitoring requirements |
| Calculation method (if applicable) | Based on the registered CPA-DDs, the fraction of users not using the baseline stoves ($f_{\text{non old}}$) has been monitored. Then f_{old} has been calculated as $f_{\text{old}} = 1 - f_{\text{non old}}$ |
| QA/QC procedures | The CME provided training, guidelines and monitoring templates to ensure that the Monitoring Organization responsible for monitoring followed appropriate procedures. |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | - |

| | |
|---------------------------------------|---|
| Data/parameter | Stove_{year} |
| Unit | Year |
| Description | Calculated average stove year in the monitoring period. |
| Measured/calculated/default | Calculated |
| Source of data | PoA Distribution and Monitoring Database |
| Value(s) of monitored parameter | 0.75 |
| Monitoring equipment | No specific monitoring equipment has been used for the surveys |
| Measuring/reading/recording frequency | Each ICS entered into the PoA Distribution and Monitoring Database was linked to a distribution date (recorded during distribution). Thus, for any monitoring period it is possible to calculate the fraction of year covered by stoves for that monitoring period. The recording of the sales date was done in a regular basis during the crediting period and the monitoring on an annual basis. |
| Calculation method (if applicable) | Average of all stove records in the CPA Distribution Records. |
| QA/QC procedures | The CME was responsible for overseeing the collection of data by DOs during distribution, training the DOs in correct data recording practices, maintaining a secure Database, and back up of files contained in the Database. |
| Purpose of data/parameter | Calculation of baseline emissions |
| Additional comments | - |

E.3. Implementation of sampling plan

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a) List of CPAs to which the single sampling was applied

A single sampling plan was carried out for CPAs (5341-P1-0008-CP1, 5341-P1-0009-CP1 and 5341-P1-0010-CP1) covered in this monitoring report.

b) Description of implemented single sampling design;

Due to the large number of ICS distributed under the PoA it was not economically feasible to monitor each individual ICS unit distributed. Therefore, representative sampling was undertaken as part of a PoA-wide Sampling Plan. The sampling plan consisted of monitoring the following four parameters mentioned in section D.2.:

| Parameter | Description of parameter |
|-----------|--------------------------|
|-----------|--------------------------|

| | |
|----------------|---|
| $\eta_{new,y}$ | The thermal efficiency of the ICS distributed (%) |
| SOF | The Stove Operating Fraction, i.e. the fraction of users using the ICS |
| f_{old} | The fraction of stove users still using baseline (replaced) stoves |
| μ_{old} | The amount of woody biomass that continues to be used in the replaced stoves (kg) |

Based on the registered PoA-DD and CPA-DDs for CPAs 5341-P1-0008-CP1, 5341-P1-0009-CP1 and 5341-P1-0010-CP1, 95/10 reliability level was selected for cross-CPA sampling for the four parameters mentioned above. As per page 43 of the PoA-DD (PoA sampling plan), for the parameter η_{new} , the population of each stove model shall be deemed homogeneous across CPAs as the stoves have been designed to meet stringent efficiency specifications and are manufactured in factories to specification. As per page 47 of the PoA-DD, for other parameters (SOF, f_{old} , μ_{old}), the homogeneity of the population is demonstrated in compliance with the following conditions;

| Homogeneity condition | Characteristic of Population | Status of population |
|--|---|---|
| Country | All units have been distributed in the same geographical area, i.e. Kenya | homogeneous |
| Fuel Type – charcoal / wood fuel | There are two fuel type in the population: Charcoal and woodfuel. | Charcoal stoves have been considered as one sampling frame and wood fuel stoves have been considered as other sampling frame. |
| End user – domestic / small-medium enterprises / community | All units are for domestic (household) usage as per their design | Homogeneous within each sampling frame |
| Stove Type - efficiencies are in a similar range defined as being within +/-10% of each other and they have other common design features | The stove models disseminated have efficiencies within +/-10% of each other | Homogeneous within each sampling frame |

The initial target population were the stoves distributed and recorded under CPA 5341-0008, 5341-0009 and 5341-0010. The population was divided into two sampling frames based on fuel type. Simple Random Sampling approach was applied in each sampling frame separately to monitor the three parameters i.e. stove operation (SOF), fraction of traditional stoves still in operation (f_{old}) and amount of woody biomass that continues to be used by the replaced stoves (μ_{old}). Thus, the sample size calculations for parameters SOF, f_{old} , μ_{old} were calculated considering PoA population under two sampling frames.

The required sample sizes were derived using equation (1) on page 68 and equation (4) on page 70 of the Guideline: Sampling and surveys for CDM project activities and programmes of activities, Version 04.0 for proportion based and mean based parameters respectively as follows:

$$n = \frac{z^2 \cdot N \cdot V}{(N - 1) \cdot c^2 + z^2 \cdot V}$$

$$V = \left(\frac{SD}{Mean}\right)^2 \text{ for mean parameters}$$

$$V = p \cdot (1 - p) / p^2 \text{ for proportion parameters}$$

Where:

n = sample size

N = population size

z = Confidence value constant (1.96 for 95%)

c = Desired precision (10%)

SD = expected standard deviation for mean parameter

$Mean$ = expected mean for mean parameter

p = expected proportion for proportion-based parameter

Refer ER calculator worksheet 'Sampling plan' for more details on calculation of sample size for each parameter. The expected parameter values (mean, standard deviation and proportion) have been determined based on project developer's knowledge and experience as per para 12(b) and 12(c) of the Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 08.0

[https://cdm.unfccc.int/filestorage/e/x/t/extfile-20191129115244333-](https://cdm.unfccc.int/filestorage/e/x/t/extfile-20191129115244333-Meth_stan05.pdf/Meth_stan05.pdf?t=R0J8cWF1YWc1fDD4rM-o7hiVCfdtE0w7Ec1E)

[Meth_stan05.pdf/Meth_stan05.pdf?t=R0J8cWF1YWc1fDD4rM-o7hiVCfdtE0w7Ec1E](https://cdm.unfccc.int/filestorage/e/x/t/extfile-20191129115244333-Meth_stan05.pdf/Meth_stan05.pdf?t=R0J8cWF1YWc1fDD4rM-o7hiVCfdtE0w7Ec1E)

The stoves were selected by randomly assigning a number to each stove and sorting in increasing order from lower to higher number. Random numbers were generated using online random number generator and the numbers obtained were used to identify the samples from the population. A higher number of samples were monitored than that required to ensure that the desired precision / confidence is achieved as well as have sufficient number of samples that use both ICS and baseline stove for determining μ_{old} .

c) Collected data (electronic spreadsheets may be attached and referenced);

Data was collected for SOF, f_{old} and μ_{old} following a survey form. The information collected was introduced into an electronic database, the CPA Monitoring Record. This survey form was designed in a way that would allow the surveyor first to check the validity of the records from the CPA Distribution Records, and secondly to collect the necessary information from field visit for the ER calculations. In order to achieve the 95/10 reliability level for cross-CPA sampling few additional stoves were sampled from the database than that required (as mentioned in the table above) to cover for non-responses, if any.

As for the thermal efficiency of the stoves, water boiling tests were conducted using WBT protocol by PCIA as available on GACC website. The WBT tests conducted, were distributed across various models. Refer ER calculator worksheet "Survey Summary" and "WBT Test Results" for details on data collected during monitoring.

d) Analysis of the collected data;

Analysis of the data monitored through sampling revealed the following results:

| Parameter | Results | Units | Precision Achieved (%) |
|--------------|---------|----------|------------------------|
| η_{new} | 34.0 | % | Ok, acceptable |
| SOF | 0.985 | fraction | Ok, acceptable |
| f_{old} | 0.055 | fraction | Ok, acceptable |
| μ_{old} | 650 | kg/year | Ok, acceptable |

e) Demonstration of whether the samples were randomly selected and are representative of the population.

Stoves were selected by randomly after arranging them in chronological order of date of sale and assigning a number to each stove. Random numbers were generated using online random number generator available at <http://stattrek.com/statistics/random-number-generator.aspx> and the random numbers received were selected from sampling frame to identify the samples to be monitored. The approach ensured that the samples picked are random and represent the population.

SECTION F. Calculation of emission reductions or net anthropogenic removals

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

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$$ER_y = B_{y,savings} \cdot f_{NRB} \cdot NCV_{biomass} \cdot EF_{projected fossil fuel}$$

$$B_{y,savings} = B_{old} \cdot \left(1 - \frac{\eta_{old}}{\eta_{new}}\right)$$

$$B_{old} = LAF \cdot N_{all} \cdot SOF \cdot (Q_{biomass} - \left(\frac{\mu_{old}}{1000} \cdot f_{old}\right)) \cdot Stove_{year}$$

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

>>

As explained above, the methodology directly provides equation for emission reductions; without separate baseline, project or leakage emission reduction equations. Calculation of Emission Reductions has already been explained above as per the methodology. Thus, this section is not applicable.

F.3. Calculation of leakage emissions

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As explained above, the methodology directly provides equation for emission reductions; without separate baseline, project or leakage emission reduction equations. Calculation of Emission Reductions has already been explained above as per the methodology by application of Gross to Net Leakage adjustment factor of 0.95 to baseline emissions. Thus, this section is not applicable.

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 |
| 5341-P1-0008-CP1 | 23,936 | 0 | 0 | 0 | 23,936 | 23,936 |
| 5341-P1-0009-CP1 | 23,142 | 0 | 0 | 0 | 23,142 | 23,142 |
| 5341-P1-0010-CP1 | 25,759 | 0 | 0 | 0 | 25,759 | 25,759 |
| Total | 72,837 | 0 | 0 | 0 | 72,837 | 72,837 |

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 (tCO ₂ e) | Amount estimated ex ante for this monitoring period in the CPA-DD (t CO ₂ e) |
|-----------------------------|--|---|
| 5341-P1-0008-CP1 | 23,936 | 32,655 |
| 5341-P1-0009-CP1 | 23,142 | 32,655 |
| 5341-P1-0010-CP1 | 25,759 | 32,655 |
| Total | 72,837 | 97,965 |

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

>>

The ex-ante estimate per CPA, for the monitoring period has been calculated as follows:
 = Ex-ante ER as per CPA-DD (Section B.4.4) * effective duration of monitoring period/ 365
 = 32,655

F.6. Remarks on increase in achieved emission reductions

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N/A

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

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The emission reductions are lower than the ex-ante estimates substantiating that the CPAs are below the limit of type II category.

Document information

| <i>Version</i> | <i>Date</i> | <i>Description</i> |
|--|--------------|---|
| 03.0 | 31May 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. |
| 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. |
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