



**Monitoring report form for CDM programme of activities  
(Version 02.0)**

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

**MONITORING REPORT**

<b>Title of the PoA</b>	Paradigm Sub Saharan Africa Cook Stove Programme	
<b>UNFCCC reference number of the PoA</b>	9672	
<b>Version numbers of the PoA-DD applicable to this monitoring report</b>	10	
<b>Version number of this monitoring report</b>	1	
<b>Completion date of this monitoring report</b>	09/05/2018	
<b>Monitoring period number</b>	2 <sup>nd</sup> Monitoring Period	
<b>Duration of this monitoring period</b>	01/01/2017 – 31/12/2017 (first and last days are included)	
<b>Monitoring report number for this monitoring period</b>	1	
<b>Coordinating/managing entity</b>	The Paradigm Project	
<b>Host Parties</b>	<b>Host Party of the PoA</b>	<b>Is this the host Party of a CPA covered in this monitoring report? (yes/no)</b>
	Rwanda	No
	Ethiopia	Yes
<b>Sectoral scopes</b>	Sectoral Scope 3: Energy Demand	
<b>Applied methodologies and standardized baselines</b>	AMS.II.G: "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass" (Version 5.0)	
<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>	<b>Amount achieved before 1 January 2013</b>	<b>Amount achieved from 1 January 2013</b>
	N/A	6,540
<b>Amount of GHG emission reductions or net anthropogenic GHG removals</b>	29,001	

<b>estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report</b>	
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## **PART I      Monitoring of programme of activities (PoA)**

### **SECTION A.    Description of PoA**

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

>> The PoA “Paradigm Sub Saharan Africa Cook Stove Programme” targets households that are primarily using inefficient biomass technologies for cooking and replaces these technologies with improved efficiency cookstoves. The project is currently distributing the EzyStove improved wood stove in Ethiopia, working through its local operating entity, EzyLife.

#### *Policy/Measure or Stated Goal of the PoA*

The PoA “Paradigm Sub Saharan Africa Cook Stove Programme” aims to abate greenhouse gas (GHG) emissions and reduce non-renewable biomass consumption used for thermal energy needs by introducing improved, higher efficiency cook stoves to replace traditional inefficient and low efficiency cook stoves.

The PoA intends to provide the following benefits:

#### Environmental benefits:

Through the introduction of improved efficiency cooking stoves, the project will reduce the demand for biomass in household cooking and thus reduce the rate of deforestation resulting from inefficient biomass cooking in the project area. In addition to reducing the amount of biomass consumed in household cooking, the improved stoves also reduce GHG emissions resulting from inefficient combustion in traditional technologies, thus improving air quality and reducing harmful gasses that contribute to climate change.

#### Social and economic benefits:

By reducing the amount of biomass needed for cooking, the project is contributing to productive time and income savings that were previously spent on gathering or purchasing cooking fuel. The project is also reducing exposure to indoor air pollution, which primarily affects women and children, by minimizing toxic emissions produced by inefficient cooking technologies. In addition to household benefits, the project is supporting local jobs related to production and distribution of ICS.

#### *Framework for the Implementation of the PoA*

The Coordinating/Managing Entity (CME) of the PoA is The Paradigm Project, a social enterprise with experience implementing cookstove projects in Sub Saharan Africa and Latin America. Working through its local operating entities and partners, Paradigm manufactures cookstoves, builds distribution channels to reach the end consumer, provides technical expertise on cookstove technologies and carbon asset management, and, in countries where appropriate, facilitates financing for products. All tools and data management practices for the CPAs are managed by the CME, who trains local enumerators to conduct surveys, manage data entry and storage and perform quality checks on data. Paradigm’s local entities operate under the brand names EzyLife and Paradigm East Africa Manufacturing.

The CME will communicate directly with the CDM Executive Board and relevant Designated Operational Entity (DOE) on all matters related to the PoA and its Component Project Activities (CPAs).

**A.1.1. Corresponding generic component project activities (CPAs)**

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Generic component project activity (CPA) for Paradigm Sub Saharan Africa Cook Stove Programme	10	Sectoral Scope 3: Energy Demand	AMS.II.G: "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass" (Version 5.0)

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

Title and UNFCCC reference number of the CPA	Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Crediting period type and duration	Covered in this monitoring report? (yes/no)
9672-0001	Generic component project activity (CPA) for Paradigm Sub Saharan Africa Cook Stove Programme	10	7 years renewable September 1, 2013 – August 31, 2020	Yes
9672-0002	Generic component project activity (CPA) for Paradigm Sub Saharan Africa Cook Stove Programme	10	7 years renewable September 1, 2013 – August 31, 2020	No

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

>> The CME is The Paradigm Project

**SECTION B. Implementation of PoA****B.1. Description of implemented PoA**

>> The management system based on EB 65 Annex 3 (Version 2.1) "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities" has been followed according to the following criteria:

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

The Paradigm Project, as CME, was directly responsible for all activities regarding registration of the CPA and is the sole implementing party involved in the CPA, responsible for all operations under the CPA. The CME reviewed the included CPA for its compliance with the eligibility criteria outlined in the PoA-DD and Generic CPA. CME staff responsible for review and inclusion of the CPA have relevant expertise in CDM carbon asset development and the specifics of the PoA.

- b) Records of arrangements for trainings and capacity development for personnel

The CME has trained staff responsible for distribution, data management and monitoring within the CPA. The CME has records of training activities and has developed tools for standardizing data collection and quality control measures. Records of trainings and other methods of capacity development will be kept in electronic form for 2 years beyond the end of the relevant crediting period.

- c) Procedures for technical review of inclusion of CPAs

The CPA included in this monitoring period is directly owned and operated by the CME. The CPA was checked by the CME for compliance with all eligibility criteria and evidence has been reviewed and documented.

d) Procedure to avoid double counting

The CME directly manages and operates the CPA and is the exclusive manufacturer and distributor of the improved cookstove technology (the EzyStove) in the project boundary. In addition to the proprietary nature of the technology distributed that provides assurances that the technology is not credited under any other project within the project boundary, the CME has implemented a redundancy check via a serialization system for each cookstove credited under the CPA.

e) Records and documentation control process for each CPA under the PoA

Continuous records for improved cookstove sales and distribution to end users are maintained using a system developed by the CME and implemented by trained staff at the CPA level. Electronic records are kept for all ICS sales to distributors and, at the point of distribution to the end user, end user details, date of distribution and the serial number of the ICS is recorded. This information is stored by the CPA operator and entered into an electronic database that is kept by the CME. This database is checked for accuracy and used in sampling for monitoring and verification.

f) Measures for the continuous improvement of the PoA management system

The CME will continue to review and look for opportunities to improve its management system, especially through the use of improved, automated data collection techniques. Utilizing best practices developed in other cookstove projects, the CME is satisfied with its processes and tools for operations and data management used in this monitoring period.

The monitoring report covers a single CPA implementing the EzyStove improved cookstove within the borders of Ethiopia.

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

**B.2.1. Corrections**

>> Post Registration Change to the PoA was approved on April 11, 2016 under reference number PRC-9672-002.

**B.2.2. Inclusion of monitoring plan**

>> N/A

**B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools**

>> Post Registration Change to the PoA was approved on April 11, 2016 under reference number PRC-9672-002. These changes allow for the use of controlled cooking tests (Option 3 equation 5 under AMS.II.G) in calculating fuel savings in the project activity.

**B.2.4. Changes to programme design**

>> N/A

## PART II Monitoring of CPAs

>> This section describes the implementation and monitoring of a single CPA within the Paradigm Sub Saharan Africa Cook Stove Programme distributing the EzyStove improved cookstove to Ethiopian households using traditional biomass technologies.

### SECTION C. Implementation of CPAs

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

>> Ethiopia has a population of nearly 81 million people with average household income levels below the poverty line and a low penetration of improved stoves. The Paradigm Project saw a large demand and need for a technology that could effectively reduce GHG emissions as well as the financial and time burdens imposed by the use of inefficient stoves. The EzyStove technology implemented in this CPA can cook most local dishes and, by improving the efficiency of wood combustion and thermal energy transfer to pots, decreases the amount of wood fuel needed for household cooking tasks.

The CPA described in this monitoring report, TPP-CPA-ETH-01, distributes the EzyStove improved cook stove in Ethiopia. The CPA is implemented by EzyLife Ethiopia, a subsidiary company directly managed by The Paradigm Project, the CME. The CME works in close partnership with regional Ethiopian governments to identify Weredas through which the technology can be implemented. Sales demonstrations, including a demonstration of the benefits and use of the stove, are conducted for large groups, who may then opt to purchase a stove through their local Tabiya.

#### a) Description of the installed technology, technical processes and equipment for the CPAs

The EzyStove reduces the amount of wood needed by 37.8% and the emissions of CO<sub>2</sub> by 69.1%, compared with a traditional three-stone fire. The outer exoskeleton creates a strong, long lasting support structure for the fire chamber, while enabling any type of pot or pan to be used. The EzyStove significantly reduces harmful smoke and wood consumption and generally cooks faster than traditional technologies.



Figure 1: EzyStove Improved Wood Cookstove

The EzyStove is designed to be manufactured locally, reducing the cost to end users by as much as 40% from a comparable imported model. The stove is steel and uses a simple, robust technology requiring no moving parts. Operation is easy and the desired fuel savings is achieved through enhancing airflow, improving insulation and focusing the heat generated by biomass onto the desired cooking surface.

- b) Information on the implementation and actual operation of the CPAs, including relevant dates (e.g. construction, commissioning, start of operation)

<b>Project Activity</b>	<b>Date</b>
<i>Registration of the PoA</i>	22/07/2014
<i>Start date of crediting under CPA 9672-0001</i>	01/09/2013
<i>First date of ICS installation</i>	25/03/2015
<i>Operating period under this MR</i>	01/01/2017 – 31/12/2017

EzyLife began initial product sales in March of 2015 seeking to provide affordable efficient stoves for the majority of Ethiopians who cook meals using biomass. Prior to 2015, the CME developed a partnership to work with a 3<sup>rd</sup> party partner contacted to be a distributor of stoves in Ethiopia. However, after more than a year of intermittently selling efficient stoves and conducting activities to develop distribution, the CME and the 3<sup>rd</sup> party partner mutually elected to part ways. Consequently, the CME re-launched a directly-managed entity in 2014 to pursue the same goals. Since records of sales pre-dating the CME-managed entity being developed were incomplete, the CME elected to include only those units which it sold directly and could account for completely. Thus, no records except those originated by the CME in its work on the ground are included in this monitoring report. The time lag between the start date of crediting and the first recorded dates of ICS installation are representative of the time between starting work with the 3<sup>rd</sup> party partner and successfully launching a directly-operated business in Ethiopia. Since its relaunch, EzyLife has established a local manufacturing facility in the north of the country, working closely with government organizations to facilitate end user sales and donations of the EzyStove. In 2017, EzyLife refined and scaled an event-based sales model, demonstrating the EzyStove and explaining its benefits to large groups. This is the second year of annual monitoring and credits generated under this CPA for the second monitoring report are generated from January 1 to December 31, 2017.

The total GHG emissions for the monitoring period is 6,540. Annual energy savings per household calculated during the monitoring period is 0.0077 GWh per device, with total energy savings in the CPA during the monitoring period totalling 55.41 GWh. This is within the overall cap per CPA of 180 GWh.

## **C.2. Location of CPAs**

>> The boundary of the CPA is the geographical boundary of Ethiopia. During the monitoring period, stoves were primarily distributed in the northern region of Tigray. Stove covered under this monitoring period have been distributed in the regions of Tigray, Afar and Oromia. The following map shows the concentrated areas where the majority of ICS have been distributed:

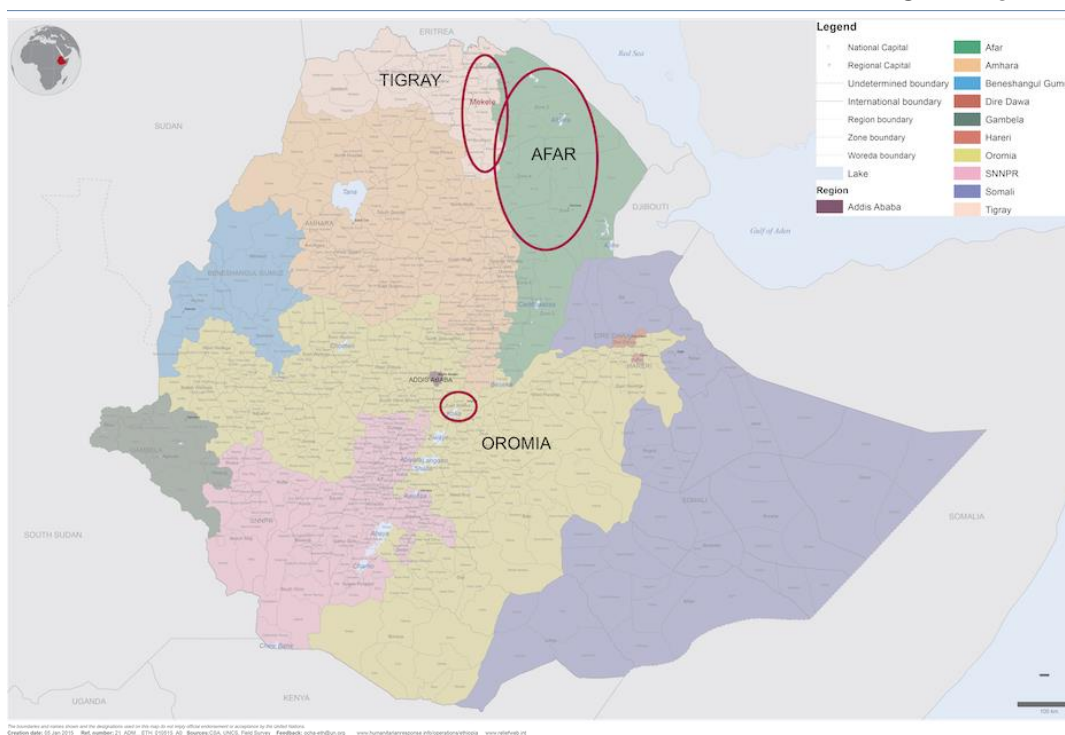


Figure 2: Administrative map of Ethiopia, highlighting area of ICS sales

**C.3. Post-registration changes to CPAs**

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

>> N/A

**C.3.2. Corrections**

>> N/A

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

>> N/A

**C.3.4. Inclusion of monitoring plan**

>> N/A

**C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools**

>> N/A

**C.3.6. Changes to project design**

>> N/A

**SECTION D. Description of monitoring system of CPAs**

>> The monitoring plan for all CPAs within the PoA are standardized following the relevant methodology and project standards and in accordance with the PoA-DD.

*Sales data collection and recording*

Each CPA operator shall keep a database that includes the following parameters which shall be designed according to the forms prescribed below:

## 1) CPA Database (Total Sales Record)

Parameter	Description
Unique ID of the CPA	Each CPA in this PoA shall have an attached unique serial number identifying it under the PoA.
Start date of the CPA	The CPA operator shall indicate the start date of the CPA in this database and provide documentary evidence of start date such as a purchase order for stoves or similar proof of start of CPA activities.
Name and Contact details of the CPA operator	The name, email address, telephone number of the CPA operator shall be provided in this database
Sales information and contact details for each sale to resellers within the CPA	The date of sale and quantity of units sold, name, contact phone and detailed location information will be recorded for each bulk sale within the CPA. These sales will consist of bulk sales to CPA level intermediaries or distributors..
Total number of ICSs deployed	Cumulative ICS distribution data
Type(s) of ICS technologies included in the CPA	A description of the ICS technologies to be distributed in the CPA. Multiple ICS can be deployed

The CPA operator shall collect information on sales to end users of cookstove products. The CPA operator trains bulk purchasers of stoves on data collection best practices and provides the reseller with a registration format to collect customer contact details, stove serial numbers and communicate the transfer of carbon rights at the point of purchase. This information is stored by the CME in a customer database according to the format below:

## 2) Detailed Customer Database

Parameter
Name of and phone number (if available) of ICS recipient
Name of and phone number of distributor/sales agent (last point of contact with the consumer)
Date of Sale of ICS
Date of Delivery of ICS
Geographical Location of the final recipient (point of use of the ICS)
Unique Serial or Batch Number of ICS
Name of ICS
New or Repeat purchase of cookstove by end user

The CPA operator is responsible for the primary data collection for both databases. Information for the first database is matched to an accounting system where bulk sales information is recorded. A data manager, who the CME has trained and provided with a data-entry template, will enter end-user data into the Detailed Customer Database as stoves are sold to end users.

Data for this monitoring period falls under a single CPA and hence there is no ambiguity as to the attribution of data to the specific CPA.



*Survey monitoring of stove use and replacement of traditional technologies*

Monitoring surveys are conducted using the Open Data Kit application. The survey is designed by the CME, who trains local enumerators in survey implementation. The CME conducts quality control checks on this data and analyses results to determine the proportion of stoves in use in the project, as well as the displacement of traditional technologies within the home.

**SECTION E. Data and parameters****E.1. Data and parameters fixed ex ante**

<b>Data/Parameter</b>	$\eta_{old}$
Unit	%
Description	Efficiency of the system being replaced
Source of data	AMS-II.G default value
Value(s) applied	0.1032
Choice of data or measurement methods and procedures	A weighted average has been used to incorporate improved cook stoves and traditional three stone fires in Ethiopia. The weighted average efficiency of the baseline stoves was derived from national data the proportion of households in the baseline scenario using traditional stoves with a default efficiency of 0.10 (established at 96.8% of the total population) and the proportion using improved stoves with a default efficiency of 0.20 (established at 3.2% of the total population), The thermal efficiency of either stove type was based of the default values in the baseline and monitoring methodology AMS-II.G
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	

<b>Data/Parameter</b>	NTG
Unit	Fraction
Description	Net to gross adjustment factor of to account for leakage
Source of data	AMS-II.G default value
Value(s) applied	0.95
Choice of data or measurement methods and procedures	AMS-II.G provides that the use of non-renewable woody biomass saved under the project activity to justify the baseline of other CDM project activities can also be a potential source of leakage and that as an alternative to leakage assessments 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	Calculation of leakage
Additional comments	

<b>Data/Parameter</b>	$f_{NRB}$
Unit	Fraction
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
Source of data	Default values from the CDM SSC_WG Information note on default fNRBs calculated using the methodology prescribed in the baseline and methodology AMS-II.G
Value(s) applied	0.88

Choice of data or measurement methods and procedures	The baseline and methodology AMS-II.G describes the methodological procedure to be followed in determination of the Non-Renewable biomass fraction which was strictly adhered to in the default values provided by the SSC-WG
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	

<b>Data/Parameter</b>	$NCV_{biomass}$
Unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	Baseline and methodology AMS-II.G
Value(s) applied	0.015
Choice of data or measurement methods and procedures	The baseline and methodology AMS-II.G provides for the NCV of biomass as per the IPCC default value provided in paragraph 11
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	

<b>Data/Parameter</b>	$EF_{projected\_fossilfuel}$
Unit	tCO <sub>2</sub> /TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data	Baseline and methodology AMS-II.G
Value(s) applied	81.6
Choice of data or measurement methods and procedures	The baseline and methodology AMS-II.G provides an emissions factor which is conservative and accounts for projected fossil fuel consumption as follows: This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. It is assumed that the mix of present and future fuels used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression over solid fuel in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices). Thus a 50% weight is assigned to coal as the alternative solid fossil fuel (96 tCO <sub>2</sub> /TJ) and a 25% weight is assigned to both liquid and gaseous fuels (71.5 tCO <sub>2</sub> /TJ for Kerosene and 63.0 tCO <sub>2</sub> /TJ for Liquefied Petroleum Gas (LPG))
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	

<b>Data/Parameter</b>	$B_{old}$
Unit	Tonnes
Description	Quantity of woody biomass used in the absence of the project activity in tonnes per device per year
Source of data	Literature Review
Value(s) applied	3.4545 tonnes
Choice of data or measurement methods and procedures	Option (a) of Paragraph 13 of the baseline and monitoring methodology AMS-II.G has been selected for calculation of the parameter $B_{old}$ . A comprehensive baseline report has been availed supporting this value
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	

## E.2. Data and parameters monitored

<b>Data/Parameter</b>	$S_y$
Unit	Number
Description	Number of distributed ICS in year y
Measured/calculated/default	Measured
Source of data	Detailed Customer Databases consisting of detailed sales records for all sales to end consumers directly, or through intermediaries or distributors
Value(s) of monitored parameter	9,316
Monitoring equipment	Sales and registration records
Measuring/reading/recording frequency	Continuously
Calculation method (if applicable)	Calculated directly from the customer database
QA/QC procedures	The CME inspects data records for consistency and a 5% sample is selected for quality control checks by phone to confirm accuracy
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	Data is compiled annually and calculated for each annual crediting period

<b>Data/Parameter</b>	$n_y$
Unit	Fraction
Description	Fraction of distributed ICS operational in year y
Measured/calculated/default	Measured
Source of data	Survey
Value(s) of monitored parameter	0.5978
Monitoring equipment	Monitoring survey done using the ODK application on an Android phone. Survey will include an interview with the user and, for in-person surveys, a physical inspection of the ICS
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Calculated fraction determined by reported survey results. Stoves reported as not in use, in disrepair, or not in the project home were counted as not in use
QA/QC procedures	Reference section B.2 for detailed sampling plan and QAQC procedures
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	The parameter is monitored annually and calculated for each annual crediting period

<b>Data/Parameter</b>	$D_y$
Unit	Number
Description	Cumulative number of days which ICSs have been operational in year y
Measured/calculated/default	Calculated
Source of data	Detailed Customer Database

Value(s) of monitored parameter	2,632,412
Monitoring equipment	N/A
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Days between the date of delivery and the end of the crediting period are counted for each ICS distributed
QA/QC procedures	The CME inspects data records for consistency and a 5% sample is selected for quality control checks by phone to confirm accuracy
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	The parameter is monitored annually and calculated for each annual crediting period

<b>Data/Parameter</b>	$SM_y$
Unit	Fraction
Description	Fraction of meals in a week cooked on the project stove in year y
Measured/calculated/default	Measured
Source of data	Survey
Value(s) of monitored parameter	0.771
Monitoring equipment	Monitoring survey done using the ODK application on an Android phone
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	The survey asks for total meals cooked during the week and asks which stove(s) are used for cooking at each meal time in order to calculate the fraction of meals cooked on the ICS vs baseline stoves (if any). Each full traditional meal cooked (breakfast, lunch, dinner) is counted as one meal for 7 days of the week. Tea or coffee is counted as half a meal. Additional questions are asked to determine the number of meals not cooked every day, but regularly in the week, such as injera, which is common in Ethiopia. As all meals are factored into the monitoring, $SM_y$ subsumes all possible uses of biomass in the project scenario and calculates the percentage of ICS meals accordingly
QA/QC procedures	Reference section E.3 for detailed sampling plan and QAQC procedures
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	The parameter is monitored annually and calculated for each annual crediting period

<b>Data/Parameter</b>	$\eta_{new,y}$
Unit	Fraction
Description	Efficiency of the device being deployed as part of the project activity in year y
Measured/calculated/default	Calculated
Source of data	Water Boiling Tests
Value(s) of monitored parameter	0.222
Monitoring equipment	Extech MO210 moisture meter with self-calibration function. A digital flat scale and thermometers were calibrated prior to testing
Measuring/reading/recording frequency	Annually

Calculation method (if applicable)	Efficiency was determined for two test phases (cold start and hot start) and then averaged for each stove
QA/QC procedures	Reference section E.3 for detailed sampling plan and QA/QC procedures
Purpose of data/parameter	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	Households selected for WBTs relinquish their aging stove and receive a new replacement stove. These new stoves are recorded as new replacement stoves in the Detailed Customer Database and are accounted for accordingly. The parameter is monitored annually and calculated for each annual crediting period

### E.3. Implementation of sampling plan

>> The following sampling plan has been applied to all cookstoves within the CPA:

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

The monitoring report covers a single CPA, which was monitored according to the sampling plan outlined in the generic CPA.

- b) Description of implemented single sampling design

The objective of the sampling plan is to determine the following parameters on an annual basis with a 95/10 confidence/precision:

$n_y$	Fraction of ICS still operational
$SM_y$	Fraction of meals cooked per week on the project stove
$\eta_{new,y}$	Efficiency of the ICS

#### *Target population*

The target population was all households who purchased the ICS and were recorded in the CME's monitoring database.

#### *Sampling method*

A stratified random sampling plan was used. The PoA-DD defines a strata for monitoring as the geographical boundaries of a country and unique stove type. The monitoring period covers a single CPA within the geographical boundaries of Ethiopia with a single technology implemented. Thus one strata is used to cover the CPA under this monitoring period. Within this strata, a simple random sample approach was used.

#### *Sample size*

A sample size calculation was undertaken using the calculations outlined in the generic CPA-DD and in accordance with the *Standard for sampling and surveys for CDM project activities and programme of activities*. A sample size was calculated to meet the required 95/10 confidence/precision using parameters for variance and response rates calculated from the prior year's monitoring data for the same CPA. Additional households were selected to account for potential non-response and outliers. For parameter  $n_y$ , a minimum sample of 106 households was calculated. For parameter  $SM_y$ , a minimum sample of 107 households was calculated. For parameter  $\eta_{new,y}$ , a minimum sample of 11 households was calculated. To ensure that the project could reach the minimum required households and achieve precision requirements, a sample of 223 households was set for parameters  $n_y$  and  $SM_y$  and a sample of 27 households was set for parameter  $\eta_{new,y}$ .

#### *Sample frame*

Samples were selected using a random number generator in Excel. Following the sampling calculations, the first 223 households selected were surveyed to determine parameters  $n_y$  and  $SM_y$ . The first 27 households randomly selected were also chosen for WBTs to determine parameter  $\eta_{new,y}$ .

c) Collected data (electronic spreadsheets are included for reference)

All surveyed parameters were collected by trained enumerators using the Open Data Kit (ODK) application over an Android phone. The enumerators visited households to conduct surveys and inspect the physical condition of the project stoves. If a household was too far to visit or was unavailable during the time of monitoring, the enumerator had the option to conduct a survey by phone. Of the 223 households sampled, 182 were monitored, of which 3 were removed as outliers. All other households were not able to be reached. All stoves in use were monitored for the parameter  $SM_y$ , totalling 107 households. Data collected from surveys is compiled into an excel database and has been shared with the DoE. Copies of all electronic surveys will remain available through the ODK online platform.

Water Boiling Tests were conducted at a designated laboratory using a trained tester. Stoves randomly selected for WBTs were collected during household survey visits and sent to the laboratory for testing. Of the 27 households sampled, 6 could not be reached or were too far for monitoring, 1 refused to be monitored and 2 were not tested because the stove was not in use (usage surveys were conducted in these households), for a total sample of 18 households with completed WBTs. One WBT was removed as an outlier because the boiling point recorded was more than 10 degrees below the local boiling point. Data was recorded on paper during testing and transferred to excel.

Quality control procedures were conducted using best practices. Households surveyed were randomly selected for a phone check on the accuracy of data. WBTs were randomly selected for a review by a third party, Mekele University in Addis Ababa, to ensure accuracy of data.

d) Analysis of the collected data

The data is first cleaned, checked for quality and accuracy, and any outliers are removed. Outliers are determined both by numerical analysis and user response. Specifically, respondents reporting use of the ICS for commercial cooking in such a mode that cannot be separated cleanly from household meal data are removed so as not to improperly skew the data. Additionally, the Median Absolute Deviation for the total number of meals cooked per week is calculated and any survey results exceeding more than 3x the MAD away from the median are removed. 3 outliers for parameters  $n_y$  and  $SM_y$  and one outlier for parameter  $\eta_{new,y}$  were identified and removed in preparing the monitoring report. Data is analysed in Excel to determine proportions and mean values. These calculations are then factored into the emissions reduction calculations.

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

The final data set is analysed for precision for all three parameters. The following precision/confidence results were achieved:

<b>Parameter</b>	<b>Sample Achieved</b>	<b>Value</b>	<b>Confidence</b>	<b>Precision</b>
$n_y$	179	59.8%	95%	7.20%
$SM_y$	107	77.1%	95%	2.85%
$\eta_{new,y}$	17	22.2%	95%	1.77%

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

Samples were randomly selected using a random number generator on data organized by date of distribution. The sample frame was then compared to the overall target population to ensure representativeness.

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

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

>> Emission reductions are calculated as follows, according to the AMS.II.G, version 5 methodology and the calculations outlined in the SSC-PoA-DD and the generic CPA-DD:

$$ER_y = B_{y,savings} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel} \times N_{y,i}$$

Where:

ER <sub>y</sub>	Emission reductions during the year <i>y</i> in tCO <sub>2</sub> e
B <sub>y,savings</sub>	Quantity of woody biomass that is saved in tonnes
f <sub>NRB,y</sub>	Fraction of woody biomass saved by the project activity in year <i>y</i> that can be established as non-renewable biomass
NCV <sub>biomass</sub>	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
EF <sub>projected_fossilfuel</sub>	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO <sub>2</sub> /TJ
N <sub>y,i</sub>	Number of project devices of type <i>i</i> operating in year <i>y</i> ,

The project uses Option 2 Equation 3 of the baseline and monitoring methodology AMS-II.G to calculate the parameter B<sub>y,savings</sub> as shown below:

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

Where:

B <sub>old</sub>	Quantity of woody biomass used in the absence of the project activity in tonnes
η <sub>old</sub>	A weighted average 0.1032 has been used as a weighted average of the traditional three stone fires and the improved cook stoves in Ethiopia. .
η <sub>new</sub>	Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol. Use weighted average values if more than one type of system is being introduced by the project activity.

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

>> Not applicable, as the relevant methodology, AMS.II.G version 5, provides for the calculation of emission reductions and does not require the calculation of project emissions separately from baseline emissions. Emission reduction calculations are described in section H.1 above.

### F.3. Calculation of leakage emissions

>> Per the monitoring plan outlined in the generic CPA-DD, the project has adopted a net gross adjustment factor of 95% to account for leakage within the project.

**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
9672-0001	0	6,540	N/A (included in net removals via .95 NTG calculation)	0	6,540	6,540
<b>Total</b>	0	6,540		0	6,540	6,540

**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 <sub>2</sub> e)	Amount estimated ex ante (t CO <sub>2</sub> e)
9672-0001	6,540	29,001
....		
<b>Total</b>	6,540	29,001

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

>> Because the project was delayed in its early work, stove sales did not really begin in earnest until early 2015, and did not begin to increase in volume significantly until mid-to-late 2016. Due to several challenges in distribution and financing for clean cookstoves, sales have continued to be inconsistent and have failed to achieve significant volumes during the monitoring period. Therefore the reduced actual values achieved are a result of slower sales of ICS than expected.