



Monitoring report form for CDM programme of activities
(Version 05.0)

| MONITORING REPORT | | | |
|--|--|---|-------------------------------------|
| Title of the PoA | IDCOL Improved Cook Stove Program | | |
| UNFCCC reference number of the PoA | 10512 | | |
| Version number of the PoA-DD applicable to this monitoring report | 03 | | |
| Version number of this monitoring report | 01 | | |
| Completion date of this monitoring report | 17/01/2022 | | |
| Monitoring period number | 02 | | |
| Duration of this monitoring period | 01/09/2020 to 30/11/2021 (Inclusive of both days) | | |
| Monitoring report number for this monitoring period | Not Applicable | | |
| Coordinating/managing entity | Infrastructure Development Company Limited | | |
| Host Parties | Host Party of the PoA | Is this the host Party of a CPA covered in this monitoring report? (yes/no) | |
| | Republic of Bangladesh | Yes | |
| Applied methodologies and standardized baselines | Methodologies: AMS-II.G. ver. 10- Energy efficiency measures in thermal applications of non-renewable biomass Standard Baseline: Not Applicable | | |
| Sectoral scopes | 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 until 31 December 2020 | Amount achieved from 1 January 2021 |
| | 0 tCO ₂ e | 1,240,672 tCO ₂ e | 674,514 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 | 1,597,370 tCO ₂ e | | |

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

The objectives of the IDCOL ICS program is to reduce GHG emissions, solid fuel use for cooking and the impact of HAP - which disproportionally affects women and children - by creating a sustainable market-based approach towards adoption of higher efficiency cook-stoves in the country. The program aims to develop a sustainable market for ICS by supporting development of a supply chain in rural Bangladesh and creating demand for ICS with the goal of achieving 100% coverage of ICS by 2030 as per Bangladesh Government's Country Action Plan for Clean Cookstoves.

A number of types of stoves are included in the program: portable stoves, single and double mouth chimney stoves including commercial stoves and metallic stoves. In this PoA, IDCOL intends to increase the share of higher efficiency stoves, which have greater impact in terms of reducing GHG emissions and household air pollution. The CPA under the PoA aid in reducing greenhouse gas (GHG) emissions by replacing traditional wood-fuel three stone stoves with wood-fuel ICS. The replacement of traditional stoves by ICS improves heat transfer to the cooking utensil thereby reducing the amount of fuel (non-renewable biomass) required for cooking. A reduction in consumption of non-renewable biomass contributes towards reduction in GHG emissions into the atmosphere. Thus, ICS reduce GHG emissions through their improved thermal efficiency as compared to traditional/ baseline stoves.

In accordance with version 10.0 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. This program is managed by Infrastructure Development Company Limited (IDCOL) as the Coordinating/Managing Entity (CME). IDCOL will coordinate with different CPA implementers, as applicable. The PoA is a voluntary action by the CME.

During the current monitoring period 1,915,186 tCO₂e GHG emission reduction achieved by CPA.

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: IDCOL Improved Cook Stove Program – CPA 01 Reference No.: CPA 01 Date 17/09/2019 | Version 03 Date 17/09/2019 | Sectoral Scope 3 : Energy demand | Methodologies: AMS-II.G.: “Energy efficiency measures in thermal applications of non-renewable biomass (ver. 10) Standardized Baseline: Not applicable |

A.1.2. CPAs included in the PoA

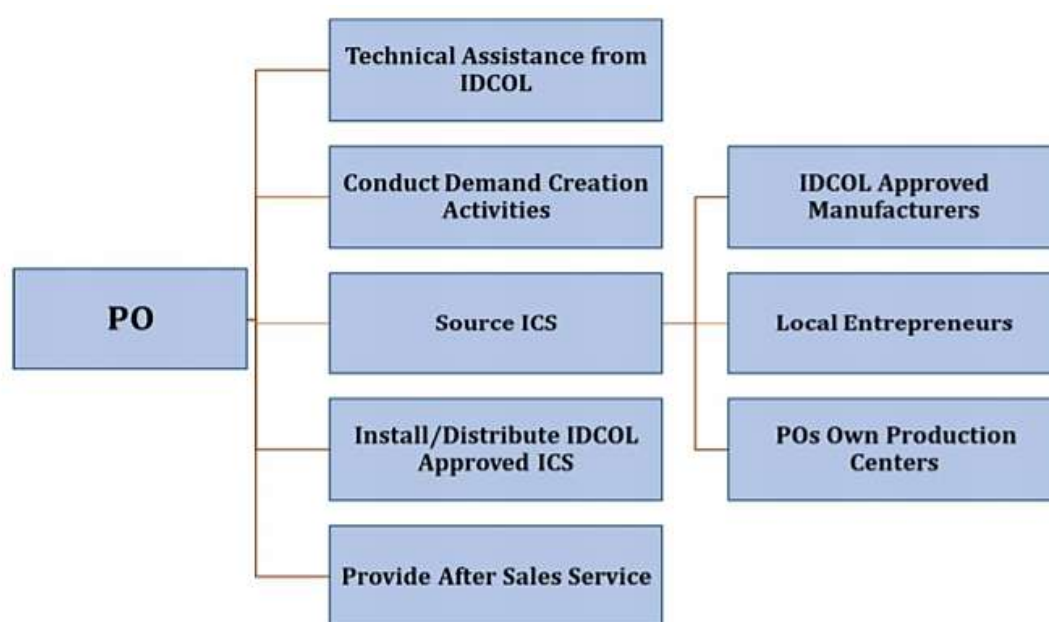
| Title and UNFCCC reference number of the CPA | Version of the PoA-DD | Title and reference number of the corresponding generic CPA | Crediting period type and duration | Covered in this monitoring report? (yes/no) |
|--|-------------------------------|---|---|---|
| Title: IDCOL Improved Cook Stove Program – CPA 01 Reference Number: 10512-P1-0001-CP1 | Version 03 Date 17/09/2019 | Title: IDCOL Improved Cook Stove Program – CPA 01 Generic Reference No.: CPA 01 Date 17/09/2019 | Type: Fixed Duration: 15/01/2020 14/01/2030 | Yes |

For stove distribution and in particular the fixed type concrete stoves, the supply chain is as follows:



IDCOL used web-based software to keep track of each installed stove having unique serial number. POs use the software to record installation while IDCOL monitoring team enter the inspection findings.

The activities carried out by the Partner Organisations is depicted in the graphic below:



As CME, IDCOL performed the following responsibilities :

- General management and financing of the PoA;
- Communications with the CDM EB, including on matters related to PoA/CPA inclusion, validation, verifications and emission reductions
- Identification of CPA implementers and selection and preparation of CPA for their inclusion in the PoA, ensuring that any CPA under the PoA are neither registered as an individual CDM project activity nor included in another registered PoA
- IDCOL ensured that the same approved baseline and monitoring methodology is applied to all the CPA;
- IDCOL established CER ownership agreements with the CPA implementer;
- IDCOL ensured that the CPA implementer have CER transfer agreements with each local partner
- Managed the data base (document control for each CPA) for calculating ERs based on data received from the CPA implementer; and
- Assessment of competency of entities (external consultant/partner, if any) involved in CPA inclusions as well as ensure that project documents are technically reviewed (either internally or externally outsourced)
- IDCOL facilitated validation and verification of the program by a Designated Operational Entity.
- Training and capacity development of POs and maintaining training records.
- Improvement in Management system as and when required.

IDCOL is the CPA implementer of the implemented CPA01 and performed the following responsibilities :

- IDCOL identified local partners for manufacturing and installation of ICS as per specifications and materials as communicate by CME/CPA Implementer.
- Executed agreement with the local partners, for transfer of emission reductions in favour of themselves / CME.
- Executed agreement with the ICS beneficiary, for transfer of emission reductions in favour of themselves / CME.
- Disbursed incentives/subsidies to the local partner (according to their role and as per CME instructions, if any).
- Inspected installed ICS, Collection of ICS data from the field and recording / archiving of collected data.
- Conducted ex-post monitoring of ICS installed for performance, usage as per monitoring requirements set out in the registered monitoring plan.
- Conducted Training of local partners on production, installation, maintenance and after-sales services of ICS and maintained records.
- Carried out national level awareness raising and demand creation activities.

The role of local partner is detailed below:

- Manufactured and installed ICSs at beneficiary households.
- Executed agreement with the ICS beneficiary, for transfer of emission reductions in favour of themselves / CME.
- Collected and recorded the end user information, including date of ICS installation, its location and baseline information.
- Provided after sales maintenance services to ICS beneficiaries as per the terms and conditions agreed with CME / CPA implementer. Adequate record keeping systems for the compilation, computation and storage of installation data collected as per CME/CPA implementer instructions.

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

No Post-registration changes during the current monitoring period to PoA

B.2.2. Inclusion of monitoring plan

No inclusion of monitoring plan during the current monitoring period

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

No permanent changes to registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standard baselines, or other methodological regulatory documents during the current monitoring period.

B.2.4. Changes to programme design

No permanent changes during the current monitoring period to PoA.

B.2.5. Changes specific to afforestation or reforestation activities

Not applicable as this PoA is not an afforestation or reforestation activity.

PART II Monitoring of CPAs

This Monitoring Report covers CPA 01 (10512-P1-0001-CP1). This CPA follows the generic CPA as identified in section A.1.2, Part I of this monitoring report above.

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

The CPA involves commercial dissemination of 1,266,758 high efficiency biomass fired cook stoves (ICS) to replace the traditional inefficient cook-stoves in Bangladesh until first monitoring period. IDCOL as the coordinating and managing entity (CME) for the PoA will work with Partner Organisations (POs), who are mostly Non-Government Organizations, Micro Finance Institutions and some private sector companies who produce/procure and install cooking systems as per technical standards set by IDCOL.

Majority of the population in Bangladesh is not aware of the fuel saving potential of ICS or that the use of traditional biomass fuels is associated with GHG emissions and health hazards through household air pollution. In the absence of the CPA, the rural households would continue to use the traditional inefficient cook-stoves using traditional biomass fuels, the emissions of which particularly harms women and children, who are disproportionately exposed to it.

The CPA will result in an estimated annual average GHG reductions of 1,278,597 tCO₂e and total GHG emission reductions of 12,785,973 tCO₂e over a 10-year crediting period.

During the current monitoring period 1,915,186 tCO₂e GHG emission reductions has been achieved by the CPA.

The CPA is a small scale type II category CPA.

Description of the installed technology, technical processes and equipment:

Improved Cook Stoves are designed to increase heat transfer to the cooking pot, while being suitable for traditional utensils and cooking habits of people in Bangladesh. The improvement in thermal efficiency is achieved by optimizing the dimensions of the ICS combustion chamber and ensuring effective airflow to aid complete combustion of biomass.

The specification of the ICS and the installation for the CPA is as follows:

| Tier | Stove | Materials | Thermal Efficiency ¹ | | ICS installed ² | | | |
|--------|---|--|---------------------------------|------|----------------------------|--------|--------|--------|
| | | | 2020 | 2021 | 2018 | 2019 | 2020 | 2021 |
| Tier 2 | Single Mouth 10" with Insulation and Lining | 1.25" thick outer concrete layer | 0.30 | 0.30 | 1235 | 8875 | 11902 | 2779 |
| Tier 2 | Single Mouth 9" with Insulation and Lining | 1.25" thick outer concrete layer | 0.30 | 0.30 | 0 | 17 | 15904 | 136537 |
| Tier 3 | Single Mouth 8" Portable with Insulation and Lining | 1.25" thick outer concrete layer | 0.35 | 0.35 | 61843 | 296452 | 410152 | 297678 |
| Tier 3 | Double mouth (9" & 8") with Insulation and Lining | 1.25" thick outer concrete layer of stove body | 0.34 | 0.34 | 1408 | 4797 | 6879 | 8076 |
| Tier 3 | Double mouth (10" & 9") with Insulation and Lining | 1.25" thick outer concrete layer of stove body | 0.39 | 0.34 | 294 | 869 | 606 | 455 |

The ICSs are in continued operation since their installation

C.2. Location of CPAs

The CPA is located within the boundary of Bangladesh. Specifically, the ICS under the CPA are spread over the districts within Bangladesh.

The geographical coordinates of Bangladesh are 23°45'50"N - 90°23'20"E

¹ As per WBT report

² As per ICS installation database



Further, for each ICS under each CPA has a serial no, apart from that the information on the location of the ICS has been recorded by collecting address of the user where the ICS is installed. Thus, location of each ICS in the CPA can be traced back. The exact address including Village, Post Office, Union name, Upazilla and District are available in ICS Installation database.

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

No temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies, standardized baselines or other methodological regulatory documents during the current monitoring period.

C.3.2. Corrections

No any corrections to CPA during the current monitoring period.

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

No any changes to the start date of the crediting period during the current monitoring period.

C.3.4. Inclusion of monitoring plan

No any inclusion of monitoring plan during the current monitoring period.

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

No any permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents during the current monitoring period.

C.3.6. Changes to project design

No any changes to project design during the current monitoring period.

C.3.7. Changes specific to afforestation or reforestation CPA

Not Applicable as this CPA is not an afforestation or reforestation activity.

SECTION D. Description of monitoring system of CPAs

Each ICS carries a unique serial number. Information on details about the user, serial number of ICS and the installation date is recorded at the time of installation of the ICS by the respective Partner Organisations (PO). All entries are directly feed to the IDCOL database by the PO. The database containing ICS and user records is maintained and reviewed regularly.

Data on other ex-post parameters, including operational performance of ICS, continued usage of baseline stove, etc are recorded objectively during sample surveys conducted annually. For the current monitoring period, sampling was done using 95/10 as confidence / precision. Monitoring consisted of checking the representative samples against monitoring plan parameters using a questionnaire based survey. The data collected was transferred into excel sheet for analysis and calculation of emission reductions. IDCOL is responsible for developing the Monitoring Report; and for ensuring adherence to the monitoring procedures set in the monitoring plan.

The data recorded at the time of installation, as well as that collected through sampling surveys / tests are transferred onto the emission reduction calculation workbook. For results of the ER calculations, refer ER calculation sheet.

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

| Data/Parameter | $B_{old,p}$ |
|--|--|
| Unit | tonnes/person/year |
| Description | Annual quantity of woody biomass that would have been used per person in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices |
| Source of data | AMS II.G. version 10.0 |
| Value(s) applied | 0.50 |
| Choice of data or measurement methods and procedures | Default value specified by the methodology |
| Purpose of data/parameter | To calculate baseline emission |
| Additional comments | - |

| Data/Parameter | $N_{p,HH}$ |
|--|--|
| Unit | Number |
| Description | Average number of persons served per household prior to project implementation |
| Source of data | Statistical Year Book Bangladesh, 37th Edition, Bangladesh Bureau of Statistics (2017) |
| Value(s) applied | 4.48 |
| Choice of data or measurement methods and procedures | - |
| Purpose of data/parameter | To calculate baseline emission |
| Additional comments | - |

| | |
|--|--|
| Data/Parameter | $B_{old,HH}$ |
| Unit | tonnes/household/year |
| Description | Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices |
| Source of data | Calculated or determined using ex-ante baseline surveys/ published information / literature |
| Value(s) applied | 2.24 |
| Choice of data or measurement methods and procedures | Calculated based on $B_{old,p}$ times $N_{p,HH}$ |
| Purpose of data/parameter | To calculate baseline emission |
| Additional comments | $B_{old,i,j}$ equals $B_{old,HH}$ when only one project device per household is distributed. During the stove installation, the presence of existing project ICS, if any, shall be monitored and in case an existing project ICS is found installed in the same household, the subsequent (second) ICS will not be included in the CPA. Alternatively, the presence of multiple project ICS in a household may be determined ex-post during surveys and the total ICS population shall be discounted by the fraction of sampled household found using more than one project ICS. |

| | |
|--|--|
| Data/Parameter | $f_{NRB,y}$ |
| Unit | Fraction |
| Description | Fraction of woody biomass saved by the project activity during year y that can be established as non-renewable biomass |
| Source of data | Calculated as per Tool: Calculation of the fraction of non-renewable biomass, EB 97, Annex 9 |
| Value(s) applied | 0.843 |
| Choice of data or measurement methods and procedures | As per the "TOOL30: Calculation of the fraction of non-renewable biomass" |
| Purpose of data/parameter | To calculate baseline emission |
| Additional comments | - |

| | |
|-----------------------|---|
| Data/Parameter | $EF_{projected_fossil\ fuel}$ |
| Unit | tCO ₂ e/TJ |
| Description | Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers. |
| Source of data | AMS II.G. version 10.0 |
| Value(s) applied | 63.7 |

| | |
|--|--|
| Choice of data or measurement methods and procedures | Default value specified by the methodology |
| Purpose of data/parameter | To calculate baseline emission |
| Additional comments | - |

| | |
|--|---|
| Data/Parameter | $NCV_{biomass}$ |
| Unit | TJ/tonne |
| Description | Net calorific value of the non-renewable woody biomass that is substituted |
| Source of data | AMS II.G. version 10.0 |
| Value(s) applied | 0.0156 |
| Choice of data or measurement methods and procedures | IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried', as indicated in the methodology |
| Purpose of data/parameter | To calculate baseline emission |
| Additional comments | - |

| | |
|--|---|
| Data/Parameter | $\eta_{old,i,j}$ |
| Unit | Fraction |
| Description | Efficiency of the old devices being replaced by project devices of type i and batch j |
| Source of data | AMS II.G. version 10.0 |
| Value(s) applied | 0.11 |
| Choice of data or measurement methods and procedures | As per the Bangladesh Country Action Plan for Clean Cookstoves, more than 90% households use Three Stone Fire Stove / conventional stoves in Bangladesh. Therefore, following the approved CDM methodology AMS II.G/v10, a default value of 10% has been used for the 90% conventional stoves and for other types of baseline stoves a default value of 20% has been used. Thus, a weighted average efficiency of 11% with a 90:10 mix has been considered. |
| Purpose of data/parameter | To calculate baseline emission |
| Additional comments | - |

| | |
|--|---|
| Data/Parameter | NTG |
| Unit | Fraction |
| Description | Net to gross adjustment factor |
| Source of data | AMS II.G. version 10.0 |
| Value(s) applied | 0.95 |
| Choice of data or measurement methods and procedures | As per the methodology AMS II.G Version 10.0, para 34, $B_{y,savings,i,j}$ is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required. |
| Purpose of data/parameter | To calculate leakage |
| Additional comments | - |

E.2. Data and parameters monitored

| Data/Parameter | $N_{y,i,j}$ | | | | | | |
|---------------------------------------|--|---|-------|--------|--------|--------|--|
| Unit | - | | | | | | |
| Description | Number of project devices of type i and batch j operating during year y | | | | | | |
| Measured/calculated/default | Calculated | | | | | | |
| Source of data | ICS installation database | | | | | | |
| Value(s) of monitored parameter | Tier | Stove | 2018 | 2019 | 2020 | 2021 | |
| | Tier 2 | Single Mouth 10" with Insulation and Lining | 1235 | 8875 | 11902 | 2779 | |
| | Tier 2 | Single Mouth 9" with Insulation and Lining | 0 | 17 | 15904 | 136537 | |
| | Tier 3 | Single Mouth 8" Portable with Insulation and Lining | 61843 | 296452 | 410152 | 29678 | |
| | Tier 3 | Double mouth (9" & 8") with Insulation and Lining | 1408 | 4797 | 6879 | 8076 | |
| | Tier 3 | Double mouth (10" & 9") with Insulation and Lining | 294 | 869 | 606 | 455 | |
| | Monitoring equipment | Not Applicable | | | | | |
| Measuring/reading/recording frequency | At least once every two years (biennial) | | | | | | |
| Calculation method (if applicable) | The CPA implementer is maintaining database of all the ICS installed. A usage monitoring survey was conducted to determine the number of operating stoves of type i and batch j on a sampling basis. | | | | | | |
| QA/QC procedures | A 95 /10 confidence / margin of error is applied for the sampling parameter as per para 22 of Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 08.0. | | | | | | |
| Purpose of data/parameter | To calculate baseline emissions | | | | | | |
| Additional comments | - | | | | | | |

| Data/Parameter | μ_y |
|-----------------------------|--|
| Unit | Fraction |
| Description | Adjustment to account for any continued use of pre-project devices during the year y |
| Measured/calculated/default | Calculated |
| Source of data | Fraction based on monitoring survey results |

| | | | |
|---|--|---|-----------------|
| Value(s) of monitored parameter | Tier | Stove | Monitored value |
| | Tier 2 | Single Mouth 10" with Insulation and Lining | 1 |
| | Tier 2 | Single Mouth 9" with Insulation and Lining | 1 |
| | Tier 3 | Single Mouth 8" Portable with Insulation and Lining | 1 |
| | Tier 3 | Double mouth (9" & 8") with Insulation and Lining | 1 |
| | Tier 3 | Double mouth (10" & 9") with Insulation and Lining | 1 |
| Survey was conducted . No baseline stove was found being used in the monitored samples during the monitoring survey conducted during monitoring period. | | | |
| Monitoring equipment | Not Applicable | | |
| Measuring/reading/recording frequency | At least once every two years (biennial) | | |
| Calculation method (if applicable) | <p>The sampled households were checked for presence of baseline stove and if it was being used along with project stove for cooking. For samples where baseline stove was found not being used, $\mu_y = 1.0$.</p> <p>The surveys were designed to capture the cooking habits and stove usage of households in the region, including quantification of use of baseline devices, by formulating questions and/or collecting evidences to determine the frequency of usage of both the project devices and baseline devices. For example, if there were 3 pre-project devices per household and it was determined during the survey that use of one of them continues during the crediting period then a conservative adjustment factor of 0.66 is applied for the relevant monitoring period. In the case where there was only one pre-project device per household and its use during the project period continues along with the project stove to meet 25% of the cooking needs of the household in which case the adjustment factor is 0.75.</p> <p>The method 1 of the methodology has been used to monitor this MR.</p> | | |
| QA/QC procedures | A 95 /10 confidence / margin of error is achieved for the sampling parameter irrespective of annual / biennial monitoring frequency as per para 22 of Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 08.0. | | |
| Purpose of data/parameter | To calculate baseline emissions | | |
| Additional comments | - | | |

| | |
|-----------------------------|---|
| Data/Parameter | $\eta_{new,i,j}$ |
| Unit | Fraction |
| Description | Efficiency of the device of each type i and batch j implemented as part of the project activity |
| Measured/calculated/default | Measured |
| Source of data | WBT test reports |

| | | | | |
|---------------------------------|--------|---|------|------|
| Value(s) of monitored parameter | Tier | Stove | 2020 | 2021 |
| | Tier 2 | Single Mouth 10" with Insulation and Lining | 0.30 | 0.30 |
| | Tier 2 | Single Mouth 9" with Insulation and Lining | 0.30 | 0.30 |
| | Tier 3 | Single Mouth 8" Portable with Insulation and Lining | 0.35 | 0.30 |
| | Tier 3 | Double mouth (9" & 8") with Insulation and Lining | 0.34 | 0.30 |
| | Tier 3 | Double mouth (10" & 9") with Insulation and Lining | 0.39 | 0.30 |

| | | | | |
|---|---|---|---|------------------------|
| Monitoring equipment | The following equipment was used for conducting WBTs | | | |
| | Specifications | Digital Thermometer | Digital Weighing Scale | Digital Moisture Meter |
| | Manufacturer | Lutron Electronic Enterprise Co. Ltd., Taiwan | Lutron Electronic Enterprise Co. Ltd., Taiwan | Camry, China |
| | Model | TM-9126 | MS-7003 | ACS-30-JE21 |
| | Serial No. | Q663607, Q663608, Q663609, Q663610, Q663611, Q663612, Q663613, Q663614, Q663618 | AI.55589, AI.55592 AI.55593 | |
| | No. of Units | 09 | 03 | 03 |
| | Accuracy | $\pm(0.2\% + 0.5^{\circ}\text{C})$ | $\pm(5\% + 5\text{d})$ | Capacity:30 kg d=2g |
| <p>The equipment were newly purchased at the time of use so measurements were done with the necessary guarantees.</p> <p>Manufacturer specifications on efficiency based on water boiling test (WBT) has been used.</p> <p>The WBT has been carried out in accordance with national standards (if available) or international standards or guidelines (e.g. the WBT procedures specified by the partnership for clean indoor air (PCIA): http://www.pciaonline.org/testing). The sampling test of stoves by such certification bodies/agents or manufacturers conducted following a 95/10 precision in accordance with the "Standard for sampling and surveys for CDM project activities and programme of activities".</p> <p>The WBT test has been conducted on to meet the sampling requirement of monitoring plan of the project activity.</p> | | | | |
| Measuring/reading/recording frequency | Annually | | | |
| Calculation method (if applicable) | Recorded at the time of commissioning/distribution; Adjusted for the loss of efficiency as paragraph 32 of the registered CPA DD | | | |
| QA/QC procedures | The equipment used for testing was newly purchased | | | |
| Purpose of data/parameter | To calculate baseline emissions | | | |

| | |
|---------------------|---|
| Additional comments | <p>Following provisions in paragraph 32 of AMS II.G. version-10, to account for loss in efficiency of the project devices, CPAs can use any one of the following options –</p> <p>(c) Determine the rate of efficiency drop for a representative sample of the first batch of project device i in year y and assume that same rate of loss in efficiency applies to all other batches. In other words, it may be assumed that the degradation of efficiency measured in a representative sample of the first batch of project devices i apply to all subsequent batches. The efficiency of the project devices in the first batch has to be monitored annually through representative samples and this rate of loss in efficiency may be applied correspondingly to all batches;</p> <p>(d) Determine the loss in efficiency annually from a representative sample of each batch and use the actual loss rate that is measured.</p> |
|---------------------|---|

| | |
|---------------------------------------|--|
| Data/Parameter | Date of commissioning of project device i |
| Unit | Date |
| Description | Actual date of commissioning of the project device |
| Measured/calculated/default | Measured |
| Source of data | ICS Installation database |
| Value(s) of monitored parameter | Refer ICS installation database |
| Monitoring equipment | Not Applicable |
| Measuring/reading/recording frequency | Recorded at the time of commissioning/distribution |
| Calculation method (if applicable) | Not Applicable |
| QA/QC procedures | Not Applicable |
| Purpose of data/parameter | To calculate baseline emissions |
| Additional comments | - |

E.3. Implementation of sampling plan

Sampling plan as per PoA-DD. A single sampling plan covering all the ICS under the PoA have been covered in this monitoring report to estimate parameter values.

The number of units installed under the CPA are as follows:

| Tier | Stove | 2018 | 2019 | 2020 | 2021 | CPA Ref No. | Type of ICS eligible under CPA | CPA monitoring period covered under this PoA monitoring period |
|--------|---|-------|--------|--------|--------|-------------------|--------------------------------|--|
| Tier 2 | Single Mouth 10" with Insulation and Lining | 1235 | 8875 | 11902 | 2779 | 10512-P1-0001-CP1 | Wood Fuel | 01/09/2020 to 30/11/2021(Incl usive of both days) |
| Tier 2 | Single Mouth 9" with Insulation and Lining | 0 | 17 | 15904 | 136537 | | | |
| Tier 3 | Single Mouth 8" Portable with Insulation and Lining | 61843 | 296452 | 410152 | 297678 | | | |
| Tier 3 | Double mouth (9" & 8") with Insulation and Lining | 1408 | 4797 | 6879 | 8076 | | | |
| Tier 3 | Double mouth (10" & 9") with Insulation and Lining | 294 | 869 | 606 | 455 | | | |

Description of implemented sampling design:

Due to the large number of ICS installed under the CPA it is not economically feasible to monitor each individual ICS unit installed, therefore, a representative sampling was performed as part of the CPA Sampling Plan. The Sampling Standard version 08.0 (paragraph 23) mandates application of 95/10 confidence/precision for CPAs solely composed of micro-scale CDM units hence the same was applied as a conservative measure despite the methodology taking precedence.

The objective of the sampling was to obtain an unbiased and reliable estimate of the proportion or mean value of the following parameters over the course of the monitoring period, and with 95/10 confidence/precision. The sampling plan consists of monitoring the following parameters as mentioned below:

| S. No. | Monitoring Parameter | Description of Monitoring Parameter |
|--------|----------------------|---|
| 1. | $N_{y,i,j}$ | Number of project devices of type i and batch j operating during year y |
| 2 | μ_y | Adjustment to account for any continued use of pre-project devices during the year y |
| 3 | $\eta_{new,i,j}$ | Efficiency of the device of each type i and batch j implemented as part of the project activity |

The target population is the total ICS population served under the CPA (and covered under the monitoring report), and the sampling frame consists of aggregated data of end-users of the ICS as recorded in the CPA Database.

The sampling was conducted using stratified random sampling technique over the sampling frame. The ICS in the sampling frame were stratified by ICS models (Tier 2 -Single Mouth 10", Single Mouth 9" & Tier 3-Single mouth 8", Double mouth (9" & 8"), Double mouth (10" & 9") and batches 'j' i.e., year of installation (2018, 2019, 2020 and 2021). Thus, the population was categorised into applicable sampling strata for identifying samples for various monitoring parameters, as applicable.

The sample size was calculated as per section B.5 of the registered CPA-DD. The expected parameter values (mean, standard deviation and proportion) have been determined based on CME's knowledge and experience as per para 13(b) and 13(c) of the Sampling and surveys for CDM project activities and programmes of activities, Version 08.0.

| Parameter | Total population (N) | Expected results | Reliability | Sample Size (n) required | Samples covered during monitoring |
|---|----------------------|-----------------------------|-------------|--------------------------|-----------------------------------|
| $\eta_{y,Tier}$ 2,CPA1,Installed, 2018, SM 10" | 1235 | 0.30 (mean) 0.03040 (SD) | 95/10 | 2 | 3 |
| $\eta_{y,Tier}$ 2,CPA1,Installed, 2019, SM 10" | 8875 | 0.30 (mean) 0.03040 (SD) | 95/10 | 2 | 3 |
| $\eta_{y,Tier}$ 2,CPA1,Installed, 2020, SM 10" | 11902 | 0.30 (mean) 0.0300 (SD) | 95/10 | 2 | 3 |
| $\eta_{y,Tier}$ 2,CPA1,Installed, 2021, SM 10" | 2779 | 0.30 (mean) 0.0300 (SD) | 95/10 | 2 | 3 |
| $\eta_{y,Tier}$ 2,CPA1,Installed, 2021, SM 9" | 136537 | 0.30 (mean) 0.0300 (SD) | 95/10 | 2 | 6 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2018, SM 8" | 61843 | 0.35 (mean) 0.03521 (SD) | 95/10 | 7 | 8 |
| $\eta_{y,Tier}$ 2,CPA1,Installed, 2019, SM 9" | 17 | 0.30 (mean) 0.03000 (SD) | 95/10 | 2 | 3 |
| $\eta_{y,Tier}$ 2,CPA1,Installed, 2020, SM 9" | 15904 | 0.30 (mean) 0.03000 (SD) | 95/10 | 4 | 5 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2019, SM 8" | 296452 | 0.35 (mean) 0.03521 (SD) | 95/10 | 7 | 8 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2020, SM 8" | 410152 | 0.35 (mean) 0.03500 (SD) | 95/10 | 7 | 8 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2021, SM 8" | 297678 | 0.35 (mean) 0.03500 (SD) | 95/10 | 5 | 8 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2018, DM (9"&8") | 1408 | 0.34 (mean) 0.03448 (SD) | 95/10 | 2 | 3 |

| Parameter | Total population (N) | Expected results | Reliability | Sample Size (n) required | Samples covered during monitoring |
|---|----------------------|--------------------------------|-------------|--------------------------|-----------------------------------|
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2019, , DM (9"&8") | 4797 | 0.34 (mean) 0.03448 (SD) | 95/10 | 2 | 3 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2020, , DM (9"&8") | 6879 | 0.34 (mean) 0.03400 (SD) | 95/10 | 2 | 2 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2021, , DM (9"&8") | 8076 | 0.34 (mean) 0.03400 (SD) | 95/10 | 2 | 2 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2018, , DM (10"&9") | 294 | 0.39 (mean) 0.03931 (SD) | 95/10 | 2 | 3 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2019, , DM (10"&9") | 869 | 0.39 (mean) 0.03931 (SD) | 95/10 | 2 | 3 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2020, , DM (10"&9") | 606 | 0.39 (mean) 0.03900 (SD) | 95/10 | 2 | 4 |
| $\eta_{y,Tier}$ 3,CPA1,Installed, 2021, , DM (10"&9") | 455 | 0.39 (mean) 0.03900 (SD) | 95/10 | 2 | 4 |

The sample size is determined using the following formulas:

$$n \geq \frac{z^2 * N * V}{(N-1) * precision^2 + z^2 * V}$$

Where,

n = number of ICS to be sampled

N = Total number of ICS in the population

Z = Constant referring to level of confidence (1.96 for 95 % confidence)

Precision = Required precision (e.g. 10% = 0.1)

For Proportion based parameters ($N_{y,i,j}$ and μ_y)

$$V = \frac{SD^2}{p} \text{ Where:}$$

$$SD^2 = \frac{\sum_{i=1}^k g_i * p_i * (1 - p_i)}{N}$$

$$\bar{p} = \frac{\sum_{i=1}^k g_i * p_i}{N}$$

Where,

g_i = weight of strata i in the population

i = expected proportion of strata i in the population

k = total number of strata in the population

$$V = \left(\frac{SD}{Mean} \right)^2$$

Where

$$SD^2 = \frac{\sum_{i=1}^k g_i * SD_i^2}{N}$$

$$Mean = \frac{\sum_{i=1}^k g_i * m_i}{N}$$

Where,

SD_i = expected standard deviation of strata i in the population

m_i = expected mean of strata i in the population

Each ICS in the target strata is uniquely identifiable by its ICS number, was allocated a sample number, starting at 1 and increasing up to the total number of ICS in the strata. Random numbers were generated (using online random number generator and the numbers obtained were used to identify the samples from the corresponding strata for monitoring. A higher number of samples were selected for monitoring than that required to ensure that the desired precision / confidence is achieved as well as have cover for no-responses. The sample size determination is described in Emission Reduction (ER) calculation sheet.

Collected Data:

Data was collected for $N_{y,i,j}$ and μ_y following a specially design survey form. The information collected was introduced into an electronic database, the CPA Monitoring Record. The survey forms were designed to allow the surveyors to collect the necessary information from field visit for the ER calculations. The monitoring surveys (for determining $N_{y,i,j}$ and μ_y) were done.

For the thermal efficiency of the stoves to determine $\eta_{new,i,j}$, water boiling tests were conducted for measuring stove efficiency.

Analysis of data collected and confidence/precision achieved

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

| Sampling Constants | Values |
|---------------------------|------------|
| Monitoring period start | 01/09/2020 |
| Monitoring period end | 30/11/2021 |
| Level of Sampling | CPA 01 |
| Confidence (%) (90 or 95) | 95% |
| Margin of Error (%) | 10% |
| Z value | 1.960 |

For detailed calculations refer ER calculator, worksheet 'Monitoring Survey' and 'WBT Summary'**Error! Not a valid link.**

SECTION F. Calculation of emission reductions or net anthropogenic removals

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

As per applicable meth, AMS-II.G. version 10, Emission reductions are calculated as:

$$ER_y = \sum_i \sum_j ER_{y,i,j} - LE_y$$

$$ER_y = \sum_i \sum_j ER_{y,i,j} - LE_y$$

Where:

- i = Indices for the situation where more than one type of project device is introduced to replace the pre-project devices
- j = Indices for the situation where there is more than one batch of project device
- ER_y = Emission reductions during year y in t CO₂e
- $ER_{y,i,j}$ = Emission reductions by project device of type i and batch j during year y in t CO₂e
- LE_y = Leakage emissions in the year y

$$ER_{y,i,j} = B_{y,savings,i,j} \times N_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossil\ fuel}$$

Where:

- $B_{y,savings,i,j}$ = Quantity of woody biomass that is saved in tonnes per cookstove device of type i and batch j during year y
- $f_{NRB,y}$ = Fraction of woody biomass that can be established as non-renewable biomass (fNRB)
- $NCV_{biomass}$ = Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')

- $EF_{projected_fossilfuel}$ = Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers. Use a value of 63.7 t CO₂/TJ
- $N_{y,i,j}$ = Number of project devices of type i and batch j operating during year y
- μ_y = Adjustment to account for any continued use of pre-project devices during the year y (fraction). Use 1.0 in other cases

Option 3: water boiling test (WBT):

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

Where:

- $B_{old,i,j}$ = Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type i and batch j
- $\eta_{old,i,j}$ = Efficiency of the old devices being replaced by project devices of type i and batch j
- $\eta_{new,i,j}$ = Efficiency of the project device i and batch j

As only one project device is installed per household, the baseline woody biomass consumption per household ($B_{old,HH}$) is used as the total annual quantity of woody biomass that would have been used in the absence of the project activity in each device ($B_{old,i,j}$).

$B_{y,savings,i,j}$ is multiplied by a net to gross adjustment factor (NTG) of 0.95 to account for leakages, in which case surveys are not required.

Accordingly, the Emission reductions could be presented as:

$$ER_y = B_{y,savings,i,j} \times N_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossilfuel} \times NTG$$

Sample calculations are as follows:

| Data Ex Ante | Unit | Value | Source |
|----------------------------|------------------------|--------|----------------------------------|
| $B_{old,p}$ | tonnes/person/ year | 0.50 | Registered CPA-DD, section B.4.2 |
| $N_{p,HH}$ | Number | 4.48 | Registered CPA-DD, section B.4.2 |
| $B_{old,i,j} = B_{old,HH}$ | tonnes/household/ year | 2.24 | Registered CPA-DD, section B.4.2 |
| $f_{NRB,y}$ | Fraction | 0.84 | Registered CPA-DD, section B.4.2 |
| $EF_{project_fossilfuel}$ | tCO _{2e} /TJ | 63.70 | Registered CPA-DD, section B.4.2 |
| NTG | Fraction | 0.95 | Registered CPA-DD, section B.4.2 |
| $NCV_{biomass}$ | TJ/tonne | 0.016 | Registered CPA-DD, section B.4.2 |
| $\eta_{old,i,j}$ | Percentage | 11.00% | Registered CPA-DD, section B.4.2 |
| Conversion factor | | 0.2777 | GWh/TJ |

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

The calculation algorithm in the methodology directly calculates emission reductions hence this is not applicable.

F.3. Calculation of leakage emissions

The calculation algorithm in the methodology directly calculates emission reductions hence this 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 until 31/12/2020 | From 01/01/2021 | Total amount |
| 10512-P1-0001-CP1 | 1,915,186 | 0 | 0 | 0 | 1,240,672 | 674,514 | 1,915,186 |
| Total | 1,915,186 | 0 | 0 | 0 | 1,240,672 | 674,514 | 1,915,186 |

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

| CPA UNFCCC reference number | Amount achieved during this monitoring period (t CO ₂ e) | Amount estimated ex ante for this monitoring period in the CPA-DD (t CO ₂ e) |
|-----------------------------|---|---|
| 10512-P1-0001-CP1 | 1,915,186 | 1,597,370 |
| Total | 1,915,186 | 1,597,370 |

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

The amount has been calculated on pro-rata basis:

$[1,278,597 \text{ tCO}_2 / 365 \text{ days}] * \text{number of monitoring days i.e. } 456 = 1,597,370 \text{ tCO}_2$.

F.6. Remarks on increase in achieved emission reductions

Amount of GHG emission reduction achieved during this monitoring period is more than the amount estimated ex ante for this monitoring period in the CPA-DD.

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

The CPA (10512-P1-0001-CP1) covered in the monitoring period is a Type II small-Scale CPA, solely composed of microscale units. The thermal energy saving by each of the ICS is only 0.006 GWh_{th} and this value is far less than the 1.8 GWh_{th} annual energy saving limit per ICS.

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Document information

| <i>Version</i> | <i>Date</i> | <i>Description</i> |
|--|----------------|---|
| 05.0 | 8 October 2021 | Revision to: <ul style="list-style-type: none"> Ensure consistency with version 03.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN). |
| 04.0 | 6 April 2021 | Revision to: <ul style="list-style-type: none"> Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR). |
| 03.0 | 31 May 2019 | Revision to: <ul style="list-style-type: none"> Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN); Add a section on remarks on the observance of the scale limit of small-scale CPAs during the crediting periods; Add "changes specific to afforestation or reforestation activities/CPA" as a possible post-registration changes; Clarify the reporting of net anthropogenic GHG removals for A/R PoAs between two commitment periods; Make structural and editorial improvements. |
| 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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