



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

**MONITORING REPORT**

<b>Title of the PoA</b>	Improved Cook Stove Programme in Fiji	
<b>UNFCCC reference number of the PoA</b>	10497	
<b>Version numbers of the PoA-DD applicable to this monitoring report</b>	02 (dated 05/06/2019)	
<b>Version number of this monitoring report</b>	01.1	
<b>Completion date of this monitoring report</b>	14/09/2020	
<b>Monitoring period number</b>	01	
<b>Duration of this monitoring period</b>	12/02/2020 to 31/07/2020 (both the dates are inclusive)	
<b>Monitoring report number for this monitoring period</b>	01	
<b>Coordinating/managing entity</b>	Korea Carbon Management Ltd.	
<b>Host Parties</b>	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Republic of Fiji	Yes
<b>Applied methodologies and standardized baselines</b>	<b>Applied Methodology:</b> AMS II.G "Energy efficiency measures in thermal applications of non-renewable biomass", Version 10.0  Reference: EB100, Annex-12, valid from 31/08/2018  <b>Standardized Baseline:</b> NA	
<b>Sectoral scopes</b>	03	
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period</b>	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0 tCO <sub>2</sub> e	25,278 <sup>1</sup> tCO <sub>2</sub> e
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report</b>	39,596 <sup>1</sup> tCO <sub>2</sub> e	

<sup>1</sup> The CPA wise detailed calculation is submitted in the ER excel sheet. For ex-ante estimated value for current monitoring period, the sum of the values estimated for both the CPAs has been considered.

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

### SECTION A. Description of PoA

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

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“Improved Cook Stove Programme in Fiji”, a SSC CDM Program of Activities (PoA) is a voluntary initiative implemented by Korea Carbon Management Limited (herein after also referred to as KCM). The main objective of this PoA is the dissemination of the improved, clean and energy efficient cook stoves (also termed as ICS) primarily in rural households across different regions in the Republic of Fiji resulting in the reduction of firewood consumption leading to climate change mitigation in a sustainable manner. Overall objectives are reduction of greenhouse gases, conservation of forests and woodlands as well as improved health conditions of ICS users due to improved indoor air quality.

Korea Carbon Management Ltd. (KCM) is the coordinating/managing entity (“CME”) for this PoA. Korea Carbon Management Ltd. is a company registered in the Republic of Korea with company registration number 142-81-56603. KCM is also the implementor of the CPAs included under the PoA. The PoA facilitates the dissemination of ICS manufactured by appropriate ICS manufacturers or technology suppliers meeting CPA eligibility criteria free of cost to the end user. Carbon revenues will be used to fund ICS purchases, distribution, and cover monitoring costs which are being incurred by KCM.

At present, total three (3) CPAs have been included to the PoA to fulfil the objective as mentioned above. Each CPA has been designed to include different types of ICS. The distribution under CPA-01 has been completed and under CPA-02 is currently on going; whereas CPA-03 is yet to be initiated. This monitoring period, therefore includes only 2 CPAs (CPA-01 & CPA-02). The details are provided under the Appendix 1.

#### 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
Improved Cook Stove Programme in Fiji – CPA[#]  (Ref. Generic CPA [X])	02	03	<p>Applied Methodology: AMS II.G "Energy efficiency measures in thermal applications of non-renewable biomass" Version-10.0  (EB100, Annex-12, valid from 31/08/2018)</p> <p>Methodological Tools: Tool 30 “Calculation of fraction of non-renewable biomass”, (version 02 is referred, which was applied in the registered PDD)</p> <p>Standardized baseline: NA</p>

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

<b>Title and UNFCCC reference number of the CPA</b>	<b>Version of the PoA-DD</b>	<b>Title and reference number of the corresponding generic CPA</b>	<b>Crediting period type and duration</b>	<b>Covered in this monitoring report? (yes/no)</b>
Improved Cook Stove Programme in Fiji – CPA01  <b>(10497-P1-0001-CP1)</b>	02	Improved Cook Stove Programme in Fiji – CPA01  (Ref. Generic CPA [X])	Type: Renewal Duration: 7 years 00 months.  The start date of the first crediting period: 12/02/2020.  The end date of the first crediting period: 11/02/2027.	Yes
Improved Cook Stove Programme in Fiji – CPA02  <b>(10497-P1-0002-CP1)</b>	02	Improved Cook Stove Programme in Fiji – CPA02  (Ref. Generic CPA [X])	Type: Renewal Duration: 7 years 00 months.  The start date of the first crediting period: 15/02/2020.  The end date of the first crediting period: 14/02/2027.	Yes
Improved Cook Stove Programme in Fiji – CPA03  <b>(10497-P1-0003-CP1)</b>	02	Improved Cook Stove Programme in Fiji – CPA03  (Ref. Generic CPA [X])	Type: Renewal Duration: 7 years 00 months.  The start date of the first crediting period: 01/04/2020.  The end date of the first crediting period: 31/03/2027.	No <sup>2</sup>

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

Korea Carbon Management Ltd. (KCM)

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<sup>2</sup> CPA-03 has not been implemented yet, therefore the CPA-03 is not covered under the current monitoring period.

## **SECTION B. Implementation of PoA**

### **B.1. Description of implemented PoA**

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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 registered PoA-DD, through a technical review, the CME assesses the competence of potential CPA/CPA implementers to ensure that they fulfil technical and eligibility requirements of potential CPAs and to plan technical and administrative processes to meet PoA requirements and to ensure that each CPA meets all requirements and eligibility criteria before inclusion in the PoA. For both the CPAs covered under the current monitoring period, the CME 'KCM' is the CPA implementer, hence all required conditions and management system are adequately met.

The management system is designed as per CDM Project Standard for Programme of Activities (Version 02.0) and includes all relevant information as per paragraph 36 & 37 therein. The key details are as follows:

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

The two CPAs (i.e. UNFCCC Ref. 10497-P1-0001-CP1 and 10497-P1-0002-CP1) are implemented by KCM in line with the validated management system. CME has been prescribed as nominated entity to adhere to a series of responsibilities as per validated system. These CPAs were already included into the PoA by adopting required actions as per the responsibility chart.

The responsibility of CPA Manager has been taken up by the CDM professionals associated with CME. Whereas, a local representative "Kasabias Pte Ltd." is the local entity in Fiji that assist in the process of distribution, coordinating and management on behalf of the CME. The CDM Managers nominated by KCM closely works with the Kasabias team to ensure adherence to the all responsibilities and requirements prescribed for CPA Managers.

Similarly, the ground team of Kasabias takes care of the operational responsibilities of the team including data collection, field survey, on site visits, awareness and training activities etc. under the direct supervision of CDM managers under CME. The team details are submitted under Appendix 4.

#### **2) A record keeping system for each CPA under the PoA**

CME centrally manages the overall record keeping system for all the CPAs. The distribution records including user information of the CPAs have been collected and recorded at the point of distribution by the staff of Kasabias. The information collected from the end-user have been transferred to an electronic database in the form of an excel file, which is being updated regularly.

The distribution record carries all distribution information as per the registered PDD. The CME conducts checks to ensure that appropriate records are maintained for each CPA. Also, the required trainings for the operational team, field personnel etc. were conducted initially before the implementation starts and also during the operational phase of the CPAs. Similar trainings are proposed by CME as a regular or need based exercise for effective management of the entire system.

The CPA implementation (for all the CPAs) has been under the responsibility of CME, wherein Kasabias assists CME in the whole process on ground. The CME conducts independent quality check, field visit, testing of sample etc. at CME's level by deploying Cook Stove and CDM experts for the entire programme.

### 3) Procedures for technical review of inclusion of CPAs under the PoA

The CME has ensured before the inclusion of the CPAs that they met all the eligibility criteria as per registered PoA DD. The documents related to the CPAs are kept, organized and referred with the clear manner: the eventually hard copies of the original monitoring documents are also kept with the local team of Kasabias.

### 4) Procedure to avoid double counting of ICS/CPA under the PoA

The CPAs meet the eligibility criteria number 2 of the PoA (i.e. “a unique numbering system for ICS will be applied in each CPA, assigning a unique number to each ICS and allowing to clearly identify for each ICS to which CPA it belongs.”) which is evident from the Stove Distribution Database which includes the serial number of each distributed efficient cookstove together with the name, address reference and contact details of the user. Additionally, wherever applicable beneficiary’s ID number is also included. In addition, it has been cross-checked if there is any other voluntary carbon activities operating in the same geographic area, and it has been confirmed that there is no other GHG program or project exist in the and around the project regions in the host country. This can be further verified from the CDM and VCS database. Thus, it has ensured that the CPA is not included in any other CDM project activity or voluntary carbon activity.

### 5) Records and documentation control process for each CPA under the PoA;

CME is maintaining the general database of the CPAs included under the PoA and the separate electronic databases for each CPAs. As prescribed under the registered PoA and under the eligibility condition 7, the ICS under the program is eligible for micro scale category. The CPAs included under the PoA are solely composed of “microscale CDM units”. Hence there is no restriction ICS numbers to be distributed under each CPA. CME also ensures registration process with the end user who gives consent to an agreement (which is termed as a Beneficiary Agreement) that the household formerly used a three stone fire or traditional pot support and is willing to transfer rights to carbon assets created by the ICS to the CME. 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.

### 6) The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

Each CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

In line with the methodological tool 20 and as demonstrated above, the CPAs included into this PoA are not any de-bundled component of another CDM programme activity (CPA) or CDM project activity. Also, as per guidelines, “If each of the independent subsystems/measures (i.e. each ICS) included in the CPA of a PoA is no larger than 1% of the small-scale thresholds defined by the methodology applied then that CPA of PoA is exempted from performing de-bundling check i.e., considering as not being a de-bundled component of a large scale activity.” The AMS-II.G threshold is a maximum energy saving of 180 GWh<sub>th</sub>/year for SSC projects. The de-bundling rule does not apply to this SSC-PoA as the ICS (i.e. the independent subsystem) installed/distributed under the two CPAs would not exceed 1% of the 180 GWh<sub>th</sub>/year SSC thresholds.

CME has ensured that the both the cookstove models, i.e. “**Adarsh**” portable stove included under the CPA-01 and “**4G Cook stove**” under the CPA-02 meet this particular condition. Also, the thermal energy calculation has been performed for each CPA at the time of their inclusion. As per calculation shown in ER sheets with Adarsh single pot improved cook stove, it can save maximum 0.026 GWth per year, which is much below the threshold specified by methodology. Similarly, the maximum of 0.027 GWth energy can be saved by the ICS model 4G cookstove. Hence the CPAs are not a debundled component of larger project activity.

**7) The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA**

CME has the operational responsibility for implementing and monitoring the CPAs under the PoA. Currently “Kasabias Pty Ltd” is the local representor and providing ground assistance for CME to implement the CPAs and both the parties already have engagement and clearly stated that the implementations of CPA activities are subscribed to this PoA.

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

CME is in responsible for the coordination of the monitoring activities of the CPAs, is frequently in contact with the CPA implementing team working in the field regarding the stove distribution as well as the monitoring issues to ensure that the work is proceeding and managed following validated CPA-DDs. For continuous improvement of the system, CME is deploying carbon experts and other professionals who have experience in managing stove program so that any issues, gaps, etc. can be mitigated effectively ensuring a proper program. Also, a few capacity building programs, training sessions etc. had been conducted<sup>3</sup> during the current monitoring period and envisages that more awareness building exercises, educational sessions and regular check and balances shall be conducted in near future across the CPAs so that PoA can be driven by a robust system.

**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

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<sup>3</sup> Records of Capacity Building activities, training sessions etc. will be submitted to DOE.

## PART II      Monitoring of CPAs

### SECTION C.    Implementation of CPAs

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

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**Following description is applicable to both the CPAs (hereinafter also referred to as CPA-01 & CPA-02):**

The main objective of the CPAs is dissemination of the efficient improved cooking stove woody biomass-based ICS to the rural household of Fiji Island; which will result in reduced firewood consumption leading to climate change mitigation in a sustainable manner. Overall objectives are reduction of greenhouse gases, conservation of forests and woodlands as well as improved health conditions of ICS users due to improved indoor air quality.

There are two different models of ICS included under the CPAs. The “**Adarsh**” portable ICS model has been included under the CPA-01 & “**4G cook stove**” model has been included under the CPA-02. Both the ICS models are imported from outside the country which also refers to a technology transfer.

The project activity targets households in rural communities with no previous ICS access. The geographical boundary is the national boundary of Republic of Fiji. ICS are distributed free of cost to users. The CME, Korea Carbon Management (KCM) financed the implementation of the CPAs in full.

The CPAs apply Type II small-scale methodology AMS-II.G Version 10.0. The CPAs are therefore Type II CPAs. The CPAs qualify as Type II small-scale CPA. The implemented CPAs help in achieving following co-benefits, which will contribute in sustainable development in host country as envisaged in the registered POA-DD:

- Reduction of wood consumption leading to saving of time and efforts in collection, reducing the work burden on rural families, especially women and girls who are charged with drudgery.
- Reduction in indoor smoke leading to a cleaner cooking environment, direct benefit to health. Also, ICS provides a safer method for combusting biomass for cooking, helping to reduce burn injuries, especially for children, in the families.
- Local employment generation as ICS models are being distributed through the local representative Kasabias who has developed local resources to distribute, check and record ICS distribution. Additionally, there is an increase in number of local jobs due to monitoring and spot check mechanism which will be established after the complete distribution of the ICS.
- Also focus is given on imparting awareness and education to communities towards use of ICS and its handling. The locally deployed teams also receive regular trainings through Kasabias, which ensures qualitative employment as well.

The supporting documents such as details of local employment, training records, awareness building exercises etc. are submitted to DOE in support of quantitative co-benefits of the program.

**Description of the technology employed:****i) Adarsh improved Cookstove:**

The model type of ICS implemented under the CPA-01 is "ADARSH improved Cookstove". This is a firewood based single pot improved cookstove made of high standards metal sheets with proper insulated with outer metal sheet, which were imported from India. In particular, the technology of the ICS is natural draft. The design made has higher pressure than the atmosphere, hence raising the airflow rate in the improved cook stove tunnel, as it is heated at the bottom. This way, the top point of the improved cook stove experiences more pressure and heat.

As per water boiling test (WBT) conducted by cookstove expert from Ministry of women, children and poverty alleviation, at a national lab of The University Of the South Pacific in Fiji, the Adarsh stove is projected to have a lifespan of upto 4 years and thermal efficiency of 29.49%. Thus, 29.49% is the tested efficiency at the time of CPA inclusion.

The technical specifications of the Adarsh stove are as follows:

Parameters:	Specifications:
Name of the Stove:	Cook Stove
Designed and Manufactured by:	ADARSH
Materials used:	Flat Iron 22 Gauge, firewood shelf and pot support.
Stove Power Output:	1.421kW
Lifetime of the stove:	Upto 3-4 years
Other technical parameters (if any):	Stove design to be portable for any application



Part Name	Material	Specifications
Top Pot Support	C.I.	6 mm
Bottom Plate (With inner grat)	MS Sheet	1.2 mm 6.5 mm
Outer Body	MS Sheet	1.2 mm
Combustion Chamber	SS Sheet (3 Parts)	1.2 mm
Wood Stand	MS Rod	5 mm

As per the designed specifications and lab testing, the stove has nominal power of around 1.421 kW. As per the estimation of biomass savings based on the expected efficiency of the stove, the annual energy saved per stove in GWh will be equivalent to 0.026.

Energy flows from conventional woody biomass to households are therefore maintained, but the same amount of energy as used in the baseline scenario is gained from a relatively smaller amount of biomass. The baseline scenario is equal to the current practice i.e. in absence of the proposed project activity the equivalent amount of thermal energy generated using firewood to meet cooking energy demand.



**ii) 4G Cook Stove:**

The ICS implemented (and is being implemented) under the CPA-02 is known as “4G cook stove”. This is a firewood based single pot improved cookstove made of high standards metal sheets with proper insulated with outer metal sheet, which are proposed to be imported from Vietnam, designed & manufactured by Viet Charcoal Production Company Limited.

In particular, the technology of the ICS is natural draft. The design made has higher pressure than the atmosphere, hence raising the airflow rate in the improved cook stove tunnel, as it is heated at the bottom. This way, the top point of the improved cook stove experiences more pressure and heat. As per manufacturer’s specification, the outside diameter is 25 cm, inside diameter is 15 cm, height is 26.5 cm and weight is around 2.0 – 2.2 kg.

As per water boiling test (WBT) conducted by cookstove expert from School of Engineering and Physics, Faculty of Science, Technology and Environment, in the testing lab of The University of the South Pacific in Fiji, the 4G cook stove is projected to have a lifespan of upto 3-5 years and thermal efficiency of 32%. Thus, 32% is the tested efficiency at the time of CPA inclusion.

As per the estimation of biomass savings based on the expected efficiency of the stove, the annual energy saved per stove in GWh will be equivalent to 0.027.

**The technical specifications of the 4G cook stove are as follows:**

Parameters:	Specifications:
Name of the Stove:	4G Cook Stove
Designed and Manufactured by:	Viet Charcoal Production Company Limited
Materials used:	Stainless Steel 22 Gauge, fuel wood feed chamber, fuel wood shelf metal rods.
Safety	To be placed on a metal or concrete base with chimney if using indoor.
Lifetime of the stove:	Upto 3-5 years
Other technical parameters (if any):	Stove design to be portable for any application

**Relevant dates for the specific-case CPAs:**

CPA:	Steps:	Timeline:
10497-0001	Inclusion under the PoA	12/02/2020
	Start date of 'Crediting Period'	12/02/2020
	Project start date (i.e. stove distribution start)	09/10/2018
	Monitoring activities / Usage Surveys	September 2020
	Implementation status as on 31/07/2020	Completed
10497-0002	Inclusion under the PoA	12/02/2020
	Start date of 'Crediting Period'	12/02/2020
	Project start date (i.e. stove distribution start)	12/02/2020
	Monitoring activities / Usage Surveys	September 2020
	Implementation status as on 31/07/2020	On going, partial distribution has been achieved.

During the period, 12/02/2020 – 31/07/2020 (inclusive of both the dates), a total emission reductions of 25,278 tCO<sub>2e</sub> 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**

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The CPAs are implemented within the national boundary of the host country, Fiji.

CPA-01:

**Improved Cook Stove Programme in Fiji – CPA01**  
**(Ref. CPA 10497-P1-0001-CP1)**

As per registered CPA-DD, the project activity under the CPA was proposed to be implemented in several villages identified in different districts across a few region or provinces namely Macuata, Naitasiri, Namosi, Nausori, Rewa, Serua and Tailevu which come under the Viti Levu in Fiji.

Currently, the CPA has been fully implemented and it has covered the following locations:

Province /Region	District	Village
Naitasiri, Namosi, Nausori, Rewa, Serua and Tailevu	Korovou, Muaira, Naitasiri, Namosi, Nausori, Navuakece, Nawaidina, Rewa, Serua, Tailevu, Vutia, Waidina and Waimaro	Across different villages under these districts.

The coordinates of the project region are as follow:

Latitude: -17° 48' 59.99" S Longitude: 178° 00' 0.00" E.

The details of exact villages respective to the beneficiaries are available in the CPA distribution database.

CPA-02:

**Improved Cook Stove Programme in Fiji – CPA02**  
**(Ref. CPA 10497-P1-0002-CP1)**

As per registered CPA-DD, the project activity under the CPA was proposed to be implemented in several villages identified in different districts across a few region or provinces namely Ba, Bua, Cakaudrove, Kadavu, Lau, Lomaiviti, Macuata, Nadroga-Navosa, Naitasiri, Namosi, Nausori, Ra, Rewa, Serua and Tailevu which come under the Viti Levu in Fiji

Currently, ICS distribution under the CPA is under progress. A partial distribution has been achieved so far. The regions covered so far under the CPA include the following locations:

Province /Region	District	Village
Cakaudrove, Kadavu, Lau, Lomaiviti, Makoi, Nabua, Naitasiri, Nasinu, Nausori, Navua, Ra, Rewa, Suva, Tacirua, Tailevu and Valelevu	Across 12 different districts across the provinces/regions.	Across different villages under these districts.

The coordinates of the project region are as follow:

Latitude: -17° 47' 59.99" S Longitude: 178° 00' 0.00" E.

The details of exact villages respective to the beneficiaries are available in the CPA distribution database.

The ICS under the CPA-03 is yet to be implemented; hence not included further details.

The final location details and coordinates of the ICS distributed under the CPAs are properly maintained and can be uniquely identified from the distribution database.

The location maps are shown below for representative purposes:



Location maps for CPA-01 & 02

### 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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The Monitoring Plan applied in the PoA involves a number of key elements that ensure that the CME have high-quality, unbiased and reliable information regarding the performance of the project in terms of implementation and outcomes, and for the purposes of calculating Certified Emission Reductions (CERs) following AMS-II.G. version 10.0 on the basis of the amount of non-renewable biomass saved by the ICS in the project activity.

### The key elements are the following:

- Project database management
- Spot Checks of ICS
- Sample Plan for the Monitoring Survey
- Data Quality, Consistency and Checks for double-accounting
- Monitoring Reporting

The monitoring plan is designed to monitor the parameters listed in Section B.5.1. of the respective CPA-DD, which are required for calculation of the actual GHG emission reduction achieved by the CPAs using ex post sampling survey. The share of operating stoves and the continued use of pre-project devices will be determined based on sampling procedures. The CME is responsible for conducting the sampling surveys and maintaining a database with all operating stoves.

### The current practice of distribution and database management:

ICS are distributed free of cost to the users. The CME, Korea Carbon Management (KCM) financed the implementation of the CPAs in full. The information related to stove distribution are collected by the local team deployed by CME and the records are stored in the electronic database available with CME. The ground team verifies the accuracy and completeness of data and confirms that there is no double entry of serial numbers in the database. All technical staff of the ground team is responsible for distribution and maintenance of the stoves.

Since the stove distribution database is recorded in electronic database (currently in excel format) backed by hard copies of distribution record forms, the uniqueness of serial numbers can be easily cross checked. Also, as per prescribed procedure of 'General operating and implementing framework of the PoA', a standard beneficiary agreement for end users has been created. This agreement includes details of the beneficiary, ICS details and confirmation that ICS are non-transferable and emission reductions generated by the ICS are owned by the CME. The agreements are duly signed at the point of distribution of ICS by each receiptient. A copy of this agreement is available with each end user (i.e. beneficiary of the stove) and back up references are available with the ground team in the form of both hard copies and scanned PDF files.

Further, a spot-check mechanism has been established by CME. As per this, the trained field staff shall regularly visit randomly selected households from the database and cross-check the information on the database with the actual details of the stove at household. The objective of such spot check<sup>4</sup> visit is to identify any probable inconsistencies (e.g. change in the address of a user, whether ICSs are in use, any wear and tear, etc.) so that such inconsistency can be clearly marked and excluded from emission reductions calculations. **However, this spot-check mechanism shall be made effective once the distribution work is completed under the CPA-02 which is currently ongoing.** Therefore, during the current monitoring period no specific spot-checks were conducted, however the required monitoring forms, trainings to staff for spot-checks etc. have been developed.

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<sup>4</sup> As a spot-check practice (to be implemented), local monitoring agents shall visit households to check existence of project ICS and its operational condition and also to ensure that there is no existence of the baseline device or any other device except the project ICS. They fill out a monitoring form containing serial numbers of ICS after verifying its existence and then also take signature of the head of household. Such forms generally contain signature of the local team member and stamp of the local representative. The forms will essentially include information such as detail of household, unique no. of ICS, date of visit, date of ICS distribution, view point/analysis about ICS conditions and confirmation/remarks related to presence of other devices, etc.

## SECTION E. Data and parameters

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

The following parameters and the respective values are applicable to both the CPAs:

Data/Parameter	$B_{old,i,j}$
Unit	tonne/year
Description	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
Source of data	Calculated based on Primary Survey Report <sup>5</sup>
Value(s) applied	9.42
Choice of data or measurement methods and procedures	<p>The annual quantity of wood that would have been consumed in absence of the project activity will be calculated as below:</p> $B_{old,i,j} = B_{old,HH} / N_{d,HH}$ <p>Where, <math>B_{old,HH}</math> is determined through survey and <math>N_{d,HH}</math> is a monitoring parameter to be monitored on actual</p>
Purpose of data/parameter	Calculation of Baseline Emissions
Additional comments	<p>The value of <math>B_{old}</math> has been established as ex-ante fixed parameter at the time of validation. The value has been considered from the primary survey conducted based on actual samples, representative to all rural households in Fiji.</p> <p>Assessments, information and results established in this CPAs may be used in subsequent CPAs in lieu of conducting fresh assessments at each CPA level in absence of new data. Further as CME plans distribution of only one ICS per households hence <math>B_{old,i,j}</math> equals <math>B_{old,HH}</math></p>

Data/Parameter	$B_{old,HH}$
Unit	tones/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 survey
Value(s) applied	9.42

<sup>5</sup> The value has been considered based on the survey report “Baseline Household Fuel Assessment – Fiji, Cooking Practice and Fuelwood consumption survey in rural households of Fiji” conducted by Kasabias Pte. Ltd. based on primary survey and methodical calculations as per sampling requirements. The survey was conducted by the independent third party covering the households across rural households of Fiji Island. As per demographic figures, majority of the population of Fiji lives on the islands of Viti Levu. The survey therefore covered parts of Western Division of Fiji which mainly consists of several provinces like Western/northern Viti Levu including Ba, Nadroga-Navosa and Ra. All the CPAs included under the PoA fall within these regions only which can be verified from the CPA locations and distribution database. Hence the value of  $B_{old,i,j}$  is applicable for both the CPAs. Additionally, section I.6.5 of the registered PoA also prescribes for the parameter  $B_{old,i,j}$  that “assessments, information and results established in initial CPAs may be used in subsequent CPAs in lieu of conducting fresh assessments at each CPA level in absence of new data”. Thus, the value of the parameter has been included in the CPAs as an ex-ante fixed value and is applicable for the existing CPAs.

Choice of data or measurement methods and procedures	As per methodology, the choice of data could be based on combination of literature and/or field survey by a dedicated expert team/third party survey will be used to determine the annual quantity of woody biomass have been used per person in absence of the project activity. If survey conducted should refer the AMS-II.G non-binding survey questionnaire for baseline fuel consumption pattern. Here, the choice of data was based on primary survey, conducted through simple random sampling as per the provision of the applied methodology. The details are referred under the footnote reference #5.
Purpose of data/parameter	Baseline emission calculation
Additional comments	The value is fixed ex-ante. Assessments, information and results established in this CPAs may be used in subsequent CPAs in lieu of conducting fresh assessments at each CPA level in absence of new data.

<b>Data/Parameter</b>	<b><math>\eta_{old}</math></b>
Unit	%
Description	Efficiency of the system being replaced (Traditional Cooking Stoves)
Source of data	Default value as per applied methodology AMS-II.G version 10.0
Value(s) applied	10
Choice of data or measurement methods and procedures	The default value of 0.10 is used, as the replaced system is a three stone fire, or a conventional device with no improved combustion air supply or flue gas ventilation, i.e. without a grate or a chimney.
Purpose of data/parameter	Calculation of Quantity of woody biomass that is saved in tonnes per device
Additional comments	The value is fixed ex-ante

<b>Data/Parameter</b>	<b><math>NCV_{biomass}</math></b>
Unit	TJ/Tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	Default value as per applied methodology AMS-II.G version 10.0
Value(s) applied	0.0156
Choice of data or measurement methods and procedures	Default value as per applied methodology AMS-II.G version 10.0
Purpose of data/parameter	For calculation of emission reduction
Additional comments	The value is fixed ex-ante

<b>Data/Parameter</b>	<b><math>EF_{projected\_fossilfuel}</math></b>
Unit	tCO <sub>2</sub> /TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers
Source of data	Default value as per applied methodology AMS-II.G version 10.0
Value(s) applied	63.7
Choice of data or measurement methods and procedures	This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. The value is calculated, based on the global average ratio of cooking fuels (the normalized ratio of kerosene and liquefied petroleum gas (LPG) excluding coal), i.e. 9 per cent for kerosene (71.5 t CO <sub>2</sub> /TJ) and 91 per cent for LPG (63.0 t CO <sub>2</sub> /TJ)
Purpose of data/parameter	For calculation of emission reduction
Additional comments	The value is fixed ex-ante

Data/Parameter	$L_y$
Unit	Fraction
Description	Leakage adjustment factor
Source of data	Default value as per applied methodology 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, $B_{old,i,j}$ can be 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	For calculation of emission reduction
Additional comments	The value is fixed ex-ante

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 from the official data received from Ministry of Forest, Fiji
Value(s) applied	90.97
Choice of data or measurement methods and procedures	The choice of data was Official records from the Ministry of Forest, Fiji. The calculation method was in accordance to the "methodological tool 30" (version 02). The $f_{NRB}$ value was calculated at country level, the primary equations of the tool 30 have been used, followed by sub-equations in line with the "default $f_{NRB}$ guideline" which also refers to the same parameters and output as prescribed under the tool 30.
Purpose of data/parameter	For calculation of emission reduction
Additional comments	The value is fixed ex-ante and considered at PoA level. Therefore, the value has been fixed at the time of PoA-validation, subsequently applied for all the CPAs.

Data/Parameter	Life span
Unit	Number of years
Description	The operating lifetime of the project device (i.e. ICS)
Source of data	Manufacturer specification and/or Lab test report by National Agency
Value(s) applied	4 (for Adarsh ICS, under CPA-01) 5 (for 4G Cook stove, under CPA-02)
Choice of data or measurement methods and procedures	These values have been taken from manufacturer and also verified by a third party test report (WBT) conducted for each ICS type, conducted by cookstove expert from Ministry of women, children and poverty alleviation, at a national lab of The University Of the South Pacific in Fiji.
Purpose of data/parameter	For calculation of baseline emission
Additional comments	The value is fixed ex-ante

## E.2. Data and parameters monitored

Data/Parameter	$N_{y,i,j}$
Unit	Number
Description	Number of project devices of type $i$ and batch $j$ operating during year $y$
Measured/calculated/ Default	<p>CME maintains the database of all stoves installed. The number of operating stoves for each device <math>i</math> and batch <math>j</math> shall be determined on a sampling basis (in line with the sampling plan prescribed under the section I.7.2 of the registered PoA-DD).</p> <p>The results from monitoring were used to calculate <math>N_{y,i,j}</math> as follows:  <math display="block">N_{y,i,j} = (n_{i,j,operational} / n_{i,j,total}) * N_{y,i,j,installed}</math></p> <p>Where:  <math>N</math> = number of stoves  <math>n</math> = number of samples</p> <p>All ICS distributed are recorded with their respective installation date and recipient /location. The distribution date for each ICS listed in the Project Database of each CPA signifies the start of operation for each appliance type.</p> <p><b>Sampling Frame:</b> Project Database of each CPA as defined by the ICS type, serial number and end-user information.</p> <p><b>Sample Size and Desired Precision:</b> it refers to the PoA-DD, Part II, Section I.7.2.</p> <p><b>Sample Method:</b> it refers to the PoA-DD, Part II, Section I.7.2.</p> <p>Thus, the number of stoves still operating will be determined based on representative sampling. The total number of operational stoves shall be calculated as the fraction of stoves of type found operational in the sampling survey multiplied by total number of stoves in the project database (the parameter <math>N</math> as described in the next table below), as defined under the equation mentioned above.</p>
Source of data	Stove distribution database and survey records
Value(s) of monitored parameter	17,749 <sup>6</sup>
Monitoring equipment	Based on sampling survey
Measuring/reading/recording frequency	At least once every two years (biennial)
Calculation method (if applicable)	As per sampling method.
QA/QC procedures	<p>For each CPA CME shall maintain a distribution record to calculate this parameter. The CME supervises the activities of each CPA implementer (when not the CME itself), and provides training, guidelines and templates to facilitate accurate testing and record keeping.</p> <p>In the case the desired precision is not met, lower bound values shall be used against repeating the survey to determine the operational fraction of stoves of type <math>i</math> and age <math>a</math>.</p>

<sup>6</sup> Considered total numbers of stove distributed and considered as commissioned as on the month of June 2020 across both the CPAs (i.e. CPA #1 & 2). Thus, this total number is inclusive of both the ICS types – Adarsh ICS & 4G Cook stove. The values are provided under the Parameter “N” below and the stove numbers distributed under each CPA shall be submitted in the ER sheet which can be further verified from the distribution database. The total operational ICS in each CPA are accounted for ER calculation by multiplying the result derived from the sampling survey for the ex-ante parameter “ $N_y$ ” - adjustment fraction for operational stove.



Purpose of data/parameter	Calculation of baseline emission
Additional comments	<p>All data sources will be transparent and verifiable. At the CPA-level, it is assumed ex-ante that there is only one project stove being used per household for calculating <math>B_{old,i,j}</math> therefore, ex-post sampling based monitoring shall also include assessment of presence of multiple operational project stoves in a sampled household. The number of project stoves in the CPA shall be adjusted accordingly to claim emissions reduction only for one operational project stove per household to ensure equivalence with the baseline established.</p> <p>Here 'project devices of type <math>i</math>' is of two different type, i.e. Adarsh and 4G. The total ICS numbers in each CPA applicable under the current monitoring period are submitted under the ER sheet and net operational ICS numbers in each CPA are considered for ER calculation.</p>

<b>Data/Parameter</b>	<b>N</b>
Data unit	Number
Description	Number of project devices distributed
Source of data	Stove distribution database
Value(s) applied	Total 17,749
Measurement methods and procedures	Every time an ICS is distributed a sale agreement is filled (the beneficiary agreement) with all details to uniquely identify each ICS. Based on the information collected into this electronic database, the number of ICSs distributed is determined.
Monitoring frequency	Recorded at the time of commissioning/distribution of project devices
QA/QC procedures	-
Purpose of data	Calculation of baseline emission
Additional comment	<p>Here,</p> <p>ICS under CPA-01 – 806</p> <p>ICS under CPA-02 – 16,943</p>

<b>Data/Parameter</b>	<b><math>\eta_{new,i,j}</math></b>
Unit	%
Description	Efficiency of the device of each type $i$ and batch $j$ implemented as part of the project activity
Measured/calculated/Default	Measured and calculated
Source of data	Manufacturer's Specification or/and Certification by a national standards body or an appropriate certifying agent recognized by that body. (Refer to 'additional comments' section for more details)
Value(s) of monitored parameter	<p><b>For Adarsh ICS:</b> 29.49%</p> <p><b>For 4G Cook Stove:</b> 32%</p>
Monitoring equipment	NA
Measuring/reading/recording frequency	<p>(i) Recorded at the time of commissioning/distribution</p> <p>(ii) Adjusted for the loss of efficiency per annum as per para 32 (a) of AMS-II.G. version--10.0.</p>

Calculation method (if applicable)	<p>As per the given provision, the efficiency of the Adarsh &amp; 4G ICS have been sourced from: Test reports/Certificate on efficiency carried out for the specific ICS type by a national level govt. organization (Ministry of women, children and poverty alleviation), through an appropriate WBT testing done at a national lab of The University Of the South Pacific in Fiji at national lab at USP in Fiji.</p> <p>Thus, (i) these values were considered as the recorded values at the time of commissioning/distribution. (ii) Adjusted for the loss of yearly efficiency of ICS as per para 32 (a) of the applied methodology, AMS-II.G Version-10.</p>
QA/QC procedures	The value is used from the third party report, hence not required.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	<p>Here 'project devices of type <i>i</i>' is of two different type, i.e. Adarsh and 4G.</p> <p>As per Data/Parameter table 11 of the methodology (AMS II.G, version 10), the efficiency of the project ICS have been determined based on certification by an appropriate certifying agent. Additionally, the measurement method has been considered as per para 32(a) of the methodology. Therefore, no further sampling has been applied for this parameter.</p> <p>If any sample stove is found to be operating below the 20% efficiency, the proportionate number of stoves of that type included in the CPA will be considered to be non--operational and not accounted for ER calculation.</p> <p>The current monitoring period is the 1<sup>st</sup> monitoring &amp; verification of the PoA, included only the first two CPAs. As can be verified from the CPA distribution database, all ICS operational are in their 1<sup>st</sup> vintage year; no ICS is in the 2<sup>nd</sup> year of operation. Therefore, no loss in yearly efficiency as per para 32 (a) of AMS-II.G. version-10.0 is applicable during the current monitoring period.</p>

Data/Parameter	Date of commissioning of batch j
Unit	Date
Description	To establish the date of commissioning, the CME opted to group the devices into monthly "batches" and the last date of commissioning of a device within that monthly batch has been used as the date of commissioning for the entire batch.
Measured/calculated/Default	Measured
Source of data	Distribution record of ICS
Value(s) of monitored parameter	To be referred from the ER calculation sheet
Monitoring equipment	NA
Measuring/reading/recording frequency	Recorded at the time of commissioning/distribution of first ICS of the batch
Calculation method (if applicable)	As per sampling method.
QA/QC procedures	NA
Purpose of data/parameter	Start Date

Additional comments	<p>The record to be kept for crediting period + 2 years.</p> <p>In order to be conservative in emission reduction calculation, CME has considered the last date of distribution of a particular month as the date of complete commissioning of the stove batch distributed for that particular month (here a batch is referred to as total numbers of stoves distributed in a particular month). Therefore, start date of accounting of emission reductions for stoves distributed in a particular month has been considered as the next day of the last date of stove distribution for that month. Whereas, for the purpose of identification of ICS numbers vintage-wise, the year fraction for each ICS has been calculated from the date of its distribution. Therefore, this is a conservative approach both for the purpose of ER calculation and calculation of yearly efficiency as per para 32 of the applied methodology.</p> <p>In the current monitoring period, the end date of monitoring period has been considered as 31<sup>st</sup> July 2020. Therefore, the total number of stoves that are distributed/commissioned as on the month of June 2020 has been considered for ER accounting. The last date of distribution of ICS in the month of June 2020 was 29 Jun 2020. The month wise total distributed ICS numbers and the last date of distribution in a particular month are provided in the ER sheet, which can be further referred from the CPA distribution database.</p>
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Data/Parameter	$\mu_y$
Unit	Fraction (or %)
Description	Adjustment to account for any continued use of pre-project devices during the year y
Measured/calculated/Default	Measured
Source of data	Stove distribution database (electronic) and Sample Survey Records
Value(s) of monitored parameter	1 (or 100%) - for ICS type "Adarsh" 1 (or 100%) - for ICS type "4G"
Monitoring equipment	NA
Measuring/reading/recording frequency	At least once in two years (biennial)
Calculation method (if applicable)	<p>As per sampling method.</p> <p>A sampling monitoring survey has been conducted on calculated sample size as per the sample plan and in line with the provision given under the page 14 of the applied methodology to record usages consumption level in lieu of continued baseline stoves. The option 2 of the page 14 of the methodology has been referred while conducting the sampling survey as baseline devices are three stone fire across all the households.</p> <p>Since this parameter is a proportion (i.e. fractional value), the sampling result has been expressed as a proportional value. Thus, the Fractional value derived based on sampling survey has been considered as "<math>\mu</math>" and the value has been used in the main equation (eq 1 of the methodology) for required adjustment to account number of baseline stoves still operating. Please refer to the sampling survey sheets for the results derived from the survey and also the ER sheet for application of the values.</p>
QA/QC procedures	95/10 confidence / margin of error is achieved for the sampling parameter irrespective of annual / biennial monitoring frequency as per Sampling standard. In the case the desired precision is not met, lower bound values shall be used against repeating the survey to determine the operational fraction of stoves.
Purpose of data/parameter	To calculate baseline emission

Additional comments	The record to be kept for crediting period + 2 years
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<b>Data/Parameter</b>	<b>N<sub>d,HH</sub></b>
Unit	Fraction
Description	Number of project devices distributed per household
Measured/calculated/Default	Measured
Source of data	Stove distribution database records
Value(s) of monitored parameter	1
Monitoring equipment	NA
Measuring/reading/recording frequency	Recorded at the time of commissioning/distribution of project devices and it can be crosschecked with user details having number of ICS
Calculation method (if applicable)	NA
QA/QC procedures	The procedure will be developed in electronic system to record number of ICS provided to particular household in any CPA.
Purpose of data/parameter	To calculate baseline emission
Additional comments	<p>The record to be kept for crediting period + 2 years</p> <p>The value is applicable for both the CPAs, as only one stove distributed per household which can be verified from the unique ICS serial numbers and the distribution records kept in the CPA-databases.</p>

### E.3. Implementation of sampling plan

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As on the current monitoring period, total three CPAs (i.e. 10497-P1-0001-CP1, 10497-P1-0002-CP1 and 10497-P1-0003-CP1) are included under the PoA; and only the first two CPAs are included under the current monitoring period. The ICS distribution under the 1<sup>st</sup> CPA has been completed whereas for the 2<sup>nd</sup> CPA partial distribution achieved during the current monitoring period. The total ICS included for ER accounting during the current monitoring period across the two CPAs is 17,749; the respective numbers of ICS distributed under each CPA are demonstrated under the ER sheet separately and also attached in the Appendix 1 below.

Current monitoring period is considered from 12 February 2020 to 31 July 2020 (both the dates are included). Therefore, CME has considered the stoves included under the CPAs as on 30<sup>th</sup> June 2020 as the start date of ER accounting has been considered as per the monthly batch commissioning dates as prescribed under the section E.2 above, which is a conservative approach for ER calculation.

CME has followed the sampling plan as prescribed under the registered PoA-DD, section B.5.2. As per the same, the share of operating stoves and the continued use of pre-project devices will be determined based on sampling procedures. The CME has the responsibility of conducting the sampling surveys and maintaining a database with all operating stoves.

As per the Guideline for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 04, the sampling plan is followed in line with the required procedures and practices, as follows:

#### (a) Sampling Design:

Due to the large number of ICS envisioned to be distributed as part of the CPAs to be included in the PoA, it is not economically feasible to monitor each individual ICS unit distributed. Therefore, representative sampling will be undertaken as part of a PoA-wide Sampling Plan (by grouping and sampling across CPAs) that is designed in line with the requirements of the "Sampling and surveys for CDM project activities and programme of activities", version 04.

#### (i) Objective and Reliability Requirements:

The objective is to obtain an unbiased and reliable estimate of the proportion or mean value of the following key variables over the course of the crediting period. When biennial inspection is chosen a 95 per cent confidence interval and a 10 per cent margin of error shall be achieved for the sampling parameter. On the other hand, when the project proponent chooses to inspect annually, a 90 per cent confidence interval and a 10 per cent margin of error shall be achieved for the sampled parameters (as per para 41 of the applied Methodology AMS-II.G, version 10.0).

Also, as per the Sampling Standard (version 9), it states that *"in the case of CPAs solely composed of "microscale CDM units" as defined in the Methodological tool "Demonstration of additionality of microscale project activities", 95/10 confidence/precision shall be applied for sampling surveys in all cases, even when they are conducted at the CPA level"*.

Therefore as per the applicability, the CME has considered 95/10 confidence/precision sampling practice to consider representative sampling for the monitoring parameters. Following are the parameters considered for monitoring via sampling survey:

**$N_{y,i,j}$**  Number of project devices of type *i* and batch *j* operating during year *y*

**$\mu_{y,i,j}$**  Adjustment to account for any continued use of pre-project devices during the year *y*

As per the section E.2 above, the frequency of monitoring for both the parameters is at least once every two years.

**Also, efficiency of the project ICS ( $\eta_{\text{new},i,j}$ ) is a monitoring parameter. However, the value of the parameter  $\eta_{\text{new},i,j}$  has been considered as the efficiency value determined based on certification by an appropriate certifying agent; which is as per Data/Parameter table 11 of the methodology (AMS II.G, version 10). Additionally, the measurement method has been considered as per para 32(a) of the methodology for subsequent vinatges. Therefore, sampling has not been applied for this parameter.**

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

## **(ii) Target Populations:**

The target population for the proportion of ICS still in operation ( $N_{y,i,j}$ ) of this POA are all households in the POA database which are using fuel wood in ICS distributed under the POA for cooking.

The target population for pre-project appliances ( $\mu_{y,i,j}$ ) is the set of old stoves still in use under CPAs database.

## **(iii) Sampling Frame**

The CPAs involve distribution of two different types of ICS technology (i.e. Adarash portable stove and 4G cook stove). The CPA-01 included portable Adarash ICS, whereas CPA-02 is deploying portable 4G cook stove. Hence, two different sampling frames considered. However the fuel type and consumption is the same, i.e. fire wood and the target population is homogeneous in nature (i.e. common technology) within the CPA groups.

**Sampling Frame 1: CPA-01 with Adarash ICS.**

**Sampling Frame 2: CPA-02 with 4G ICS.**

### **A) Sampling frame for proportion of ICS in operation ( $N_{y,i,j}$ ):**

The sample frame refers to all the information sources on the Database. There are two primary mechanisms for data collection: the Registration Process for newly distributed/installed ICS and the Monitoring Survey (which includes a household questionnaire and visual inspection of ICSs) that will be used throughout the lifetime of the PoA. The detailed information collected from Registration Process is used to populate the stoves Database and the Monitoring Survey follows "Sampling and Surveys for CDM Project Activities and Programme of Activities", version 04.

This monitoring parameter  $N_{y,i,j}$  has been separately selected from the two sample frames.

### **B) Adjustment to account for any continued use of pre-project devices during the year ( $\mu_{y,i,j}$ )**

In line with applied approved methodology AMS-II.G version 10, as installing data logger is not practical and if any use of pre project device can be monitored in a common survey with other monitoring parameters; therefore, a random sub-sample within the common survey can be taken to determine continued use of old cookstoves and its proportional usage by including suitable questionnaire.

All the CPAs under the PoA are implemented by CME. As prescribed above under the 'Sampling Frame', each of the two CPAs forms a sampling frame having homogenous population and distributed ICS are of same technology in each sampling frame.

#### (iv) Sampling Method

As per registered monitoring plan, the sampling method for monitored parameters  $N_{y,i,j}$  and  $\mu_{y,i,j}$  is “Simple Random Sampling” and samples are randomly selected from the two primary sampling units as illustrated above.

To ensure a random selection of ICS, random number generators shall be applied. Each ICS in the target population is uniquely identifiable by its unique ID number. Applying the random number generators (online platform), the ICS numbers are randomly chosen from the defined population up to the required sample size as calculated by the CME. The details of the selected samples are provided in the sample survey sheet along with the stove database.

To determine the parameters, sampling survey has been involved the following approaches (outcome in brackets):

$N_{y,i,j}$  : Visual inspection of the premises to see if ICS is operational and in use. Interview with end user if required to verify that ICS is still in use (Yes/No)

$\mu_{y,i,j}$  : Pre project device only is in use then fraction to be used to calculate total number, however if pre project device is used along with project ICS, proportion of usage of each will be determined by cooking habits evaluated by survey questionnaire during the monitoring period.

Using the formulas as given in the section “Sample Size” below, the CME has randomly sampled the required number of ICS from the two primary sampling units.

#### (v) Sample Size

In line with the registered sampling plan, for the estimation of the proportion or mean value of the parameters investigated, the minimum sample size for each sample frame has been calculated based on 95/10 confidence/precision which will suffice for biennial sampling.

The procedure to determine the sample of households will ensure that they adequately represent the broader project population, minimizing sampling error. Using, a 95 per cent confidence level, and a 10 per cent margin of error, random samples will be selected from each Sampling Unit.

There are two parameters for survey that are estimated through sampling: the number of stoves still in operation during the monitoring period as determined by the monitoring survey ( $N_{y,i,j}$ ), and the continued use of old stoves, ( $\mu_{y,i,j}$ ). In line with AMS-II.G version 10, both can be sampled in a single survey with a random sample of households using the above described confidence/precision levels depending on annual or biennial monitoring frequency.

To estimate the sample size for parameters  $N_{y,i,j}$  the following equation is used:

$$n \geq \frac{1.96^2 N \times p (1-p)}{(N - 1) \times 0.1^2 \times p^2 + 1.96^2 \times p (1 - p)}$$

Where:

$n$  = Sample size

$N$  = Population size (Total number of households/ICS)

$p$  = Expected proportion

1.96 = Represents the 95% confidence required

(In the case of 90% confidence, 1.645 shall be used)

0.1 = Represents the 10% relative precision

Based on the above assumptions, the resulting sampling size for a 95/10 confidence/precision is calculated for the total population size, which comes out to be

$n \geq 41$  for Sampling Frame-1

$n \geq 43$  for Sampling Frame-2

Therefore, in this case a sample size of 43 is supposed to be sampled from each of the two primary sampling units.

#### Parameter $\mu_{y,i,j}$ :

For the purposes of determining sample size in the first monitoring period, the percentage use of old cookstoves will vary. To estimate the sample size for parameter  $\mu_{y,i,j}$  the following equation is used:

$$n \geq \frac{1.96^2 NV}{(N-1) \times 0.1^2 + 1.96^2 \times V}$$

Where,

$V = (SD/\text{mean})^2$   
 $n$  = Sample size  
 $N$  = Population size (Total number of households/ICS)  
Mean = Expected mean of ICS thermal efficiency  
SD = Expected standard deviation  
1.96 = Represents the 95% confidence required

Based on the above assumptions, the resulting sampling size for a 95/10 confidence/precision is calculated for the total population size, which comes out to be

$n \geq 4$  for each of the sampling frame.

$n = 4$ .

Since the calculated sample size was found to be less than 30, therefore, CME had applied tDistribution to have an adjusted sample size. After applying the tDistribution, the adjusted sample size is found to be 11.

Also, as per registeted PoA-DD, oversampling is also encouraged, not only to compensate for any attrition, outliers or nonresponse associated with the sample, but also to prevent a situation at the analysis stage where the required reliability is not achieved and additional sampling efforts would be required. The sample size shown above will be adjusted upwards to account for non-responses, CME shall determine the appropriate non-responses rate based on previous experience.

Therefore, CME has decided to consider an oversampling of 20% on the calculated sample size.

Thus, the sample size finalized for the two primary sampling units are as follows:

Parameter <sup>#</sup>	Sample size calculated (for Sampling Frame 1)	Sample size calculated (for Sampling Frame 2)
$N_{y,i,j}$	50	52
$\mu_{y,i,j}$	14	14
$\eta_{\text{new},i,j}$	NA	NA

*# Here, 'project devices of type i' is of two different types, i.e. Adarsh and 4G. The ICS distributed under the respective CPA of both the types are homogeneous.*

Additionally, as per registered sampling plan, it's recommended that the CME may choose to use the same samples to monitor more than one parameter, where parameters have same units.



Also, as per registered PoA-DD, the CME may choose to use the same samples to monitor more than one parameter, where parameters have same units. Sampling more than one parameter within the same sample (household) helps reduce travel needs for monitoring and the associated costs. At the same time this approach ensures the random selection of samples for every parameter.

Therefore, even though the particular parameters are surveyed and tested based on the above final sample size and selected randomly from the stove database, CME had interviewed all sampled households (i.e. samples selected for  $N_y$ ) to check for the presence of baseline devices (i.e. additional check for the parameter  $\mu_y$  for backup reference purposes). Therefore, over and above the 14 samples where the monitoring survey data for  $\mu_y$  has been collected respectively for the two frames, the survey interview was designed to check baseline device for all the 50 & 52 samples respectively under the two frames which were selected for parameters  $N_y$  and vice versa.

Thus, for these two monitoring survey parameters ( $N_y$  &  $\mu_y$ ), data collection was done for total randomly selected samples in both the sampling frames. However, results are calculated and presented for the respective samples as per calculated samples size only, which confirms in conformity with the primary sampling method and sample size estimated as there was no case of non-response in the selected samples. Thus, above calculated samples are reliable. The results are calculated and presented for all the calculated sample sizes for each parameters in line with the primary sampling method and sample size estimated.

The results derived from the sampling survey for both the monitoring parameters are submitted in the Sampling Sheets.

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

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

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According to paragraph 22 of methodology AMS-II.G, version 10, emission reductions would be calculated as:

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

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 tCO<sub>2</sub>e

$ER_{y,i,j}$  = Emission reductions by project device of type  $i$  and batch  $j$  during year  $y$  in t CO<sub>2</sub>e

$LE_y$  = Leakage emissions in the year  $y$

In the existing CPAs, 'project devices of type  $i$ ' is of two different types, i.e. Adarsh and 4G; however, all ICS included under the current monitoring period are operational in the 1<sup>st</sup> year vintage.

Now,

$$ER_y = B_{y,saving} \times N_{y,i,j} \times f_{NRB,y} \times \mu_{y,i,j} \times NCV_{biomass} \times EF_{projected\_fossilfuel} \dots\dots\dots (eq 1)$$

Where, parameters used in the formulae are already explained under the section E.1 & E.2.

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

In line with para 23 of applied approved methodology AMS-II.G version 10, four option given to determine  $B_{y,saving,i,j}$ . Here CME has chosen option three i.e. Water Boiling Test (WBT) with corresponding formula given below:

$$B_{y,savings,i,j} = (B_{old,i,j}) * L_y * (1 - \eta_{old}/(\eta_{new,i,j})). \dots\dots\dots (eq 2)$$

The above equation has been used for the CPAs as only one stove per household has been distributed, which can be cross checked from the stove distribution database.

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 $j$
$LE_y$	=	leakage adjustment factor or 0.95 (as per default value) of AMS-II.G version 10.0

The baseline saving shall be determined as:

$$B_{old,i,j} = B_{old,HH} / N_{d,HH}$$

(Here  $N_{d,HH}$  = Number of project devices per household (number). This value is currently 1 as already demonstrated under the section E.1).

Both the CPAs included under the PoA are based on wood fuel. Therefore, above equation is suitable. The detailed ER calculations are submitted in the ER sheet.

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

>>

The equations in the methodology do not calculate baseline and project emissions separately; therefore section F.1 shall be referred for this section.

## F.3. Calculation of leakage emissions

>>

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

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

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (t CO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2</sub> e)		
				Before 01/01/2013	From 01/01/2013	Total amount
10497-P1-0001-CP1	1,733	0	0	0	1,733	1,733
10497-P1-0002-CP1	23,545	0	0	0	23,545	23,545
<b>Total</b>	25,278	0	0	0	25,278	25,278

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

>> The comparison of ERs achieved with the estimated values are demonstrated under the ER sheet and results are presented below:

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO <sub>2</sub> e)	Amount estimated ex ante for this monitoring period in the CPA-DD (t CO <sub>2</sub> e)
CPA 10443-P1-0001-CP1	1,733	1,733
CPA 10443-P1-0002-CP1	23,545	37,863
<b>Total</b>	25,278	39,596 <sup>7</sup>

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

>>

The ex-ante estimated emission reductions are calculated for this current monitoring period based on the ex-ante estimation provided in the respective CPA-DD. In order to do that the estimated annual ER for each CPAs are proportionately calculated for the equivalent period of the current

<sup>7</sup> Here all the ex-ante estimated CER for each CPA has been calculated for the equivalent period of 12/02/2020 to 31/07/2020 with days fraction starting from the respective start date of the crediting period, based on the projected annual CERs as per respective CPA-DDs. The detail calculation is shown in the ER sheet.

monitoring period (i.e. 171 days). The details of the ex-ante estimation for the current monitoring period for each CPA are provided in the ER sheet.

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

>>

There is no increase in actually achieved emission reductions as compared to estimated reduction for a comparable period, whereas actual active reductions are lesser than the estimated ex-ante value for equivalent period (i.e. 36.16% lesser than ex-ante estimated value for the monitoring period). This is mainly because of partial distribution of ICS under the CPA-02. The details of distribution can be referred from the ER sheet and respective distribution database for the CPAs.

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

The combined scale of the project activities under each CPA remains under the limit of the type II small scale category under the current monitoring period; and shall remain within the limit in each year throughout the crediting period.

This can be demonstrated from the eligibility criteria given that each of the independent subsystems/measures (i.e. each ICS) included in the CPA is a micro scale unit (i.e. no larger than 1% of the small-scale thresholds defined by the methodology applied, which is 180 GWhth/year for SSC projects). Thus, the annual energy savings of each project device included under the CPAs will not be more than 1% of the small-scale CDM thresholds.

## Appendix 1

Details of ICS Distribution status as on the current Monitoring Period:

CPA Ref.	Months	Nos. of ICS Distributed	ICS as per vintage year of operation	Source/Reference
CPA 10497-P1-0001-CP1	Oct-19	329	ICS in 1 <sup>st</sup> year of operation = 806	CPA-01 Database
	Nov-19	462		
	Dec-19	15	ICS in 2 <sup>nd</sup> year of operation = 0	
	<b>Total =</b>	<b>806</b>		
CPA 10497-P1-0002-CP1	Feb-20	3371	ICS in 1 <sup>st</sup> year of operation = 17,073	CPA-02 Database
	Mar-20	7842		
	Apr-20	795		
	May-20	2860	ICS in 2 <sup>nd</sup> year of operation = 0	
	Jun-20	2075		
	Jul-20	130		
	<b>Total =</b>	<b>17,073</b>		

The current monitoring period is considered from 12 February 2020 to 31 July 2020 (both the dates are included). Therefore, CME has considered the stoves included under the CPAs as on the month of June 2020 as the start date of ER accounting has been considered as per the monthly batch commissioning dates as prescribed under the section E.2 above, which is a conservative approach for ER calculation. Thus, total ICS included under the current monitoring period is 17,749, where the last date of ICS distribution in the month of June 2020 was 29<sup>th</sup> June, comes under CPA-02. Whereas, 130 ICS distributed during the month of July 2020 shall be considered as commissioned as on 31<sup>st</sup> July, hence ER accounting for these ICS shall be considered from 1<sup>st</sup> Aug 2020, which will be part of next verification.

## Appendix 2

Formulae and Equations used in the Sampling Survey and sampling results calculation for the ex-post monitoring parameters are (in line with Sampling Guidelines and Sampling Standard) are as follows:

**For sample size calculations:**

**For Parameter  $N_y$ :**

$$n \geq \frac{1.96^2 N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.96^2 p(1-p)}$$

where:

$n$  = Sample size

$N$  = Population size (Total number of households/ICS)

$p$  = Expected proportion

1.96 = Represents the 95% confidence required (In the case of 90% confidence, 1.645 shall be used)

0.1 = Represents the 10% relative precision

**For Parameter  $n_{\text{new}}$  and  $\mu_y$ :**

$$n \geq \frac{1.96^2 NV}{(N-1) \times 0.1^2 + 1.96^2 \times V}$$

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

Where,

$n$  = Sample size

$N$  = Population size (Total number of households/ICS)

$\text{mean}$  = Expected mean

$SD$  = Expected standard deviation

1.96 = Represents the 95% confidence required (In the case of 90% confidence, 1.645 shall be used)

0.1 = Represents the 10% relative precision

**Equation for t-Distribution application:**

$$n = \left( \frac{t_{n-1} \times SD}{0.1 \times \text{mean}} \right)^2$$

Where  $t_{n-1}$  is the value of the t-distribution for the confidence when the sample size is  $n$ .

**Equation used for Reliability Check:**

$$\frac{\frac{1}{2}\text{width of confidence interval}}{\text{proportion}} \times 100\%$$

.....this equation gives the precision.

$$p \pm 1.96 \times \sqrt{1 - \frac{n}{N}} \times \sqrt{\frac{p(1-p)}{n}}$$

.....this equation gives the confidence interval where sample interest is a proportional parameter.

$$\text{Sample Mean} \pm 1.96 \times \sqrt{1 - \frac{n}{N}} \times \frac{SD}{\sqrt{n}}$$

.....this equation gives the confidence interval where sample interest is a numeric mean value parameter.

Where:

$n$  = Sample size

$p$  = sample proportion

$N$  = Population size

1.96 = Represents 95% confidence required

$$\sqrt{1 - \frac{n}{N}} \times \sqrt{\frac{p(1-p)}{n}}$$

&

$$\sqrt{1 - \frac{n}{N}} \times \frac{SD}{\sqrt{n}}$$

..... both represents “standard error”.

Thus, + & - both will give two values, which will be the upper and lower bound values of the confidence interval.

Now:

$$\text{Sample Mean} \pm t_{(n-1)} \times \sqrt{1 - \frac{n}{N}} \times \frac{SD}{\sqrt{n}}$$

This equation is to calculate confidence interval when mean value (i.e. ‘sample mean’) and ‘standard deviation’ (SD) are used. Here,  $t_{(n-1)}$  represents the relevant value from the t-distribution with (n-1) degrees of freedom that is associated with the confidence.

This equation is more suited when the objective of the sampling relates to a mean value of interest and t-Distribution used for sample size calculation. Thus, for the parameters  $\mu_y$ , this equation is used.

Moreover, two excel functions “NORMSINV” and “TINV” are applied while deriving the results from the sampling for the monitoring parameters,

The Excel NORMSINV function calculates the inverse of the Standard Normal Cumulative Distribution Function for a supplied probability value. Excel uses an iterative method to calculate

the Normsinv function and seeks to find a result,  $z$ , such that  $\text{NORMSDIST}(z) = \text{probability}$ .  $\text{NORMSINV}(p)$  gives the  $z$ -value that puts probability (area)  $p$  to the left of that value of  $z$ .

The Excel TINV function calculates the inverse of the two-tailed Student's T Distribution, which is a continuous probability distribution that is frequently used for testing hypotheses on small sample data sets.  $\text{TINV}(\text{probability}, \text{degrees\_freedom})$  gives the  $t$ -value that puts one-half the probability (area) to the right with  $DF$  degrees of freedom.

These equations are also included under the Sample sheets, to be submitted to DOE as separate document.



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**Document information**

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