

DISTRIBUTION OF ONIL STOVES – MEXICO VCS MONITORING PERIOD

Document prepared by Javier Lascurain, Fast-Track Carbon

Project Title	Distribution of ONIL Stoves – Mexico
Version	2.0
Report ID	
Date of Issue	02-December-2015
Project ID	1216
Monitoring Period	01-January-2014 to 28-October-2015
Prepared By	Javier Lascurain, Fast-Track Carbon
Contact	javier@fasttrackcarbon.com www.fasttrackcarbon.com 718 7 th Street NW, Floor 2 Washington, DC 20001

Table of Contents

1. PROJECT DETAILS	3
1.1 Summary Description of the Implementation Status of the Project	3
1.2 Sectoral Scope and Project Type	3
1.3 Project Proponent	3
1.4 Other Entities Involved in the Project	4
1.5 Project Start Date	4
1.6 Project Crediting Period	4
1.7 Project Location	5
1.8 Title and Reference of Methodology	5
1.9 Other Programs	6
2. IMPLEMENTATION STATUS	6
2.1 Implementation Status of the Project Activity	6
2.1.1 Methodology Deviations	7
2.1.2 Project Description Deviations	7
2.2 Grouped Project	7
3. DATA AND PARAMETERS	7
3.1 Data and Parameters Available at Validation	7
3.2 Data and Parameters Monitored	10
3.3 Monitoring Plan	14
4. QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	22
4.1 Baseline Emissions	22
4.2 Project Emissions	23
4.3 Leakage	23
4.4 Net GHG Emission Reductions and Removals	23
APPENDIX 1: COMPETENCIES OF MONITORING PERSONNEL	26

PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The ONIL Stoves – Mexico, San Felipe Usila 1 small-scale CPA (SSC-CPA) involves the distribution and installation of ONIL Stoves for use by households in Mexico. This CPA is the first included under the “Distribution of ONIL Stoves – Mexico” PoA and includes 22,668 improved cook stoves benefiting families throughout the country. Before the adoption of the ONIL Stove, households in Mexico used inefficient, conventional open fires.

The ONIL Stove is a fuel-efficient stove that reduces the amount of firewood required by households by up to 58%, compared to the baseline, and results in lower emissions based on its construction. A single ONIL Stove saves up to 2.893 tons of CO₂e per year.

HELPS International A.C. is the implementer of this project. HELPS International A.C. manufactures the ONIL stoves and distributes them to communities throughout Mexico.

Summary of Implementation status of the ONIL Stoves: This project was registered under the CDM as the “ONIL Stoves —Mexico, San Felipe Usila 1” which is first CPA included under the “PoA: Distribution of ONIL Stoves—Mexico” (CDM PoA 8521). The first ONIL stove to participate in the PoA was installed on 30-December-2009. To date, the project has installed 22,668 stoves (3 stoves in 2009,¹ 4,361 stoves in 2010, 8,524 in 2011, 3,883 in 2013, and 5,900 in 2014) located across Mexico. These stoves are included in the monitoring period covered here.

Relevant Implementation Dates

Date of first ONIL Stove installation in this project: 30-December-2009

Date of last ONIL Stove installation in this project: 26-December-2014

Total GHG emission reductions in this monitoring period: 22,094

1.2 Sectoral Scope and Project Type

The project is in VCS's sectoral scope 3 Energy demand. This is not a grouped project.

1.3 Project Proponent

Organization name	HELPS International A.C.
Contact person	Rodolfo Díaz
Title	Director
Address	Melchor Ocampo 1011, Centro. C.P. 68000 Oaxaca de Juárez, Oaxaca, Mexico

¹ These 3 stoves installed in 2009 could not be monitored because the area where these were installed presents security problems and are therefore inaccessible for monitoring. Evidence of the security problems was provided to the Validation and Verification Body.

Telephone	+52 155 22 424 994
Email	rodolfo.diazj@gmail.com

Organization name	C-Quest Capital LLC
Contact person	Isabel Alegre
Title	Managing Director
Address	1015 18 th Street NW Suite 730 Washington, DC 20036 United States of America
Telephone	+1 (202) 416-2400
Email	ialegre@cquestcapital.com

1.4 Other Entities Involved in the Project

Organization name	
Role in the project	
Contact person	
Title	
Address	
Telephone	
Email	

1.5 Project Start Date

30-December-2009, which is the date of the first ONIL stove installation under this project.²

1.6 Project Crediting Period

01-January-2011 to 31-December-2020; ten years; renewable twice, but not extending beyond December 31, 2033 when the maximum CDM crediting period expires.³

² Note: stoves installed in 2009 could not be accessed in the previous monitoring period due to social instability in the area of installation leading to unsafe conditions at the time of monitoring and hence were removed from the CPA. Evidence of unsafe conditions was provided to the Verification Body at the time of the previous monitoring.

³ This is in accordance with the VCS standard version 3.5 paragraph 3.8.1 that states "For non-AFOLU projects and ALM projects focusing exclusively on reducing N₂O, CH₄ and/or fossil-derived CO₂ emissions, the project crediting period shall be a maximum of ten years which may be renewed at most twice." Paragraph 3.8.3 of the standard mentions "Projects registered under other GHG programs are not eligible for VCU issuance beyond the end of the

1.7 Project Location

The boundary of the PoA is determined by the sum of the locations of the individual households within which the ICSs in this PoA are installed, but all limited to Mexico.⁴

The geographic coordinates for Mexico are the following: Northernmost and Westernmost point: 32.500000 and -117.033333 (Tijuana); Southernmost point: 14.550000 and -92.166667 (desembocadura del Rio Suchiate); Easternmost point: 21.200000 and -86.716667 (Isla Mujeres).



1.8 Title and Reference of Methodology

- CDM Methodology: AMS-II.G. version 3 - Energy efficiency measures in thermal applications of non-renewable biomass.
- Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities version 3 (EB 69 Annex 4)

total project crediting period under those programs. For example, a CDM project with a seven year twice renewable project crediting period is not eligible for VCU issuance beyond the end of those 21 years".

⁴ Geographic coordinates (where available) of stoves have been provided to the Validation/Verification Body (VVB).

- Guidelines for Sampling Surveys in Project Activities and Programme of Activities version 2 (EB 65 Annex 5)

1.9 Other Programs

The ONIL Stoves – Mexico, San Felipe Usila 1 is registered as a Small-Scale Component Project Activity under the Clean Development Mechanism (CDM) and under the Programme of Activities “Distribution of ONIL Stoves – Mexico” (Ref. PoA 8521).⁵ Evidence has been provided to the Validation and Verification Body that the emissions reductions arising from this program are not double counted under the CDM and VCS.

The project has not been submitted for validation/certification under any other GHG or environmentally related program or mechanism, so it is not eligible to create another form of GHG-related environmental credit other than CERs and VCU.

2. IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The project installed⁶ 3 stoves in 2009, 4,361 stoves in 2010, 8,524 in 2011, 3,883 in 2013, and 5,900 in 2014 for a total of 22,668 stoves making part of this project.⁷ The monitoring period (01-January-2014 to 28-October-2015) covered all these stoves. A monthly stove installation schedule is presented below for the three distribution years:

Month	2009	2010	2011	2013	2014
Jan	0	0	157	1,086	1
Feb	0	0	125	63	1240
Mar	0	0	58	1	943
Apr	0	5	228	446	643
May	0	81	234	96	1152
Jun	0	0	198	0	673
Jul	0	0	923	105	64
Aug	0	1	309	180	218
Sep	0	157	566	194	121
Oct	0	527	637	1,532	184
Nov	0	734	1,286	160	249
Dec	3	2,856	3,803	20	412
Total	3	4,361	8,524	3,883	5,900

⁵CDM documentation can be accessed through: https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/2BH1T0SFERD67JCZXAIWMKLO8PN5UQ/view (PoA) and https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/3NLVJQM5FYWDA604R2GCPS8ZOEIB9U/view (San Felipe Usila 1 project).

⁶ Note: the monitoring report for the period 01-January 2011 to 31-December 2012 included 3 stoves installed in 2009, but the zone where these stoves are installed could not be accessed due to security concerns and the stoves were removed from the project database.

⁷ The stoves from 2009 do not form part of this count as they were removed from the database.

Only one stove model (ONIL Plancha Stove) was distributed in the CPA. Before the monitoring period, HELPS International A.C. created an online platform to input and access stove data and user information, as user registration became available.

CDM methodology AMS-II.G version 03 allows the use of a correction factor of 0.95 applied to the overall emissions reductions to account for any possible leakage. This factor has been applied to the emissions reductions presented in this report.

2.1.1 Methodology Deviations

This project did not apply any methodology deviations.

2.1.2 Project Description Deviations

The monitoring of this project presents 3 deviations with respect to the Project Description:

1. Number of stoves included in the CPA. Originally, the total number of stoves included in this project was capped at 13,859. Because of the lower-than-expected stove efficiency and adoption rate, the project would not be economically sustainable and its continuity jeopardized if capped at 13,859 stoves.⁸ Therefore, a deviation is requested to increase the number of stoves to 22,668. This deviation results in annual energy savings of **96.08** GWh/year, which is still lower than the 180 GWh/year that would qualify the project as small scale as per the CDM thresholds for type II projects.⁹
2. Crediting period. The original crediting period for this project was from 01-January-2010 to 31-December-2012. Project participants request a deviation to extend this crediting period to 31-December-2020 (ten years, renewable twice, but not extending beyond the CDM total crediting period for this CPA).¹⁰ Project participants have provided evidence that carbon credits claimed under VCS will not be double counted under the CDM and vice-versa. An updated project description with this deviation is submitted along with the verification and monitoring reports.

2.2 Grouped Project

Not applicable. This is not a grouped project.

3. DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	B _{old}
------------------	------------------

⁸ The original estimate is based on the assumption that 100% of the stoves would be operational and the efficiency of the ONIL stoves, as tested in the field would be 24%. However, the efficiency, the fraction of operational stoves and the thermal efficiency of these are lower than the values used to estimate the value of 13,859 stoves.

⁹ See CDM EB 61 Annex 21 paragraph 3

¹⁰ As per paragraph 3.8.3 of the VCS Standard version 3.5.

Data unit	Tonnes/year
Description	Quantity of Biomass used in the absence of the project activity (per appliance)
Source of data	Baseline surveys, ex-ante
Value applied:	5.34
Justification of choice of data or description of measurement methods and procedures applied	The baseline survey assessed the average biomass usage per household per annum amongst users of traditional 3-stone fires or traditional pot support, according to interviews in Mexico. Since no countrywide baseline existed, HELPS International A.C. implemented the baseline interview in November of 2009. The sample conforms to the Standard for Sampling and Surveys in CDM Project Activities and Programmes of Activities (EB 69 Annex 4).
Purpose of the data	Calculation of baseline and project emissions
Comments	See CDM PoA-DD for more details on the baseline measurement

Data / Parameter	L
Data unit	Fraction
Description	Net to gross adjustment factor to account for leakage
Source of data	Paragraph 13 (a) of the AMS II.G methodology, version 3
Value applied:	0.95
Justification of choice of data or description of measurement methods and procedures applied	A net to gross adjustment factor (0.95 default) is applied in order to adjust B_{old} to account for leakages as per paragraph 13 (a) of the AMS II.G, version 3 methodology.
Purpose of the data	Calculation of leakage
Comments	

Data / Parameter	η_{old}
Data unit	Fraction
Description	Efficiency of the system being replaced
Source of data	Paragraph 6, Option 2 (b) of the AMS II.G methodology, version 3, default
Value applied:	0.10 (default for conventional open fires, as stated in the methodology)
Justification of choice of data or description of measurement methods and procedures applied	Provided as default value since replaced system is conventional open fire.

Purpose of the data	Calculation of baseline and project emissions
Comments	

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of non-renewable biomass saved by the project activity
Source of data	FAO, ex-ante, calculated
Value applied:	0.87
Justification of choice of data or description of measurement methods and procedures applied	For biomass savings to be calculated, the portion of biomass used that is renewable must be accounted for based on the methodology. The FAO 2010 report¹¹ gives a reforested area value of 247,600 ha/yr (p. 38), average forest densities of 60.25 m³/ha for conifers and 38.82 m³/yr for hardwoods. Reforested areas in Mexico are 0.2527 conifer and 0.7473 hardwoods, which give a total reforested volume of 10,952,872.76 m³. Value of 0.6 tonnes/m³ (average density of oak of which baseline survey identified as most commonly used fuel wood) is used to translate DRB to mass. Since reforested trees have a survival rate of 57.6% DRB is adjusted accordingly to exclude the trees which did not survive.¹² The B_{old} number (5.34 tonnes of fuel wood per household per year) obtained from the baseline survey is multiplied by the estimated number of homes in Mexico (5.44 million) that still use open fires to obtain an estimate of the total amount of fuel wood used in Mexico ($B_{old,mexico}$). NRB is $B_{old,Mexico}$ (excluding fuel wood used in baseline stoves) minus the DRB component (excluding trees that did not survive). Then, $f_{NRB} = NRB / (NRB + DRB)$
Purpose of the data	Calculation of baseline and project emissions
Comments	

Data / Parameter	$NCV_{biomass}$
Data unit	TJ/t
Description	Net calorific value of non-renewable biomass that is substituted

¹¹ FAO, *Evaluación de los Recursos Forestales Mundiales, Informe Nacional, 2010, Mexico*, World Forest Resources Assessment, National Report, 2010, Mexico. www.fao.org/forestry/fra/67090/en/mex/; Data on reforested hectares on Page 38, data on average tree density and percentage of each on Page 43

¹² *Reforestación, Evaluación Externa Ejercicio Fiscal 2007*, CONAFOR, Colegio de Postgraduados and SEMARNAT, http://www.era-mx.org/biblio/Evaluacion_Colpos_Reforestacion_2007.pdf

Source of data	IPCC default value for fuel wood, <i>ex-ante</i> , AMS II.G methodology, version 3.
Value applied:	0.015 TJ/tonne
Justification of choice of data or description of measurement methods and procedures applied	Default value that is provided in AMS II.G, version 3
Purpose of the data	Calculation of baseline and project emissions
Comments	

Data / Parameter	EF _{projected_fossilfuel}
Data unit	tCO ₂ /TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data	IPCC default value for LPG, <i>ex-ante</i> , AMS II.G methodology, version 3.
Value applied:	81.6 t CO ₂ /TJ
Justification of choice of data or description of measurement methods and procedures applied	Default value that is provided in AMS II.G, version 3
Purpose of the data	Calculation of baseline and project emissions
Comments	

3.2 Data and Parameters Monitored

Data / Parameter	$n_{y,i}$
Data unit	Quantity
Description	Number of ONIL Stoves in operation during the monitoring period as determined by the monitoring survey. This includes total number of stoves distributed/installed in the entire CPA.
Source of data	ONIL Stove registration data and data from monitoring surveys
Description of measurement methods and procedures to be applied	The percentage of stoves found to be still in operation based on the sampling plan in this monitoring period is applied to the total number of stoves distributed/installed in each CPA included in the sample (according to the ICS registration records in the monitoring database and the applicable sample frame). The proportion of

	sampled ICS found in operation in this monitoring period was applied to the total number of stoves for each CPA when calculating emission reductions. Because the confidence/precision requirements set out in EB 69 Annex 4 and the PoA-DD Section E.7.2 were not satisfied, then CPA Implementers followed the procedures outlined in the Monitoring Plan (E.7.2 of the PoA-DD) to ensure appropriate conservative values as defined by AMS II.G Version 3 were used. Fast-Track Carbon guided a local team through the survey implementation.
Frequency of monitoring/recording	Data from Registration Cards was uploaded to database continuously to come up with the overall number of stoves installed under the CPA. Monitoring surveys captured the fraction of operational ONIL stoves.
Value monitored:	$9,520 = 0.4200$ multiplied by 22,668 stoves eligible in the database. Note that the fraction of stoves found in operation was 48.80%; however, the lower bound of the 95% confidence interval is applied as a conservative measure since the 5% precision was not reached (the sample attained an 13.95% precision).
Monitoring equipment	Monitoring surveys and registration card records loaded into CPA database
QA/QC procedures to be applied	Staff was trained to obtain unbiased and reliable survey data. Monitoring database was checked for errors. There were four cases in which the stoves were not considered in use despite users affirming using stoves: 1. When surveyors discovered, based on visual inspections or their observations that a stove was not in use. 2. When users had another type of improved cookstove along with the ONIL stove. The measure was taken to prevent double counting with other programs and to accurately estimate emissions reductions (as the presence of another improved cookstove may affect the baseline). 3. In cases where there was no prior use of three stone fires. In these cases, the firewood baseline would not be applicable. 4. When stoves were modified to operate as three stone fires (e.g. when insulating material and combustion chamber were removed). As QC, the Fast-Track Carbon under contract with the CME performed internal crosschecks on the project database to detect errors or duplicates.
Purpose of the data	Calculation of baseline and project emissions
Calculation method	The lower bound of the proportion of stoves still in operation (0.4200) multiplied by total size of the CPA ($22,668$) = $9,520$ stoves in operation during monitoring survey
Comments	Stoves that that were used along other types of improved

	cookstoves, or where the baseline was not applicable (because households were not using three-stone fires prior to the ONIL stove installation or because they were already using another type of improved cookstove) were considered as non-operational and discounted from the fraction of stoves that remain in operation. The removal of these stoves resulted in more conservative emissions reductions estimates.
--	--

Data / Parameter	SS _y
Data unit	Fraction
Description	The fraction of ongoing baseline stove use within the population of in-use ONIL Stoves during a monitoring period.
Source of data	ONIL Stove registration data and data from monitoring surveys.
Description of measurement methods and procedures to be applied	A survey asked for usage of baseline stoves as per the monitoring plan outlined in Section E.7.2 of the PoA-DD. SS _y was calculated in each monitoring period as follows: the number of sampled households with operational ICS that also continue to use a baseline stove divided by the total number of operational ICS in the sample. This parameter was used to calculate the ex-post baseline adjustment factor in each monitoring period, as outlined in section E.6.2 of the PoA-DD.
Frequency of monitoring/recording	Once per monitoring period
Value monitored:	66.93% [upper bound (most conservative) of the 95% confidence interval where the precision reached at that level was 9.24%]
Monitoring equipment	Surveys
QA/QC procedures to be applied	Data for this parameter was collected using the same survey for the fraction of n _{y,j} (appliances in operation) conducted by trained project staff members. Fast-Track Carbon undertook internal crosschecks as QC.
Purpose of the data	Calculation of baseline and project emissions
Calculation method	The number of households with operational ONIL stoves and continuing to use baseline stoves divided by the total number of households with operational ONIL Stoves.
Comments	The percentage of household that also contain a baseline stove (0.6693) is then corrected by dividing it by 0.571 (which is the percentage of stoves in the SS _y baseline study) and multiplied by the amount of fuel wood used by households with operational ONIL and baseline stoves to come up with an adjusted baseline wood consumption value.

Data / Parameter	$\eta_{\text{new},i}$
Data unit	Fraction
Description	Efficiency of the ICS
Source of data	Efficiency tests conducted in monitoring period
Description of measurement methods and procedures to be applied	The Water Boiling Test (WBT) protocol used was the WBT version 4.2.2 published by the Global Alliance for Clean Cookstoves. The WBTs were conducted by trained staff from the Grupo Interdisciplinario de Tecnologia Rural Apropiada, A.C. (GIRA), a third party to the project. Stoves were tested at the place of installation (i.e. in stove user households) using firewood available in the same households. Each sampled stove was tested once for the cold start phase and once for hot start phase. GIRA staff ensured the stoves were at room temperature before applying cold start tests. Each test used two aluminium pots with 2.5 litres of water in each. Testers supplied clean water to the households where tests were conducted. Pots were put in direct contact with fire by removing the metal rings around the stove burners. Boiling point temperatures used in calculations were adjusted based on altitude that was taken with GPS instruments. On each stove, GIRA performed one cold start and one hot start. The calorific value of the different species of wood was taken from the literature, where available. When not available in the literature, a broader distinction was made between softwoods and hardwoods and average values of these types of woods were applied accordingly to the species of wood for which data was unavailable.
Frequency of monitoring/recording	Water Boiling Tests were implemented over stove samples of 2010, 2011, 2013, and 2014 vintages (i.e. installed during 2010, 2011, 2013, and 2014) during monitoring period. Tests were executed between 01-October-2015 and 23-October-2015.
Value monitored:	0.1373 (ICS distributed in 2010). This is the lower bound of the confidence interval since the 5% precision was not attained at a 95% confidence level. 0.1231 (ICS distributed in 2011) This is also the lower bound of the confidence interval since the 5% precision was not attained at a 95% confidence level. 0.1589 (ICS distributed in 2013) This is also the lower bound of the confidence interval since the 5% precision was not attained at a 95% confidence level. 0.1631 (ICS distributed in 2014) This is also the lower bound of the confidence interval since the 5% precision was not attained at a 95% confidence level.
Monitoring equipment	- Digital scales - Firewood moisture meters - Digital thermometers - Thermocouples

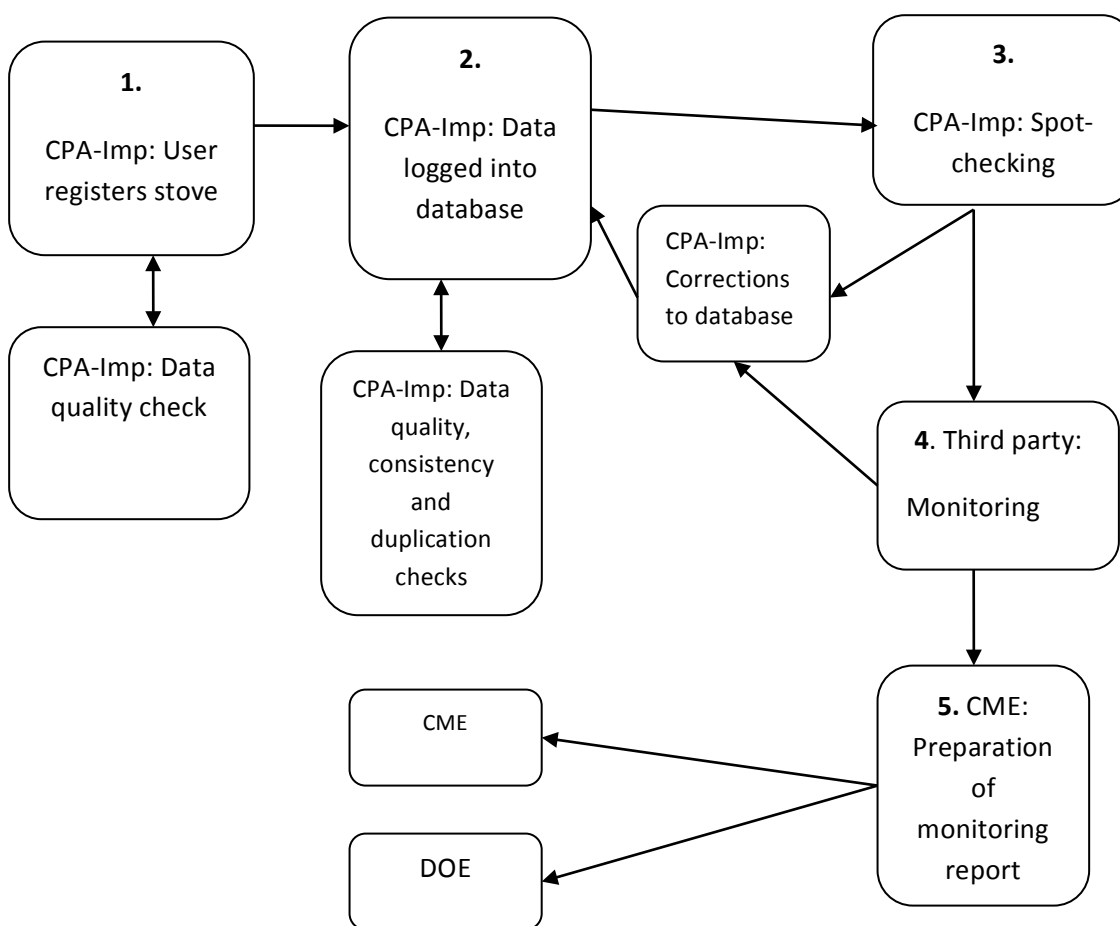
QA/QC procedures to be applied	WBT version 4.2.2 A check was performed for outliers, but none were found (defined as those thermal efficiency values 3 standard deviations above or below the vintage sample mean, as per the CDM PoA-DD section E.7.2).
Purpose of the data	Calculation of project emissions
Calculation method	WBT version 4.2.2 calculation methods.
Comments	

Data / Parameter	$t_{y,j}$
Data unit	Fraction
Description	Fraction of project's monitoring period the stove is in operation (weeks in operation/total weeks in monitoring period)
Source of data	ONIL Stove registration data in monitoring database and length of monitoring period
Description of measurement methods and procedures to be applied	Calculated from database records
Frequency of monitoring/recording	Continuous monitoring
Value monitored:	0.933 [average]
Monitoring equipment	---
QA/QC procedures to be applied	Cross checks and spot checks in the database to ensure installation/registration dates are correctly captured
Purpose of the data	Calculation of baseline and project emissions
Calculation method	Days in operation during monitoring period divided by total number of days in monitoring period. This calculation is applied to every ONIL stove in the database.
Comments	

3.3 Monitoring Plan

The project's monitoring system follows the monitoring plan described in section E.7.2 of the PoA.

Organizational structure, responsibilities and competencies: To obtain the monitoring variables, the CPA implementer follows the steps, organizational structure and responsibilities in the flow chart below. Appendix 1 contains description of monitoring personnel competencies.



The CME, through Fast-Track Carbon, coordinated, managed and assisted HELPS International A.C. and monitoring third parties with each element of the monitoring plan. Details of the monitoring steps on the flowchart are the following:

1. **HELPS International A.C.: User registered stove.** HELPS International A.C. field personnel collected the information in the Registration Card from the users. Information was collected via a Registration Card filled by HELPS International A.C. staff and partner organizations. HELPS International A.C. staff double-checked the accuracy of the information and requested clarifications if needed.
2. **HELPS International A.C.: Data logged into database.** HELPS International A.C.'s trained staff inputted the information from the Registration Card into the database. HELPS International A.C. and CQC/Fast-Track Carbon checked the database records and removed duplicates (this included completing the serial number, checking for name duplicates, etc...).

3. **HELPS International A.C.: Spot-checks (ongoing).**¹³ HELPS International A.C. visited locations in the field and reported updates to office either via telephone or forms. HELPS International A.C. personnel corrected the database and clearly marked stoves that were not installed, were given away, the end user died or left town, or had any other issues that made the stove no longer eligible to participate in the CPA. These stoves were excluded from the emission reduction calculations.
4. **Third Parties: Monitoring.** Third Parties followed the sampling plan outlined in the PoA-DD (Section E.7.2) and reported in section D.2 below. Data was collected in the field from 01-October-2015 to 28-October-2015.
5. **CME Preparation of monitoring report.** CQC through Fast-Track Carbon prepared the final monitoring report and retained copies of the document.

Data measuring, recording Method and Implementation of Sampling Approaches

Steps 1, 2 and 3 captured end user information and populated the database, as well as provided database quality control.

Step 4 involves creating sampling surveys to capture data on continuous use of stove ($n_{y,j}$) and use of baseline systems along with ICS (SS_y) as well as stove thermal efficiency ($\eta_{new,i}$) as described in the table below.

Parameter	Description of Parameter	Sampling approach (outcome in brackets)
$n_{y,j}$	Proportion of ONIL Stoves still in operation	Visual inspection of the premises to see if ONIL stove is operational and in use. Interview with end user if required to verify that ONIL stove is still in use [Yes/No]
SS_y	Percentage of continued baseline stove use among ONIL stove households in the database	Interview with end user and visual inspection to determine if a baseline (replaced) stove is still being used in addition to ONIL stove [Yes/No]
$\eta_{new,i}$	Thermal Efficiency of operational ONIL Stoves	ONIL Stoves were tested using WBTs [ONIL stove thermal efficiency]

Sampling captured information on monitoring variables with required confidence/precision¹⁴ and used multi-stage sampling (as per of EB 69 Annex 5 Section E). The method involved, in a first stage, grouping ONIL stoves by implementer and model and randomly selecting villages to sample. In a second stage, stoves within the selected municipalities were also randomly selected. The CME sampled a total of 23 stoves per locality, assuming a response rate of 87% to come up with 20 effective stoves per locality. Since all stoves were of the same model and managed by the same CPA Implementer, no further stratification was needed to capture parameter $n_{y,i}$ and SS_y data. Stoves were divided into three Primary Sampling Units for $\eta_{new,i}$ (stoves managed by same CPA Implementer, of the same model and vintage)

¹³ PPs presented the DOE with evidences that spot checks were performed independently from monitoring during monitoring period.

¹⁴ According to paragraph 22 of Methodology AMS-II.G version 03, 95/10 confidence/precision for annual and 95/5 for biennial sampling across CPAs. In case a single CPA is sampled, 90/10 confidence/precision for annual and 95/5 confidence/precision shall be required for biennial sampling.

given that multiple stove vintages were present. Each stove vintage was sampled separately using the multi-stage sampling method described below.

Step 5 involved monitoring analyses and accuracy and precision checks. The CPA implementer and CME scrutinized the monitoring data to confirm accuracy of results, analyzed the data, and estimated the resulting emissions reductions outlined in this monitoring report.

The following parameters were obtained through sampling:

1. $n_{y,i}$: proportion of stoves in operation
2. SS_y : fraction of households that continue to use baseline systems (3-stone fires) along with ONIL stoves
3. $\eta_{new,i}$: thermal efficiency of ONIL Stoves

Multi-stage sampling was used for all monitoring parameters in accordance with the Sampling Plan of section E.7.2 of the PoA-DD. The objective was to obtain reliable and unbiased estimates of the monitoring parameters. Reliability levels were set at 95% confidence and 5% precision as per AMS II.G version 3, paragraph 22 for biennial sampling.

A single homogeneous population (Primary Sampling Unit, as per PoA-DD) was considered for $n_{y,i}$ and SS_y (proportion parameters) since the CPA Implementer and stove model (HELPS International A.C. and ONIL Stove respectively) were the same throughout the CPA. Four sampling populations (Primary Sampling Units) were considered for parameter $\eta_{new,i}$: stoves from the 2010 vintage, stoves from the 2011 vintage, stoves from the 2013 vintage, and stoves from the 2014 vintage. No other vintages were included in the CPA since these four populations comprise the entire CPA.

The multi-stage sampling approach considered two stages. To sample parameter $n_{y,i}$ and SS_y (both parameters were captured in the same survey), a third party¹⁵ randomly selected 64 villages from the entire population of 873 villages in the CPA database.¹⁶ On a second stage, the CME randomly selected 23 stoves from each locality. Where the village had less than 23 stoves, the CME selected the closest stoves to that locality using GPS coordinates.¹⁷

The procedure to sample parameter $\eta_{new,i}$ was similar. In this case, the procedure described here was applied to each of the stove vintages independently. In a first stage, a third party selected 3 villages from the population of villages in each stove vintage (164 villages for the 2010 vintage; 298 villages for the 2011 vintage; 130 villages for the 2013 vintage; and 311 villages from the 2014 vintage). On a second stage, the CME randomly selected 10 stoves in each locality.¹⁸

Parameters obtained from the previous monitoring period (see PoA-DD section E.7.2) were used to estimate sample sizes. However, the samples could not obtain the 95/5 confidence/precision levels required for biennial sampling, so the CME chooses to apply the upper or lower bound of the confidence interval (whichever is more conservative), as per Methodology AMS-II.G version 3 paragraph 22.¹⁹

The following table summarizes the sample sizes and results. Note: the below table uses the concept valid surveys. Valid surveys for each surveyed parameter were:

¹⁵ random.org provided the third-party drawing service

¹⁶ Note: the sample was taken from an effective 892 villages. Those villages in the State of Guerrero were excluded due to persistent insecurity in the area. One sampled village was removed from the CPA database and hence from the monitoring sample because ONIL stove users could not be found in that locality.

¹⁷ In cases where accurate GPS coordinates were not available for any reason, the CME randomly selected stoves from the closest locality.

¹⁸ To account for households where stoves could not be tested for any reason, the CME provided additional randomly selected stoves in each locality. To avoid sampling biases in this extra sample, WBT implementers were asked to visit the extra sample of stoves only if any of the 10 firstly selected stoves could not be tested and in a predetermined order until a total of 10 stoves could actually be applied WBTs. Due to stoves not being in use or missing, in some localities the sample of 10 stoves could not be completed.

¹⁹ The upper-bound is the most conservative as stated in paragraph 22 in AMS II.G, version 3

1. For parameter $n_{y,i}$, valid surveys were those in which it was possible to ascertain if the stove was still in use or not. In most cases, a complete survey was applied. In other cases, users could not be found, but it was possible to determine that stoves were no longer in use. These cases are considered as valid surveys too because surveyors could ascertain stoves were no longer in use. The initial number of surveys to be applied was 1,487; however, response rates for surveys were 78.68%, so the total number of valid surveys for parameter $n_{y,i}$ were 1,170 ($1,487 \times 0.7868$).²⁰
2. For parameter SS_y , valid surveys are the subsample of $n_{y,i}$ valid surveys where stoves continue to be in operation (i.e. $n_{y,i}=1$). Because the multi-stage sampling approach applied to sample the parameter require to estimate within-locality variances, those localities with only 1 sample were also excluded from the calculation of SS_y . This measure is conservative because the parameter estimation uses the upper bound of the confidence interval (the most conservative) and reducing the sample size increases the value of the upper bound of the confidence interval. Section E.7.1 of the PoA-DD (Description of measurement methods and procedures to be applied for parameter SS_y) states: "A survey will be conducted surveying households if they use a second (baseline) stove as per the monitoring plan outlined in Section E.7.2 of the PoA-DD. SS_y will be calculated in each monitoring period as follows: the number of sampled households with operational ICS that also continue to use a baseline stove divided by the total number of operational ICS in the sample." Thus, the number of valid surveys for parameter SS_y is smaller than the number of valid surveys for parameter $n_{y,i}$ as only operational stoves were considered.
3. For parameter $\eta_{new,i}$, valid surveys are those records where ONIL stove were in operation and that could be tested during the monitoring period. Some stoves could not be tested because they had been destroyed; the users could not be reached or did not accept the test to be conducted on their stoves.

Monitored Parameter	Survey Results	Precision/ confidence	Sample size (villages/surveys)	Valid villages/surveys
Proportion of stoves in operation ($n_{y,i}$)	0.4880	95%/13.95% (precision not met)	64/1,487	64/1,170 ²¹
Stoves in operation (SS_y)	0.6127	95%/9.24% (precision not met)	65/1,487	58/568 ²²

Monitored Parameter	Test Results	Precision/ confidence	Sample size (villages/surveys)	Valid records
Efficiency of 2010 ONIL Stove vintage	17.11% (13.73% is lower confidence interval)	95%/19.76% (precision not met)	3/30	23
Efficiency of 2011 ONIL Stove vintage	16.58% (12.31% is lower confidence interval)	95%/25.74% (precision not met)	3/30	19
Efficiency of 2013 ONIL Stove vintage	19.16% (15.89% is lower confidence interval)	95%/17.05% (precision not met)	3/30	27

²⁰ Records which were not randomly selected or that were not the closest to the selected locality in cases where samples had to be complemented with the closest stoves were also excluded.

²¹ This is the total number of surveys for which data could be gathered. Some households could not be surveyed because stove users were not at home or could not be located. The CME also excluded records which were not randomly selected or that were not the closest to the selected locality in cases where samples had to be complemented with the closest stoves.

²² Only considered stoves that had operational ONIL stoves.

Efficiency of 2014 ONIL Stove vintage	18.80% (16.31% is lower confidence interval)	95%/13.26% (precision not met)	3/30	29
---------------------------------------	--	--------------------------------	------	----

The 5% relative precision level was not attained for all monitoring parameters at the 95% confidence (required for biennial sampling). The Project proponents applied provisions of EB69 Annex 5 section “How to deal with failure to reach reliability”, such as scrutinizing the data. However, precision was still not attained. Therefore, project proponents followed the guidance on paragraph 22 of AMS-II.G version 03.0 which indicates: “In cases where survey results indicate that 90/10 precision or 95/5 precision is not achieved, the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/5 precision.” Thus, for the purposes of calculating emissions reductions, project proponents decided to use the upper or lower bound (whichever is most conservative) of the confidence interval for the parameters where the 95/5 statistical reliability was not attained. These values are calculated as follows:

$n_{y,i}$ (use of lower bound of confidence interval for conservativeness): mean value obtained in survey x (1- precision attained) = $0.4880 \times (1-0.1395) = \mathbf{0.4200}$. Thus, project proponents used an $n_{y,i}$ value of 0.4200 to estimate emissions reductions.

SS_y (use of upper bound of confidence interval for conservativeness): mean value obtained in survey x (1+ precision attained) = $0.6127 \times (1+0.0924) = \mathbf{0.6693}$. Thus, project proponents used an SS_y value of 0.6693 to estimate emissions reductions.

$\eta_{new,i}$ (use of lower bound of confidence interval for conservativeness): mean value obtained in survey x (1- precision attained) = $0.1711 \times (1-0.1976) = \mathbf{0.1373}$ for 2010 vintage stoves; $0.1658 \times (1-0.2574) = \mathbf{0.1231}$ for 2011 vintage stoves; $0.1916 \times (1-0.1705) = \mathbf{0.1589}$ for 2013 vintage stoves; and $0.1880 \times (1-0.1326) = \mathbf{0.1631}$ for 2014 vintage stoves. Thus, project proponents used a thermal efficiency of 0.1373 for 2010 vintage stoves; 0.1231 for 2011 vintage stoves; 0.1589 for 2013 vintage stoves; and 0.1631 for 2014 vintage stoves.

Sample precision calculation:

The actual precision attained was calculated by clearing the precision parameter from the sample size multi-stage sampling formula. After clearing for the precision value, the following equation was obtained:

$$precision = \sqrt{\frac{1.96^2}{C} \times \left(\frac{SD_B^2}{p^2} \times \frac{M}{M-1} + \frac{1}{u} \times \frac{SD_W^2}{p^2} \times \left[\frac{\bar{N} - \bar{u}}{\bar{N} - 1} \right] - \frac{C}{M-1} \times \frac{SD_B^2}{p^2} \right)}$$

Where:

Parameter	Parameter definition	Value for parameter $n_{y,i}$	Value for parameter SS_y	Value for parameter $\eta_{new,i}$ (2010 vintage)	Value for parameter $\eta_{new,i}$ (2011 vintage)	Value for parameter $\eta_{new,i}$ (2013 vintage)	Value for parameter $\eta_{new,i}$ (2014 vintage)
1.96	z-value for 95% confidence level	1.96	1.96	1.96	1.96	1.96	1.96

C	Number of sampled localities	64	58 ²³	3	3	3	3
SD_B^2	Unit variance (variance across localities)	0.0886	0.0460	0.0005	0.0010	0.0006	0.0003
SD_W^2	Average of within group variances	0.1621	0.1862	0.0040	0.0034	0.0034	0.0033
p	Overall proportion	0.4880	0.6175	17.11%	16.58%	19.16%	18.80%
M	Number of localities in the population	873	873	164	298	130	311
$\bar{u}$	Number of samples per locality	18.28	9.79	7.667	6.333	9.000	9.667
$\bar{N}$	Average number of stoves per locality	25.97	13.29	26.55	28.59	30.08	18.97

Based on the above equation and parameters, the relative precision level for parameter $n_{y,i}$ is calculated as follows:

$$precision = \sqrt{\frac{1.96}{64} \times \left(\frac{0.0886}{0.5120^2} \times \frac{873}{873-1} + \frac{1}{18.28} \times \frac{0.1621}{0.5120^2} \times \left[\frac{25.97-18.28}{25.97-1} \right] - \frac{1}{873-1} \times \frac{0.0886}{0.5120^2} \right)}$$

=0.1395 or 13.95%

Note: the value of $1-n_{y,i}$ ($1-0.4880$) is used to estimate sample sizes, as per the CDM Guidelines for Sampling and Surveys in CDM Project Activities and Programmes of Activities (EB 69 Annex 5) which mention “the larger of the two proportions p or $1-p$ may be used to estimate sample sizes”.

Applying the same equation with the values obtained from parameter SS_y we get:

$$precision = \sqrt{\frac{1.96}{64} \times \left(\frac{0.0460}{0.6127^2} \times \frac{873}{873-1} + \frac{1}{9.79} \times \frac{0.1862}{0.6127^2} \times \left[\frac{13.29-9.79}{13.29-1} \right] - \frac{1}{873-1} \times \frac{0.0460}{0.6127^2} \right)}$$

=0.0924 or 9.24%

For parameter $\eta_{new,i}$ we obtain the following results:

2010 vintage:

$$precision = \sqrt{\frac{1.96^2}{3} \times \left(\frac{0.0005}{0.1711^2} \times \frac{164}{164-1} + \frac{1}{7.667} \times \frac{0.0040}{0.1711^2} \times \left[\frac{26.55-7.667}{26.55-1} \right] - \frac{3}{164-1} \times \frac{0.0005}{0.1711^2} \right)}$$

²³ Note that the number of localities is less than for parameter $n_{y,i}$ because some localities did not have valid surveys for parameter SS_y and localities with only 1 sample were excluded from the calculations.

= 0.1976 or 19.76%

2011 vintage:

$$precision = \sqrt{\frac{1.96^2}{3} \times \left(\frac{0.0010}{0.1658^2} \times \frac{298}{298-1} + \frac{1}{6.33} \times \frac{0.0034}{0.1658^2} \times \left[\frac{28.59-6.333}{28.59-1} \right] - \frac{3}{298-1} \times \frac{0.0010}{0.1658^2} \right)}$$

= 0.2574 or 25.74%

2013 vintage:

$$precision = \sqrt{\frac{1.96^2}{3} \times \left(\frac{0.0006}{0.1916^2} \times \frac{130}{130-1} + \frac{1}{9} \times \frac{0.0034}{0.1916^2} \times \left[\frac{30.08-9}{30.08-1} \right] - \frac{3}{131-1} \times \frac{0.0006}{0.1916^2} \right)}$$

= 0.1705 or 17.05%

2014 vintage:

$$precision = \sqrt{\frac{1.96}{3} \times \left(\frac{0.0003}{0.1880^2} \times \frac{311}{311-1} + \frac{1}{9.667} \times \frac{0.0033}{0.1880^2} \times \left[\frac{18.97-9.667}{18.97-1} \right] - \frac{1}{311-1} \times \frac{0.0003}{0.1880^2} \right)}$$

= 0.1326 or 13.26%

Implementation and quality assurance and control and procedures used for handling any internal auditing performed and any non-conformities identified: Fast-Track Carbon (under contract with the CME) trained monitoring personnel on monitoring procedures, including provisions for maximizing response rates, documenting out-of-population cases, refusals and other sources of non-response. The monitoring survey included several questions to support the information on the key monitoring parameters. These included visual inspections to confirm stove use and presence of baseline stoves, comments by surveyors, check of randomly selected households against actual household information, and refusal tracking. These strategies aimed at minimizing surveyor or non-response biases. The questionnaire was piloted in the field prior to implementation.

Fast-Track Carbon also scrutinized the data to check for inconsistencies and cases of non-response which indicate the stoves are no longer in use (e.g. where surveyors could see an abandoned ONIL Stove or when the user emigrated and could no longer be found). Records were flagged and fixed accordingly.

WBTs were managed by third-party technicians trained in proper WBT implementation. WBT records were checked for data points above or below three standard deviations from the mean, as per section E.7.2 of the PoA-DD. However, no records above or below 3 standard deviations away from the mean were found.

Monitoring staff also certified lack of conflicts of interest and agreement with the monitoring procedures.

4. QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions can be calculated as follows:

$$\text{Baseline emissions} = N_{y,i} * B_{old,adjusted} * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel}$$

Where:

$N_{y,i}$	Total number of stoves in operation for a full monitoring period equivalent within each SSC-CPA
$B_{old,adjusted}$	Quantity of woody biomass that is used by baseline appliances
$f_{NRB,y}$	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass (0.87)
$NCV_{biomass}$	Net calorific value of non-renewable woody biomass that is substituted (IPCC default value for fuel wood 0.015 TJ/tonne)
$EF_{projected_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO ₂ /TJ

Using the monitored parameter data we obtain:

$N_{y,i}$ = 9,520 stoves (1,831 of the 2010 vintage, 3,580 of the 2011 vintage, 1,631 of the 2013 vintage, and 2,478 of the 2014 vintage). Note that the monitoring period duration is 1.82466 years (from 1-January-1014 to 28-October-2015). The number of stoves is multiplied by 1.82466 and $t_{y,i}$ to adjust the number of stoves to the length of the monitoring period. This number is $9,520 * 1.82466 * 0.933 = 16,207$ stoves.²⁴ The table below presents the number of stoves adjusted to the length of the monitoring period:

Stove vintage	Number of stoves in operation	Time during monitoring period that stoves were in operation (years)	Adjusted number of stoves in operation
2010	1,831	1.8247	3,342
2011	3,580	1.8247	6,532
2013	1,631	1.8247	2,976
2014	2,478	1.3552	3,358

And,

$$B_{old,adjusted} = B_{old} - 0.45 * SS_y / 0.571$$

²⁴ Note: the number of stoves in operation is rounded to the nearest lower unit.

where

0.45 Difference between the average fuel consumption of households only having an ICS and households having an ICS and baseline stoves adjusted to the fraction of households with an ICS that are also using baseline stoves (11.87-9.76) Kg/household/day*365 days/year/1000Kg/ton *0.571 according to baseline studies; in tons per year

0.571 Is the fraction of households in secondary stove use in the baseline study that use baseline stoves along with ONIL Stoves

SS_y = 0.6693 Is the fraction of households with an ONIL stove that are also using baseline stoves. Calculated as: Total households with ONIL Stoves that use baseline stoves (BLS)/Total number of ONIL Stoves in sample;

B_{old} = 5.34 tonnes/year

B_{old,adjusted} = 5.34 - 0.45 * 0.6693 / 0.571
= 4.8161 tonnes/year

Applying these values to the baseline emissions calculations we obtain:

Baseline emissions = 16,207*4.8161*0.87*0.015*81.6 = 83,121.50 tCO₂

4.2 Project Emissions

Project emissions are calculated using the following equation:

Project emissions =

$$B_{old,adjusted} * \left[N_{y,2010} * \frac{\eta_{old}}{\eta_{new,2010}} + N_{y,2011} * \frac{\eta_{old}}{\eta_{new,2011}} + N_{y,2013} * \frac{\eta_{old}}{\eta_{new,2013}} + N_{y,2014} * \frac{\eta_{old}}{\eta_{new,2014}} \right] * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel}$$

Project emissions

$$4.8161 * \left[3,342 * \frac{0.1}{0.1373} + 6,532 * \frac{0.1}{0.1231} + 2,976 * \frac{0.1}{0.1589} + 3,358 * \frac{0.1}{0.1631} \right] * 0.87 * 0.015$$

= 59,864.31 tCO₂

4.3 Leakage

Per methodology AMS II.G version 3, a net-to-gross adjustment factor of leakage of 0.95 is applied to calculate the Emission Reductions for the period. See section 4.1 for the application of this 0.95 factor.

Overall leakage would be estimated as follows:

Leakage = [Baseline emissions – Project emissions]*0.05

Leakage = [83,121.50 tCO₂ – 59,864.31tCO₂]*0.05 = 1,162.86 tCO₂

4.4 Net GHG Emission Reductions and Removals

Emissions reductions can be calculated as follows:

$ER_y = \text{Baseline emissions} - \text{Project emissions} - \text{Leakage}$

Substituting with the values estimated above, we obtain:

$$ER_y = 83,121.50 \text{ tCO}_2 - 59,864.31 \text{ tCO}_2 - 1,162.86 \text{ tCO}_2 = 22,094 \text{ tCO}_2$$

Alternatively, emissions reductions can be calculated as per methodology AMS-II.G version 3 using the following equations²⁵:

$$ER_y = B_{y,savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel} * L$$

Where:

ER_y	Emissions reductions during the year in tCO ₂ e
$B_{y,savings}$	Quantity of woody biomass that is saved in tonnes
$f_{NRB,y}$	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass (0.87)
$NCV_{biomass}$	Net calorific value of non-renewable woody biomass that is substituted (IPCC default value for fuel wood 0.015 TJ/tonne)
$EF_{projected_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO ₂ /TJ
L	A net to gross adjustment factor (0.95 default) is applied above (equation (1) of AMS II.G, version 3) in order to adjust B_{old} to account for leakages as per paragraph 13 (a) of the methodology.

To calculate $B_{y,savings}$, we use Option 2²⁶

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

Where:

B_{old}	Quantity of wood fuel used in the absence of the project activity in tonnes
η_{old}	A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney
η_{new}	Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.

And

²⁵ See "VCU estimations version 1.2.xlsx" presented to the VVB

²⁶ Paragraph 6 of AMS II.G

$$B_{y,savings} = B_{old,adjusted} \cdot \left[\sum_{i=1}^n N_{y,i} \left(1 - \frac{\eta_{old}}{\eta_{new,i}} \right) \right]$$

Where:

- $N_{y,i}$ Total number of stoves in operation for a full monitoring period equivalent in the project
- η_{old} Efficiency of the baseline system/s being replaced. The 0.10 default value is used as the replaced systems are three-stone fires or conventional systems lacking improved combustion air supply mechanism and flue gas ventilation system i.e., traditional stoves.
- $\eta_{new,i}$ Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.

$$\eta_{old} = 0.10$$

$$\eta_{new,2010} = 0.1373$$

$$\eta_{new,2011} = 0.1231$$

$$\eta_{new,2013} = 0.1589$$

$$\eta_{new,2014} = 0.1631$$

$$B_{y,savings} = 4.8161 * \left[3,342 * \left(1 - \frac{0.1}{0.1373} \right) + 6,532 * \left(1 - \frac{0.1}{0.1231} \right) + 2,976 * \left(1 - \frac{0.1}{0.1589} \right) + 3,358 * \left(1 - \frac{0.1}{0.1631} \right) \right]$$

=21,840.20 tonnes of woody biomass

$$ER_y = 21,840.20 \text{ tonnes} * 0.015 \text{ TJ/tonne} * 81.6 \text{ tCO}_2/\text{TJ} * 0.95 * 0.87$$

$$= 22,094 \text{ tCO}_2/\text{year}$$

Period	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e) ²⁷
01-January-2014 to 31-December-2014	42,911.42	31,187.93	586.17	11,137.31
01-January-2015 to 28-October-2015	40,210.09	28,676.38	576.69	10,957.02
Total	83,121.50	59,864.31	1,162.86	22,094

²⁷ The emissions reductions in each year is rounded down to the nearest unit, yielding lower estimates than if both years were combined into single emissions reductions calculations.

APPENDIX 1: COMPETENCIES OF MONITORING PERSONNEL

HELPS International Staff in Mexico

Andrea Santos – HELPS International A.C., Database manager and field-testing coordinator
Ms. Santos is native of Oaxaca and is responsible for coordinating the database information collection. She has worked with HELPS International A.C. for four years and has received training on field sampling techniques and is the resident ONIL database expert.

Javier Lascurain– Verification project manager

Mr. Lascurain is the technical expert for this PoA. Mr. Lascurain has helped developed four additional AMS-II.G PoAs (Haiti, Sub-Saharan Africa, Malawi, and Zambia) and is an expert in PoA monitoring processes, having contributed substantially to the design of the monitoring plans of around 5 cook stove PoAs and the development of fuel consumption baselines. He has worked in marketing of environmental technologies in rural Mexico, Africa and Guatemala has advised several companies in environmental and business strategies. Mr. Lascurain is a native of Mexico and is fluent in Spanish, French and English. He has Chemical Engineering degree from Universidad Iberoamericana, and a dual Master's degree in Environmental Management and Engineering Management from Duke University.

Victor M. Barrueta Soriano, PhD– Stove expert, Water Boiling test consultant

Dr. Barrueta is the coordinator of the rural energy program for GIRA (*Grupo Interdisciplinario de Tecnología Rural Apropiable*). He is an electrical engineer from the Universidad Panamericana and has a Masters degree in Natural Resource Science and Rural Development from the Frontera Sur University in Mexico. He has recently finished his doctorate in Engineering from the Autonomous University of Mexico (UNAM). He studied energy efficiency for wood stove cooking, in which he compared all aspects and efficiencies of traditional wood stoves and the Patsari stove. He has published several national and international documents related to implementation of appropriate technologies in rural Mexico.

Oscar Troncoso Torrez – Field survey supervisor

Mr Oscar Troncoso has created, executed and evaluated sustainable development projects in indigenous communities of Mexico for over 25 years. He was advisor to the Secretariat of Indigenous Peoples of the State of Chiapas Government; Project Management Director for the Project of Integrated and Sustainable Development of the European Union and the Government of Chiapas (PRODESIS); headed HELPS International's operations in Chiapas; and was technical coordinator for various indigenous social organizations such as the National Union of Regional Autonomous Indigenous Organizations (UNORCA) in Chiapas; the Coalition of Autonomous Organizations of Ocosingo (COAO); among others. Oscar has coordinated multiple field teams in data collection, including monitoring the installation and use of over 10,000 improved cookstoves throughout Mexico. He is an anthropologist by training and fellow LEAD-Cohort 11.