

Gold Standard (version 2.2)  
Monitoring Report

Title of the project	Oromia Cookstove Distribution Project
Gold Standard project id	GS5463
Version number of the monitoring report	3
Completion date of the monitoring report	06/11/2019
Date of project design certification	13/06/2017
Start date of crediting period	01/01/2016
Duration of this monitoring period	01/01/2016 to 31/12/2018
Duration of previous monitoring period	n/a
Project representative(s)	Mr. Worku Kassaye Maru
Host Country	The Federal Democratic Republic of Ethiopia
Selected methodology(ies)	Gold Standard Methodology: Technologies and Practices to Displace Decentralized Thermal Energy Consumption, Version 2.0 (in the following: TPDDTEC methodology)
Estimated amount of annual average emission reductions (as per approved PDD)	43,032 tCO <sub>2</sub> e
Total amount of emission reductions (as per approved methodology) achieved in this monitoring period	25,302 tCO <sub>2</sub> e

## SECTION A. Description of project

### A.1. Purpose and general description of project

>> (Provide a brief summary of the detailed description given in section B.1 including purpose of the project, brief description of the installed technology and equipment and relevant dates for the project (e.g. construction start/end, commissioning, continued operation periods, etc.)

Oromia Improved Cook Stove Dissemination Project is a small-scale project activity that introduces Improved Cook Stoves hereinafter referred to as ICSs or appliances within the terrestrial boundaries of the Federal Democratic Republic of Ethiopia. The ICSs reduce the non-renewable biomass consumption required to provide thermal energy for domestic cooking requirements.

The project is implemented by Oromia Coffee Farmers Cooperative Union.

The project disseminates two improved cook stoves, one for cooking and the other for baking, in each project household. The Tikikil stove (for Cooking) is a rocket stove with skirt that has been adopted to suit the cooking requirements of most Ethiopian households and designed for local production techniques; and hence named "Tikikil" meaning "Appropriate". The second stove is named Mirt and is used for injera baking purpose. Together, both technologies displace traditional cooking stoves for all household cooking needs. The key partners of the project are Oromia Coffee Farmers Cooperative Union (implementer), Horn of Africa Regional Environment Centre and Network (carbon consultant) and the Fair Climate Fund (buyer of carbon credits). The project's goal is to supply 20,000 households with the two project stoves as package. The households are identified through the network of OCFCU's member cooperatives throughout Oromia.

The targeted rural/urban poor households rely on traditional wood stoves or low efficiency cook stoves. As these open fires or three-stone fires are highly energy-inefficient, the dissemination of technologies that reduce fuel wood consumption offers huge environmental and socioeconomic benefits. The appliances distributed reduce non-renewable biomass consumption and in so doing abate GHG emissions. The improved thermal efficiency of the ICSs reduces fuel consumption, levels of indoor air pollution and the time and effort/money required to collect/purchase fuel.

A tabular overview of the history and the milestones of the project is presented in *Table 1* below.

*Table 1: History and milestones of the project activity*

Date	Milestone	Description
<b>March 2013</b>	Training of stove producers and set-up of stove production centers	Four local stove producer groups (SMEs) are organized and a training of stove production and business planning is provided for the members
<b>June 2014</b>	Initiation of GS validation under the Paradigm PoA	Submission of two CPAs under the GS PoA "Paradigm Sub Saharan Africa Cook Stove Programme"
<b>16/12/2015</b>	Start of implementation	Deployment of stoves to households commences
<b>16/05/2016</b>	ERPA signature	OCFCU and FCF sign an Emission Reduction Purchase Agreement (ERPA) on the sale and purchase of GS VERs of the project
	Departure from the Paradigm PoA	Cancellation of the agreement with The Paradigm Project and retirement of the CPAs from the Paradigm PoA upon methodological disagreements

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11/10/2016	Initiation of stand-alone GS validation	Submission of the first stand-alone small-scale PDD to the auditor KBS
13/06/2017	GS registration	The project successfully passes validation and GS registration review and is registered as a GS VER project.

### A.2. Location of project

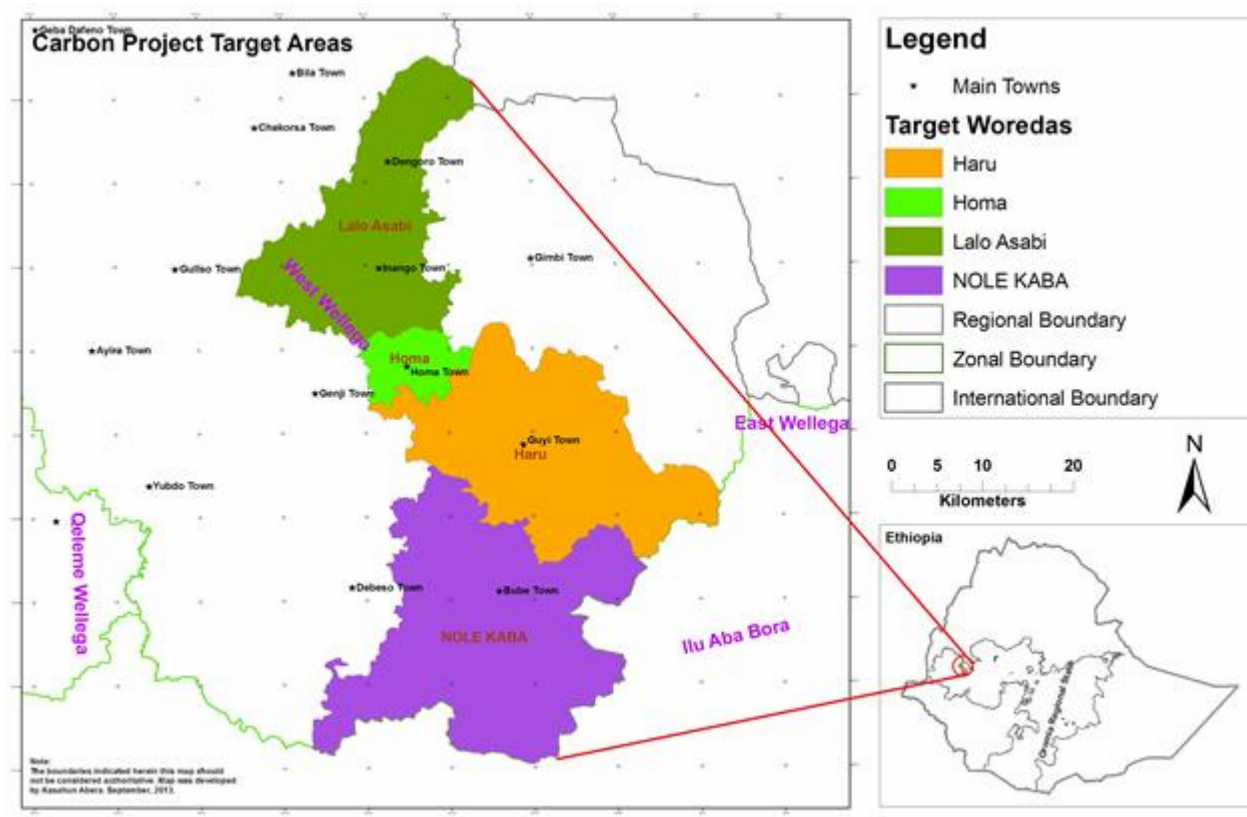
>> (Provide host country, state/province, city/town details along with GPS co-ordinates.)

Host country: The Federal Democratic Republic of Ethiopia

The project is located in Ethiopia, Oromia Regional State, West Wollega Zone in four selected districts namely Nole Kaba, Haru, Lalo Asabi and Homa as shown in the figure bellow.

Geographical location	Target Woredas			
	Nole Kaba	Haru	Homa	Lalo Asabi
Latitude	350 47'' 59.56''	350 49'' 30.83''	350 41'' 45.78''	350 40'' 59.75''
Longitude	80 40'' 00.79''	80 58'' 48.40''	90 04'' 24.27''	90 10'' 05.63''

Figure 1: Map of the project area



**A.3. Reference of applied methodology**

>>(Indicate title and version number of the methodology.)

Gold Standard Methodology: Technologies and Practices to Displace Decentralized Thermal Energy Consumption, Version 2.0 (in the following: TPDDTEC methodology)

**A.4. Crediting period of project**

>> (Provide start date and length of the crediting period as given in approved PDD.)

Start date of crediting period: 01/01/2016

Length of crediting period: 7 years

**SECTION B. Implementation of project**

**B.1. Description of implemented project**

>> (Provide information on the implementation status of the project during this monitoring period. Specify any deviations / delays compared to information in approved project.)

The project has been under implementation since December 2015. Sales and deployment of the Mirt and Tikikil stove bundle started on 16/12/2015 and have been ongoing since. In the period December 2015 to December (end) 2018 OCFCU has sold and deployed a total of 4,793 stove bundles (i.e. one Mirt and one Tikikil). These numbers are much lower than the anticipated amounts of stoves in the registered PDD.

The reasons for the slow implementation (compared to the original planning) are on the one hand unexpected difficulties with production and dissemination logistics in the very inaccessible project area. On the other hand, the operations of the project in general have been severely hampered by civil unrest in the Oromia region of Ethiopia (where the project area is located) from November 2015 onwards and the subsequent declaration of state of emergency by the government in October 2016 (until August 2017) and February 2018, which culminated in the resigning of the prime minister. Although the reform government that took office in April 2018 has taken important steps to address the political, ethnic and economic conflicts underlying the protests, the security situation in the Oromia region is unstable until to date.

## **B.2. Post-registration changes**

### **B.2.1. Temporary deviations from Certified Key Project Information, Project Design Document, Monitoring & Reporting Plan, applied methodology or applied standardized baseline**

*>> (Indicate whether any temporary deviations have been applied during this monitoring period. If applied, provide a description of the deviation(s). Include the reasons for the deviation(s), how it deviates from the monitoring plan, applied methodology(ies) and/or applied approaches, the duration for which the deviation(s) is(are) applicable and justification on the conservativeness of the approach. Also indicate if prior approval from GS-TAC have been sought on the deviation.)*

There have been no deviations from the monitoring plan, the methodology or any of the applied approaches.

### **B.2.2. Corrections**

*>> (Indicate whether any corrections to project information or parameters fixed at validation have been applied.)*

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For the parameter  $P_{b,y}$  a preliminary value, based on the 0.5 t/person/year default value of the methodology, was used in the registered PDD in order to facilitate the ex-ante estimation of emission reductions, as no value specific to the target area and population was available at the time. To ensure the accuracy and appropriateness of the parameter with regard to ex-post emission reduction calculations, it was stipulated in the comments of the parameter table in the registered PDD that: *"KPT will be done before the first certification."*

In line with this provision, the fixed parameter  $P_{b,y}$  is now updated with a project specific value for the target area and population based on a Kitchen Performance Test (KPT).

Since the project uses the "Case of Single Sample Test" approach of the TPDDTEC methodology and more specifically follows the sub-approach for fixing  $P_{b,y}$  given in footnote 24, it has to be ensured that: *"...the value of baseline fuel consumption in the considered target area ..., may be found from credible literature such as a credible and validated report from a survey by a third party..."*

Hence, OCFCU commissioned the KPT survey in the target population to the Alternative Energy Technology Development and Promotion Directorate (AETDPD) of the Ministry of Water, Irrigation and Energy. The AETDPD conducted the field work (KPTs) of the survey in August 2018 and submitted its final report in February 2019. The baseline fuelwood consumption established by the AETDPD for the target area and population of the project is 17.1 kg/household/day.

NOTE: The importance of updating the parameter  $P_{b,y}$  is exemplified putting the measured value of 17.1 kg/household/year into relation with the PDD value of 7 kg/household/day (calculated based on the 0.5 t wood/person/year default value) and the monitored project fuelwood consumption value (parameter  $P_{p,y}$ ) of 10.38 kg/household/day. I.e., without updating  $P_{b,y}$  the project would result in an **increase** of fuelwood consumption compared to the baseline of 3.32 kg/household/day indicating **negative** emission reductions of almost 50% of the baseline. Therefore, the default value applied in the registered PDD can only be seen as a placeholder for a realistic and scientifically measured fuelwood consumption value in the baseline of the project as provided by the AETPDP survey.

### B.2.3. Changes to start date of crediting period

>> (Indicate whether any changes to the start date of the crediting period have been approved by Gold Standard that is relevant for this monitoring period.)

n/a

### B.2.4. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

>> (Indicate whether any permanent changes from the approved monitoring plan, applied methodologies or applied approaches have been approved by GS-TAC that is relevant for this monitoring period.)

n/a

## B.2.5. Changes to project design of approved project

>> (Indicate whether any changes to the design of the project have been approved by GS-TAC that is relevant for this monitoring period.)

n/a

## SECTION C. Description of monitoring system applied by the project

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### A. Total Sales Record & B. Project Database

All relevant information of project households and stoves deployed is collected by OCFCU during the sales process by means of a sales invoice/contract with carbon copy that includes a carbon waiver section regarding the concession of the right to generate carbon credits.

The hardcopy is then encoded electronically into the Project Database and afterwards stored in a fireproof cabinet.

The dataset collected and stored for each stove/household includes:

1. Date of stove purchase
2. Stove code
3. Model/type of project technology
4. Name and contact details of household

Only households whose reported primary cooking fuel is fuelwood are entered into the database/sales record.

In addition to the sales database, OCFCU also keeps full documentation regarding the production of stoves and the sourcing of materials, including purchase invoices/receipts.

### C. On-going Monitoring Studies

In April 2019 OCFCU conducted a Monitoring Survey (MS) and a Usage Survey in a combined, age-representative sample of 127 households that was randomly selected from the three age groups in the project database at the cut-off date 29/03/2019. A detailed description of the sampling approach, including drawing procedure, measurement/data-collection methods, statistical analysis and results is provided in section D.3 below.

The information gathered in the combined Monitoring and Usage Survey was:

#### a) Monitoring Survey (MS)



Information gathered:

1. User follow up
  - a. Update of address or location (if applicable)
  - b. Update of mobile telephone number (if applicable)
2. End user characteristics
  - a. Number of people served by baseline and project technology
  - b. Typical project technology usage patterns and tasks
3. Project technology and fuels
  - a. Types of project and baseline technologies used and estimated frequency
  - b. Types of fuels used and estimated quantities
  - c. Sources of fuels; (purchased or hand-collected, etc.) and prices paid or effort made

## **b) Usage Survey**

Through an interview with the primary cook and in-person observations the enumerators determined whether the project stoves were present in the household and actually in use. For this purpose, stoves were determined to be **“in use”** (see definition below), if:

1. The household was found in the project area
2. The stoves were found in the household
3. A visual inspection of the stoves and the fireplace indicated “regular use” (proven by pictures)
4. The primary cook reported a “regular use” of the stoves

## **c) Project Performance Field Test (FT) Update**

A 3-day Kitchen Performance Test (KPTs) in line with the guidance provided in Annex 4 of the TPDDTEC methodology was conducted in a sample of 70 randomly selected households in August 2018.

Prior to performing the KPTs the enumerators made it explicit to households that they must behave and consume fuel normally, to use those cooking devices that they normally use and to cook typical meals during the 72 hours of the tests. Furthermore, the enumerators explained to households that unusual cooking events, such as parties or other extracurricular events of the household, should be avoided.

A detailed description of the sampling approach, including drawing procedure, measurement/data-collection methods, statistical analysis and results is provided in section D.3 below.

### **Additional Measures: Requirements and Guidelines for carrying out usage surveys for projects implementing improved cooking devices**

Since the project uses the TPDDTEC methodology and the monitoring report is submitted after 01/07/2018 for verification the “GS Requirements and Guidelines for carrying out usage surveys for projects implementing improved cooking devices” (published 23/08/2017) apply. The monitored

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usage rate is 81.36% (see sections D.2 and D.3) and hence the project needs to demonstrate that all at least the requirements of Level A. Mandatory and Level B. Good Practice are met.

## A. Mandatory Monitoring Requirements

### Step 1. Defining stove use and non-use

Prior to the survey “regular use” was defined as:

1. “at least three times per week for both stoves (Mirt and Tikikil)”; AND
2. in cases where one or more other stoves were used in the household “more often than the sum of usage of all other stoves in the household”.

#### **Reasoning for the “regular use” definition:**

If Mirt and Tikikil are the only stoves used in a household a usage pattern of 3 times per week each translates to 6 cooking (or warming up) events per week. That means that the household prepares food almost daily on the stoves.

In the case, where also other stoves are used, the fact that Mirt and Tikikil are used more often than all other stoves together means that the Mirt and Tikikil combination is main cooking device of the household.

### Step 2. Household Usage Survey

Only primary cooks were interviewed by the enumerators. This was marked on the questionnaires. For all 127 interviewed households the following tasks were performed:

- i. Kitchen observations – Photographs of the project stove and the kitchen were taken. The condition of the Mirt and Tikikil stoves was observed and marked down by the enumerator (used/unused).
- ii. Interview with the primary cook – The primary cook was interviewed by means of a semi-structured questionnaire with regard to usage patterns, duration and frequency of use, stoves and energy sources/amounts used and seasonal trends.
- iii. Photos of the cooking area(s) – see above. All pictures clearly show the status of the stoves and the kitchen.
- iv. GPS coordinates of the household were taken.

### Step 3. Verification checks

The project developer conducted verification checks with a total of 15 randomly selected households by phone in the period 15-16 of May 2019. The information corroborated with the household was if the household was actually visited by the enumerators and the usage pattern, duration, frequency of use and seasonal trends reported. All 15 households confirmed the visit by the enumerators and corroborated the information collected.

## B. Good Practice Monitoring Requirements

Prior to the combined Monitoring and Usage Survey, OCFCU organized a 1-day training workshop April 10, 2019 to train the team that would be involved in the collection and processing of information from the users' households. This training took place at the Gimbi Grand Hotel with an attendance of eight participants listed in the table below.

SN	Name of participants
1	Kasahiun Kaba
2	Alemayhu Tamiru
3	Tekelu Hailu
4	Wagari Gudina
5	Melaku Deletera
6	Degefu Bulcho
7	Kefale Olani
8	Worku Kassaye

The training started prior to fieldwork with the main objective of ensuring that all team members and specifically the field team have the capacity, knowledge and skills required to carry out the monitoring survey. Specific objectives were to:

- Explain the rationale of the survey and enable field team to understand all the sections on the survey form.
- Enable field team to have a mastery on the usage of the field tools and a uniform application of the survey methodology.
- Prepare data collectors to undertake and ensure good overall quality of data

**Training Provider:** Mr. Negusu Tefera from Horn of Africa Regional Environmental Center and Network

### **Specific activities/elements of the survey discussed:**

- Kitchen observation
- Interview with primary cook
- Photo of the cooking area and
- GPS coordinates

For each element of the survey detailed presentation and discussion was conducted including the procedures how they communicate the households, how they take photo, and how they choose the key cook, how they interview the respondent and how they complete the survey.

During the survey, the activities and accomplishments of the field team was supervised by the project coordinators and measures were taken on the challenges encountered. Some of the major challenges were:

- Mismatch of actual stoves codes in the households and database codes, this happened mainly from registration errors and during encoding.
- Some households were not at home during monitoring survey
- Local security problem to access sole households. Especially in Lalo Asabi district the command post did not allow to travel to the villages.

## Actions taken:

- For error codes: actual stove codes were registered on the questionnaire, the source of error was traced and corrections were made in the database where appropriate.
- For households who were not at home during monitoring, reserve samples were surveyed.
- For the areas where there is serious security problem households were surveyed through by phone.

## End-User Training and follow-up visits + Awareness campaign

Regular end-user trainings, follow-up visits and awareness campaigns are an integral part of the project's design and implementation strategy. All participating households of the project receive a personal usage training by field-workers at the time of delivery/installation of the stove bundle. After installation all households are visited periodically (every 3 months) by field-workers to ensure the proper usage and to handle any queries, complaints or maintenance issues. Paper records of all household visits are available for verification.

## C. Best practice requirements

### Stove use monitoring

The use of Continuous Stove Monitors (CSMs) was not possible during the first monitoring period.

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante or at renewal of crediting period

*(Copy this table for each piece of data and parameter)*

Relevant Indicator	Emission Reductions
Data/parameter:	$EF_{b,wood,CO_2} / EF_{p,wood,CO_2}$
Unit	tCO <sub>2</sub> /TJ
Description	CO <sub>2</sub> emission factor of wood fuel
Source of data	TPDDTEC methodology
Value(s) applied)	112
Choice of data or measurement methods and procedures	Methodology default value for wood/wood waste
Purpose of data	Emission reduction calculation
Additional comments	n/a

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<b>Relevant Indicator</b>	Emission Reductions
<b>Data/parameter:</b>	$EF_{b,wood,nonCO2} / EF_{p,wood,nonCO2}$
Unit	tCO <sub>2</sub> /TJ
Description	Non-CO <sub>2</sub> emission factor of wood fuel
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Table 2.5
Value(s) applied)	8.692 ((CH <sub>4</sub> =0.3*GWP 25) + (N <sub>2</sub> O=0.004*GWP 298))
Choice of data or measurement methods and procedures	IPCC default values
Purpose of data	Emission reduction calculation
Additional comments	n/a

<b>Relevant Indicator</b>	Emission Reductions
<b>Data/parameter:</b>	$NCV_{b,wood} / NCV_{p,wood}$
Unit	TJ/ton
Description	Net calorific value of air-dry wood
Source of data	IPCC default for wood fuel
Value(s) applied)	0.015
Choice of data or measurement methods and procedures	As per TPDDTEC Equation 3
Purpose of data	Emission reduction calculation
Additional comments	n/a

<b>Relevant Indicator</b>	Emission Reductions
<b>Data/parameter:</b>	$P_{b,y}$
Unit	kg/household/day
Description	Quantity of air-dry fuelwood consumed by households in the baseline scenario per day
Source of data	2018 Baseline Study by the Ministry of Water, Irrigation and Energy (Alternative Energy Technology Development and Promotion Directorate)
Value(s) applied)	17.1
Choice of data or measurement methods and procedures	In line with section 4.C of the TPDDTEC methodology Option 1 for determining the baseline fuelwood consumption is chosen – a default value. The default value is chosen according to the provisions of footnote 24 under "Case of Single Sample Test": "... Alternatively, the value of baseline fuel consumption in the considered target area ..., may be found from credible literature such as a credible and validated report from a survey by a third party..."

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Purpose of data	Emission reduction calculation
Additional comments	A preliminary value, based on the 0.5 t/person/year default value of the methodology, was used in the registered PDD in order to facilitate the ex-ante estimation of emission reductions. However, as stipulated in the comments of the parameter table in the PDD this value is now replaced with a more accurate value, established by a third party for the actual target population. For additional explanations please refer to section B.2.2 above.

The parameters  $\eta_{old}$  and  $\eta_{hh\ size\ y}$  from the list of parameter tables in the PDD are not considered here, because they are not used for the calculation of emission reductions.

## D.2. Data and parameters monitored

*(Copy this table for each piece of data and parameter)*

<b>Relevant Indicator</b>	Emission Reductions
<b>Data/parameter:</b>	fNRBy
Unit	Fractional non-renewability
Description	Non-renewability status of woody biomass fuel in year y
Measured/calculated/default	Default/calculated
Source of data	CDM default value, <a href="https://cdm.unfccc.int/DNA/fNRB/index.html">https://cdm.unfccc.int/DNA/fNRB/index.html</a>
Value(s) of monitored parameter	88%
Monitoring equipment	n/a
Measuring/reading/recording frequency:	The NRB value may be updated periodically, either in line with the respective updates of the CDM default value or through a dedicated NRB assessment as per the TPDDTEC methodology.
Calculation method (if applicable):	In line with the provisions of AMS II.G and the guidance of the CDM Executive Board (EB90) a default country-specific fNRB value of 88%, as approved by the Ethiopian DNA on April 30, 2012 shall be applied.
QA/QC procedures:	n/a
Purpose of data:	Emission reduction calculation
Additional comments:	n/a

<b>Relevant Indicator</b>	Emission Reductions GS v2.2 Indicator 3: Access to affordable and clean energy services
<b>Data/parameter:</b>	$N_{p,y}$
Unit	Number of ICS bundles (and project technology-days)
Description	Number of distributed ICS bundles in year y (and project technology-days through year y)
Measured/calculated/default	Measured
Source of data	Total sales record

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Value(s) of monitored parameter	Period y	N <sub>p,y</sub> in period (number of ICS distributed)	N <sub>p,y</sub> in period (project technology-days)
	01/01/2016 – 31/12/2016	2,201 <sup>1</sup>	438,602
	01/01/2017 – 31/12/2017	1,230	989,525
	01/01/2018 – 31/12/2018	1,362	1,448,579
	<b>Total in monitoring period</b>	<b>4,793</b>	<b>2,876,706</b>
Monitoring equipment	Sales invoices, Excel database		
Measuring/reading/recording frequency:	Continuously		
Calculation method (if applicable):	The values for project technology-days in the project database have been established as the sum of the number of days of operation of all stove bundles in the respective years of the monitoring period 01/01/2016 to 31/12/2018.		
QA/QC procedures:	The PP database has been checked to eliminate the possibility of double counting.		
Purpose of data:	Emission reduction calculation		
Additional comments:	Data shall be stored by the PP for up to years after the end of the crediting period of the project.		

<b>Relevant Indicator</b>	Emission Reductions
<b>Data/parameter:</b>	P <sub>p,y</sub>
Unit	kg/household/day
Description	Quantity of air-dry fuelwood consumed by households in the project scenario p per day in year y
Measured/calculated/default	Measured
Source of data	Project PFT update
Value(s) of monitored parameter	10.38
Monitoring equipment	See section D.3 below for detailed explanation of survey methods and calculation of results.
Measuring/reading/recording frequency:	Every two years
Calculation method (if applicable):	See section D.3 below for detailed explanation of survey methods and calculation of results.
QA/QC procedures:	The test was supervised by carbon consultancy Bridge Builders UG and conducted by the Horn of Africa Regional Environment Centre and Network of Addis Ababa University (HoA-REC&N-AAU).
Purpose of data:	Emission reduction calculation
Additional comments:	n/a

<sup>1</sup> This number includes 72 stove bundles that were distributed in the period 15/12/2015 to 31/12/2015.

<b>Relevant Indicator</b>	Emission Reductions
<b>Data/parameter:</b>	$U_{p,y}$
Unit	Percentage
Description	Usage rate for stove bundles in project scenario p during year y
Measured/calculated/default	Measured
Source of data	Usage survey
Value(s) of monitored parameter	81.36%
Monitoring equipment	Survey in a random, age-representative sample of project households.
Measuring/reading/recording frequency:	Annually
Calculation method (if applicable):	See section D.3 below for detailed explanation of survey methods and calculation of results.
QA/QC procedures:	All records are stored electronically and on paper. All steps of the statistical analysis have been documented in this report and in the supporting Excel spreadsheet, so that they can be reproduced at any time.
Purpose of data:	Emission reduction calculation
Additional comments:	A single usage parameter is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario.

<b>Relevant Indicator</b>	Emission Reductions
<b>Data/parameter:</b>	$LE_{p,y}$
Unit	tCO <sub>2</sub> e per year
Description	Leakage in project scenario p during year y
Measured/calculated/default	Measured/calculated
Source of data	Leakage assessment
Value(s) of monitored parameter	0
Monitoring equipment	n/a
Measuring/reading/recording frequency:	To be updated every two years
Calculation method (if applicable):	<p>“To be updated every two years per the provisions of section II.6 of the TPDDTEC methodology. Where appropriate, elements regarding leakage may be included in the yearly monitoring survey.”</p> <p>Since the last leakage assessment (registered PDD) dates less than two years back no update is required for the present monitoring report.</p>
QA/QC procedures:	In cases where survey methods are used: All records will be stored electronically and on paper. All steps of the statistical analysis will be documented, so that they can be reproduced at any time.
Purpose of data:	Emission reduction calculation



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Additional comments:	Aggregate leakage can be assessed for multiple project scenarios, if appropriate.
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<b>Relevant Indicator</b>	GS v2.2 Indicator 1: Quality of employment
<b>Data/parameter:</b>	Number of trainings offered, and people engaged in ICS production
Unit	n/a
Description	Number of people engaged in ICS production and the trainings provided to them
Measured/calculated/default	Measured
Source of data	Training records of OCFCU and the project facilitator HoAREC-N
Value(s) of monitored parameter	40 Tikikil producers and 48 Mirt producers x 1 training each
Monitoring equipment	n/a
Measuring/reading/recording frequency:	Continuously
Calculation method (if applicable):	n/a
QA/QC procedures:	All training records are stored electronically and on paper.
Purpose of data:	Estimation of quality of employment
Additional comments:	n/a

<b>Relevant Indicator</b>	GS v2.2 Indicator 2: Livelihood of the poor
<b>Data/parameter:</b>	Self-reported time and monetary savings
Unit	1. Birr/household/week 2. Hours/household/week
Description	Reported savings of time and money which was otherwise wasted in search of fuel wood. The monitoring report shall quantify the self-reported reduction in time used to collect fuel wood or the amount of money used to buy wood fuel.
Measured/calculated/default	Measured
Source of data	Monitoring Survey (MS)
Value(s) of monitored parameter	1. Monetary savings: 70 Birr/HH/week in 49% of households (average) 2. Time savings: 10.5 hours/HH/week in 80% of households (average)
Monitoring equipment	n/a
Measuring/reading/recording frequency:	Annually
Calculation method (if applicable):	n/a
QA/QC procedures:	Survey data is stored electronically and on paper.
Purpose of data:	Calculation of time and monetary savings
Additional comments:	n/a

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<b>Relevant Indicator</b>	GS v2.2 Indicator 4: Quantitative employment and income generation
<b>Data/parameter:</b>	Number of jobs created and income earned
Unit	1. n/a 2. Birr
Description	Number of jobs created and amount of income earned through jobs created in the program.
Measured/calculated/default	Measured
Source of data	Employment records
Value(s) of monitored parameter	1. 9 direct permanent jobs 2. 3,507,751 Birr (total in the monitoring period)
Monitoring equipment	n/a
Measuring/reading/recording frequency:	Annually
Calculation method (if applicable):	n/a
QA/QC procedures:	Two paper copies of employment contracts will be stored (one by the employer OCFCU and one by the employee).
Purpose of data:	Calculation of quantitative employment and income generation
Additional comments:	n/a

<b>Relevant Indicator</b>	GS v2.2 Indicator 5: Fraud and cheating
<b>Data/parameter:</b>	Number of events of poor quality/fake stove production
Unit	n/a
Description	OCFCU checks the quality of stoves before transportation and rejects low quality stoves.
Measured/calculated/default	Measured
Source of data	Regular Monitoring and quality assurance process. Unannounced visits to producers.
Value(s) of monitored parameter	3 unannounced visits in the period January 2016 to December 2018 0 cases of poor quality (and rejection of stoves)
Monitoring equipment	n/a
Measuring/reading/recording frequency:	Continuously
Calculation method (if applicable):	n/a
QA/QC procedures:	Records of quality checks are stored electronically and on paper.
Purpose of data:	Estimation of fraud and cheating
Additional comments:	n/a

<b>Relevant Indicator</b>	GS v2.2 Indicator 6: Poor quality of stoves
<b>Data/parameter:</b>	Number of stove quality spot checks
Unit	n/a

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Description	Regular spot checks on randomly chosen stoves/households are performed to monitor the overall quality of stoves.
Measured/calculated/default	Measured
Source of data	Household spot checks performed by OCFCU and/or HoAREC-N
Value(s) of monitored parameter	124 visits to random households in the period January 2016 to December 2018 0 cases of poor quality
Monitoring equipment	n/a
Measuring/reading/recording frequency:	Periodically (quarterly)
Calculation method (if applicable):	n/a
QA/QC procedures:	Records of household visits are stored electronically and on paper.
Purpose of data:	Estimation of poor quality of stoves
Additional comments:	n/a

### D.3. Implementation of sampling plan

>> (If data and parameters monitored described in section D.2 above are determined by a sampling approach, provide a description on how project participants implemented the sampling plan and surveys for those data and parameters according to the approved PDD.)

#### Drawing of the random sample for monitoring $U_{p,y}$ and updating the Monitoring Survey (MS)

For the measurement/determination of the parameter  $U_{p,y}$  (usage rate of stoves) and for the update of the Monitoring Survey (MS) a sampling approach was followed. In order to minimize the monitoring effort, the **two monitoring surveys were performed on the same sample**. Furthermore, to reduce the effort and increase the response rate of monitoring a two-level sampling approach was followed:

1. Random drawing of 5 cooperatives per age group, with probability proportional to the number of households in the cooperatives belonging to the age group.
2. For each cooperative 8 (+4 backup) households were drawn randomly with equal probability.

As per the requirements for usage surveys of the TPDDTEC methodology the following boundary conditions were considered for the random drawing:

- a. "a usage parameter is required that is weighted to be representative of the quantity of project technologies of each age being credited"
- b. "The minimum total sample size is 100, with at least 30 samples for project technologies of each age being credited"
- c. "To ensure conservativeness, participants in a usage survey with technologies in the first year of use (age0-1) must have technologies that have been in use on average longer than 0.5 years. For technologies in the second year of use (age1-2), the usage survey must be

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*conducted with technologies that have been in use on average at least 1.5 years, and so on.”*

**Ad a.:** The household database was stratified into three age groups. Age group 1 consisted of 2,201 households that had received their stoves in the period 15/12/2015 to 31/12/2016. Age group 2 consisted of 1,230 households that had received their stoves 01/01/2017 to 31/12/2017. Age group 3 consisted of 1,362 households that had received their stoves 01/01/2018 to 31/12/2018.

**Ad b.:** To ensure that the required minimum sample sizes would be achieved oversampling was applied and random samples of 53, 60 and 50 households of AG1, AG2 and AG3 respectively were drawn.

**Ad c.:** For each age group only households with a deployment date in the first half of the respective calendar year were considered for the random drawing of the monitoring sample.

The sample was drawn using Microsoft Excel and the concrete procedure applied was as follows:

1. Ordering the 4,793 records of the sales database randomly using Excels rand() function
2. Selection (filtering) of 2,122 households where stoves had been installed in the first half of their respective year of deployment.
3. Drawing of AG1 sample
  - a. 1<sup>st</sup> Level: From the 24 cooperatives covered by the project 5 cooperatives were drawn with probability proportional to their representation (in terms of number of households) in the January-to-June-half of the age group, following the customary approach.<sup>2</sup>
  - b. 2<sup>nd</sup> Level: Selection of the first 8 (+4 backup) records from the top of the respective (randomly ordered) sub-list of the sales database for each of the 5 sample cooperatives.
  - c. For one of the cooperatives (Burqa Dongoro) there were only 5 households available in this age group. To compensate for this one additional household was added from each of the other 4 sample cooperatives.
4. Drawing of AG2 and AG3 samples similar to AG1
  - a. For the cooperative Siba Koche that was drawn for the AG3 sample only 2 households were available in the age group. To compensate for this 2 additional households were added from each of the other 4 sample cooperatives.

A recording of the random drawing is available for verification by the auditor.

### Fieldwork

To preserve the randomness of the sample the enumerators of the field team approached households strictly in the order of the sampling list of each age group. I.e., “back-up” households at the bottom of the list were only approached after unsuccessful visits/contact attempts with households from the top of the respective list. Exceptions were only made for logistical reasons,

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<sup>2</sup> See e.g. pag 28pp in Turner, A. G. (2003) *Sampling Strategies*, United Nations Secretariat, [https://unstats.un.org/unsd/demographic/meetings/egm/sampling\\_1203/docs/no\\_2.pdf](https://unstats.un.org/unsd/demographic/meetings/egm/sampling_1203/docs/no_2.pdf) (last accessed on 07/05/2019)

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e.g. when a household from the bottom of the list would be a neighbour of a household from the top and could conveniently be monitored along with the latter one. However, the monitoring results of such households would only be considered if and when they were actually deemed to be a monitoring household after failed visits/contact attempts with a respective number of households from the top of the list.

Furthermore, because of the tense security situation in some parts of the project area 6 interviews could only be performed by phone.

During the household visit the following routine was followed by the enumerators:

### Equipment

- 1 questionnaire
- 1 digital camera (or smartphone with camera)
- 1 GPS tracker (or smartphone with GPS app)

### Procedure

1. Administration of questionnaire, including the following sections:
  - a. Household information
  - b. Stove usage
  - c. Monitoring Survey (MS)
2. Taking of a picture of the kitchen/cooking place, showing:
  - a. The kitchen/cooking place
  - b. The project stoves
3. Recording of the GPS coordinates of the household

Finally, all questionnaires were encoded electronically into Excel and statistical analysis as per the requirements of the TPDDTEC methodology and registered PDD was performed.

### Results of statistical analysis: Usage Survey, measurement of $U_{p,y}$

Out of 163 households that were visited (or contacted by phone, in case of conflict zone households) 127 could be surveyed. Of the 36 households that could not be surveyed 6 were located in a conflict zone and could not be reached, 29 were not at home at the time of the visit and 1 had moved (within the project area).

In all of the 127 interviewed households both stoves, the Mirt and the Tikikil, were found. In 102 of these households the stoves were "in regular use" according to the definition of the project and the further condition of matching stove codes.<sup>3</sup> A breakdown of the number and percentages of households and usage cases by age group is provided in Table 2 below.

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<sup>3</sup> This additional condition was incorporated based on CAR 4 raised during verification. With regard to stove code verification a soft-match approach was followed. I.e., minor deviations, such as swapped digits, missing or additional leading 0s and inconsistent letters in the regional code at the beginning of stove codes do not constitute a mismatch.

**Table 2: Stove usage in the different age groups (according to "regular use" definition)**

Age Group	Regular use case? (% of AG)		Regular use case? (number of HHs)		Total number of monitored HHs
	FALSE	TRUE	FALSE	TRUE	
1	14.63%	85.37%	6	35	41
2	22.73%	77.27%	10	34	44
3	21.43%	78.57%	9	33	42
<b>Grand Total</b>	<b>19.69%</b>	<b>80.31%</b>	<b>25</b>	<b>102</b>	<b>127</b>

Finally, to arrive at an age-representative usage rate for the total population of stove bundles operational in the monitoring period, the usage rates have to be weighted by the number of devices of each age group in operation in the monitoring period.

The age-representative usage rate of the stove population operational in the monitoring period is then **81.36%**.

On the other hand, as discussed in Section C above it was not possible for OCFCU to implement the best practice requirements of the "GS Requirements and Guidelines for carrying out usage surveys for projects implementing improved cooking devices" in this monitoring period. Since the respective cap of 90% is greater than the monitored usage rate though no additional restrictions apply.

**Table 3: Age-representative usage rate**

	Age Group 1	Age Group 2	Age Group 3	Total
No. of households / stove bundles in DB <sup>4</sup>	2,201	1,230	1,362	4,793
				Weighted Average
Usage rate	85.37%	77.27%	78.57%	<b>81.36%</b>

## Results of statistical analysis: Monitoring Survey (MS) Update

The tables below summarize the results of the monitoring survey, including brief discussions where appropriate. Unless specified otherwise, e.g. where only results of a subset of relevant respondents are analysed, the results represent the responses of the 127 households that were found at home and were interviewed in the course of the combined monitoring campaign.

The average household size amongst respondents was 8.3 persons.

Number of people living in the household	
Children (0 - 14 y)	2.1
Women (15 - 59 y)	2.0
Men (15 - 59 y)	2.2
Women (> 59 y)	1.1

<sup>4</sup> Refer to monitoring parameter N<sub>p,y</sub>.

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Men (> 59 y)	1.0
<b>Total</b>	<b>8.3</b>

124 Mirt stoves were found to be in use according to the visual inspection of the enumerators, one was found to be broken and unusable, two were seemingly unused.

Condition of Mirt	
a. New/unused	2
b. Used - in good condition	122
c. Used - in bad condition, but still usable	2
d. Broken/unusable	1
<b>Grand Total</b>	<b>127</b>

125 of the 127 respondents reported to use their Mirt regularly, i.e. at least 2 times per week.

Mirt use (times per week)	
2	3.1%
3	3.9%
4	0.8%
5	2.4%
6	7.1%
7	81.1%
0	1.6%
<b>Grand Total</b>	<b>100.0%</b>

Nobody reported a different Mirt usage pattern for rainy or dry season.

Mirt: Same usage in DRY and RAINY season?	
Yes	127
<b>Grand Total</b>	<b>127</b>

126 Tikikil stoves were found to be in use according to the visual inspection of the enumerators, one was found to be broken and unusable.

Condition of Tikikil	
b. Used - in good condition	116
c. Used - in bad condition, but still usable	10
d. Broken/unusable	1
<b>Grand Total</b>	<b>127</b>

126 of the 127 respondents reported to use their Tikikil regularly, i.e. at least 2 times per week.

Tikikil use (times per week)
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2	1.6%
7	97.6%
0	0.8%
<b>Grand Total</b>	<b>100.0%</b>

7 users reported a different usage pattern of Tikikils for rainy and dry season but failed to provide any reasons. Interestingly, these households were all surveyed by the same enumerator. Therefore, these responses are likely to stem from a misreading (i.e. reverse interpretation) of the question by the enumerator.

Tikikil: Same usage in DRY and RAINY season?	
No	7
Yes	120
<b>Grand Total</b>	<b>127</b>

Only very few households still use any other cooking devices in addition to their Mirt and Tikikil stoves. 4 households are still using a 3-stone fire and another 2 are using a charcoal stove.

Other cooking devices used by households besides the project stoves		
	Number of HHs	Average usage (times/week)
3-stone fire	4	4.3
Charcoal stove	2	5
Electric stove	1	1

Not surprisingly the main fuel used by households is fuelwood. The average self-reported amount is 54.2 kg/week. 29% of households at least partially purchase their fuelwood, with an average expenditure of 80 Birr/week. The average distance travelled by members of the household (mostly women) to fetch wood is 2.6 km.

	% of HHs	Avg. FW consumption (kg/week)	Avg. FW expenses (Birr/week)	Avg. distance (km)
50/50	22%	62.1	76	1.8
Buy	7%	66.7	91	5.0
Collect	71%	50.4		2.8
<b>Grand Total</b>	<b>100%</b>	<b>54.2</b>	<b>80</b>	<b>2.6</b>

A comparatively large number of households (almost 50%) reports that they are saving on average 70 Birr/week with the new stoves compared to the baseline situation. This suggests that more users used to purchase fuelwood before the project and that the fuelwood savings realized with the project stoves allowed them to reduce mostly the purchased share of their fuelwood consumption.

Saving money?	% of HHs	Avg. savings (Birr/week)
Yes	49%	70
No	51%	



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Grand Total	100%	70
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Also, the savings in terms of time are sizable, with 80% of users reporting that they are saving on average 10.5 hours per week, thanks to faster cooking and less time spent on collecting fuelwood.

Saving time?	%	Avg. savings (hours/week)
Yes	80%	10.5
No	20%	
Grand Total	100%	10.5

### Project Performance Field Test (PFT) Update, measurement of $P_{p,y}$

For the measurement/determination of the parameter  $P_{p,y}$  (fuelwood consumption by households in the project scenario) a measurement campaign was performed by HoAREC with the supervision of German carbon consultancy Bridge Builders and logistical support of OCFCU in August 2018. A simple random (and randomly ordered) sample of 100 households was drawn via the Excel rand() function from the then 3,924 households in the project database. The target number of households for the campaign was 70. However, 30 additional households were drawn as backup for households that would not be able to participate in the tests (i.e. would not be at home for the full 4 days).

To preserve the randomness of the sample the enumerators of the field team approached households strictly in the order of the sampling list. Households at the bottom of the list were only approached after unsuccessful visits/contact attempts with households from the top of the respective list. Exceptions were only made for logistical reasons, e.g. when a household from the bottom of the list would be a neighbour of a household from the top and could conveniently be monitored along with the latter one. However, the monitoring results of such households would only be considered if and when they were actually deemed to be a monitoring household after failed visits/contact attempts with a respective number of households from the top of the list.

During the household visit the following routine was followed by the enumerators:

#### Equipment

- 1 questionnaire
- 1 electronic scale (hanging scale with min. 50 g precision and max. load of 20 kg)
- 1 set of ropes and container for the weighing

#### Day 0

1. Filling the qualitative section of the questionnaire
2. Filling the general information under Day 0 of the KPT section:
  - a. Date of the visit
  - b. Time of the visit
  - c. Last meal
  - d. Next meal
3. Separation of a stack of wood to be used for the measurements

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4. Weighing of the fuelwood
5. General instructions to the family regarding “normal cooking” during the period of the KPT and proper storage and separation of the assigned stack of wood.

## Days 1 and 2

1. Visit to the household at about the same time as on the previous day(s).
2. Weighing of the remaining stack of wood
3. Addition (and measurement) of additional wood to the remaining stack of wood, if necessary.

## Day 3

1. Visit to the household at about the same time as on the previous day(s).
2. Weighing of the remaining stack of wood
3. Taking note of any observations, irregularities or other comments on the KPT.

The household-level results of the 3-day kitchen performance tests for 70 households are provided in Table 4 below.

**Table 4: Mean daily fuelwood consumption of 70 households of the Project PFT Update**

HH ID	Avg. FW cons. of HH (kg/day)	HH ID	Avg. FW cons. of HH (kg/day)	HH ID	Avg. FW cons. of HH (kg/day)
775	13.7	3217	12.0	1996	9.0
2665	18.7	3080	10.0	2935	10.0
2125	12.7	655	10.0	2020	10.0
3912	11.3	1089	6.3	2245	10.0
2124	12.7	211	6.7	2945	18.0
3422	12.7	5	6.3	500	6.3
3679	12.0	1324	6.7	2178	7.0
3497	11.0	2539	7.3	2201	7.0
1665	14.0	1204	6.7	1138	9.3
3493	11.3	1277	7.3	213	9.0
972	12.8	1344	7.0	3221	6.7
3383	11.7	2425	11.7	3254	9.0
1463	12.0	781	11.0	2094	7.0
951	12.3	619	10.3	3349	9.0
1494	12.0	1359	7.7	3327	7.7
1426	12.7	2915	11.0	3312	8.3
1846	17.3	2847	7.0	156	7.3
1895	11.8	1934	9.7	309	8.7
903	10.3	3575	11.3	3230	9.3
555	17.7	806	12.0	3279	9.3
1872	14.7	846	10.0	704	8.7
562	13.3	3693	10.0	3293	8.3

895	13.7	1965	9.3		
1513	12.0	2268	10.0		

## Sample Sizing and Statistical Estimate of the Fuel or Emission Savings

According to the provisions of “Case of a Single Sample Test” of the TPPDDTEC methodology the Project PFT was analysed as a single data set, independently from the baseline default value. The **mean daily fuelwood consumption per household** that used the project stove bundle was **10.38 kg/HH/day**.

To prove the validity of the mean daily fuelwood consumption value obtained through sampling its relative precision needs to be calculated. For this calculation we follow the statistical method given in Appendix 4, par. 4 (p. 94pp) of the CDM Guideline “Sampling and surveys for CDM project activities and programmes of activities” (Version 04.0):

1. Calculate the standard error of the mean value that is being estimated (i.e. daily fuelwood consumption of households)

$$SE = \sqrt{(1 - f) \frac{s^2}{n}}$$

Where:

SE	Standard error of the mean
$s^2$	Sample variance (s is the sample standard deviation)
$f = \frac{n}{N}$	Sampling fraction – the proportion of the population that is sampled
N	Total population that is sampled
n	Sample size

2. Calculate the absolute precision of the sample

*Precision of estimate = t-value x SE*

The t-value depends on (i) the level of confidence and (ii) the sample size. It can be acquired from statistical tables for the t-distribution. It can also be derived in Excel using the TINV function.<sup>5</sup>

3. The relative precision is then calculated by dividing the absolute precision by the mean value

*Relative precision of estimate = precision / mean*

Applying these formulae to the daily fuelwood consumption values that were measured for the final sample of 70 households as shown in **Table 4** above yields the following results:

For calculating the sample variance, we use the Excel function VAR.S. Then:

<sup>5</sup> TINV(0.10,(sample size minus 1)) will give the t-value associated with 90% confidence.

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$$s^2 = 7.711070853$$

Inserting this value together with the known values for sample size  $n$  (70) and total population  $N$  (3,924) gives us the standard error:

$$SE = \sqrt{\left(1 - \frac{70}{3,924}\right) \frac{8.372095698}{70}} = 0.34273577$$

The t-value at 90% for a sample size of 70 is 1.667238549. Therefore, the precision of the estimate is:

$$1.667238549 \times 0.34273577 = 0.571422282$$

Dividing the absolute precision by the mean value of the sample of 10.38 kg/HH/day gives us the relative precision:

$$0.571422282 / 10.38 = \mathbf{5.5\%}$$

In other words, the precision of the mean daily fuelwood consumption per household of 10.38 kg/HH/day at 90% confidence is 5.5% and therefore **the 90/10 rule as per Option a. of the "Case of a Single Sample Test" statistical requirements is fulfilled.**

## SECTION E. Calculation of SDG outcomes

### E.1. Calculation of baseline value or estimation of baseline situation of each SDG outcome

>> (Provide details of equations and approaches used to calculate/estimate baseline values.)

Baseline emission calculations are conducted as follows, using the pertinent equations of the TPDDTEC methodology as presented in the registered PDD:

$$BE_{b,y} = B_{b,y} * \left( (f_{NRB,y} * EF_{b,wood,CO2}) + EF_{b,wood,nonCO2} \right) * NCV_{b,wood} \quad (3)$$

Where:

$BE_{b,y}$	Emissions for baseline scenario b during the year y in tCO <sub>2</sub> e
$B_{b,y}$	Quantity of fuelwood consumed in baseline scenario b during year y, in tons, as per by-default factor
$f_{NRB,y}$	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass
$NCV_{b,wood}$	Net calorific value of fuelwood (IPCC default of 0.015 TJ/ton)
$EF_{b,wood,CO2}$	CO <sub>2</sub> emission factor of fuelwood (IPCC default of 112 tCO <sub>2</sub> /TJ)
$EF_{b,wood,nonCO2}$	Non-CO <sub>2</sub> emission factor of fuelwood (IPCC default of 8.692 tCO <sub>2</sub> e/TJ)

$B_{b,y}$  shall be calculated according to the following formula:

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$$B_{b,y} = N_{p,y} * P_{b,y} \quad (4)$$

Where:

$N_{p,y}$	Project technology-days in the project database for project scenario p through year y
$P_{b,y}$	Quantity of fuelwood consumed by a household in baseline scenario b per day, in tons, as per by-default factor.

## E.2. Calculation of project value or estimation of project situation of each SDG outcome

>> (Provide details of equations and approaches used to calculate/estimate project values.)

Project emission calculations are conducted as follows, using the pertinent equations of the TPDDTEC methodology as presented in the registered PDD:

$$PE_{p,y} = B_{p,y} * \left( (f_{NRB,y} * EF_{p,wood,CO2}) + EF_{p,wood,nonCO2} \right) * NCV_{p,wood} \quad (5)$$

Where:

$PE_{p,y}$	Emissions for project scenario p during the year y in tCO <sub>2</sub> e
$B_{p,y}$	Quantity of fuelwood consumed in project scenario p during year y, in tons, as derived from the statistical analysis conducted on the data collected during the project performance field test
$f_{NRB,y}$	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass
$NCV_{p,wood}$	Net calorific value of fuelwood (IPCC default of 0.015 TJ/ton)
$EF_{p,wood,CO2}$	CO <sub>2</sub> emission factor of fuelwood (IPCC default of 112 tCO <sub>2</sub> /TJ)
$EF_{p,wood,nonCO2}$	Non-CO <sub>2</sub> emission factor of fuelwood (IPCC default of 8.692 tCO <sub>2</sub> e/TJ)

$B_{p,y}$  shall be calculated according to the following formula:

$$B_{p,y} = N_{p,y} * \left( (P_{p,y} * U_{p,y}) + (P_{b,y} * (1 - U_{p,y})) \right) \quad (6)$$

Where:

$N_{p,y}$	Project technology-days in the project database for project scenario p through year y
$P_{p,y}$	Quantity of fuelwood consumed by a household in project scenario p per day, in tons, as per project performance field test
$P_{b,y}$	Quantity of fuelwood consumed by a household in baseline scenario b per day, in tons, as per by-default factor
$U_{p,y}$	Cumulative usage rate for stove bundles in project scenario p during year y, based on cumulative installation rate and drop-off rate

## E.3. Calculation of net benefits as difference of baseline and project values or direct calculation for each SDG outcome

>>

### SDG 13: Climate Action

The overall GHG reductions achieved by the project activity are then calculated as follows, applying ex-ante and ex-post parameter values as per sections D.1 and D.2 to the equations given in sections E.1 and E.2:

$$ER_y = \sum BE_{b,y} - \sum PE_{p,y} - \sum LE_{p,y} \quad (7)$$

Where:

$ER_y$	Emission reduction for total project activity in year y (tCO <sub>2</sub> e/yr)
$BE_{b,y}$	Emissions for baseline scenario b during the year y in tCO <sub>2</sub> e
$PE_{p,y}$	Emissions for project scenario p during the year y in tCO <sub>2</sub> e
$LE_{p,y}$	Leakage for project scenario p during the year y in tCO <sub>2</sub> e

Table 5 below provides an overview of the input values for formulas (3), (4), (5) and (6) above:

**Table 5: Summary of ex-ante and ex-post values**

Parameters	Values as per sections D.1 and D.2	Unit
$P_{p,y}$	10.38	kg wood/HH/day
$P_{b,y}$	17.1	kg wood/HH/day
$fNRB_y$	88%	
$U_{p,y}$	81.36%	
$LE_{p,y}$	0	tCO <sub>2</sub> e
$NCV_{b,wood} / NCV_{p,wood}$	0.015	TJ/t wood
$EF_{b,wood,nonCO2} / EF_{p,wood,nonCO2}$	8.692	tCO <sub>2</sub> e/TJ
$EF_{b,wood,CO2} / EF_{p,wood,CO2}$	112	tCO <sub>2</sub> /TJ

Table 6 summarizes the baseline and project fuelwood consumption, baseline and project emissions, as well as the resulting overall emission reductions of the project in the monitoring period, calculated as per formulas (3), (4), (5) and (6) with the input values of Table 5 and the number of project technology days given in the monitoring parameter table of  $N_{p,y}$  in the respective periods.

**Table 6: Baseline and project fuelwood consumption, baseline and project emissions, emission reductions**

		01/01/2016 - 31/12/2016	01/01/2017 - 31/12/2017	01/01/2018 - 31/12/2018	Total in monitoring period
$N_{p,y}$	Days	438,602	989,525	1,448,579	2,876,706
$B_{b,y}$	t wood	7,500	16,921	24,771	49,192

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BE <sub>b,y</sub>	tCO <sub>2</sub> e	12,066	27,221	39,850	79,137
B <sub>p,y</sub>	t wood	5,102	11,511	16,851	33,464
PE <sub>p,y</sub>	tCO <sub>2</sub> e	8,208	18,518	27,109	53,835
ER <sub>y</sub>	tCO <sub>2</sub> e	3,858	<b>8,703</b>	<b>12,741</b>	<b>25,302</b>

### Small-scale threshold

From the data above it can also be deduced that the project is well within the small-scale threshold of maximum 180 GWh<sub>th</sub>/year energy savings. Table 7 below summarizes the aggregated yearly fuelwood savings of all project stoves in the monitoring period, i.e. the difference between B<sub>b,y</sub> and B<sub>p,y</sub>. The energy content of the saved fuelwood is then established by applying NCV<sub>b,wood</sub> to the amount of fuelwood and adjusted to GWh by using the conversion factor of 3.6 kJ/Wh (=TJ/GWh).

**Table 7: Thermal energy savings of the project**

		01/01/2016 - 31/12/2016	01/01/2017 - 31/12/2017	01/01/2018 - 31/12/2018	Total in monitoring period
Fuelwood savings	t wood	2,398	5,410	7,920	15,704
Energy savings (thermal)	GWh	9.99	22.54	33.00	65.43

### E.4. Summary of ex-post emission reductions for the current monitoring period

Item	Baseline estimate	Project estimate	Net benefit
Emission Reductions	79,137 tCO <sub>2</sub> e	53,835 tCO <sub>2</sub> e	<b>25,302 tCO<sub>2</sub>e</b>

### E.5. Comparison of actual emission reductions with estimates in approved PDD

Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
Emission Reductions	96,136 tCO <sub>2</sub> e	<b>25,302 tCO<sub>2</sub>e</b>

### E.6. Remarks on difference from estimated value in approved PDD

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## Gold Standard®

The main reason for the huge difference between PDD ex-ante emission reduction estimates and the actual values achieved is the much slower deployment rate of stoves. Ex-ante OCFCU estimated that they would be able to deploy 10,000 stoves (i.e. 5,000 stove bundles of Mirt and Tikikil) in 2016 and another 15,000 in 2017 and 2017 respectively each. In other words, it was expected that by the end of 2018 40,000 stoves (i.e. 20,000 stove bundles) would have been installed. The actual number achieved by the end of 2018 was 4,793 stove bundles or a total of 9,586 stoves (Mirt and Tikikil), i.e. less than a quarter of the target.

On the other hand, the ex-ante estimates for baseline fuel consumption, based on the methodologies default value of 0.5 t wood/person/year, and project fuel consumption, calculated based on rated efficiencies of the Mirt and Tikikil stoves, were completely unrealistic for the project area and circumstances. The accurate values established through the dedicated baseline fuelwood measurement (KPT) survey by the Ministry of Water, Irrigation and Energy in the target group of the project and the project performance field test conducted in the course of the monitoring campaign deviate from the estimates by factors of more than 2.5 and 3.5 respectively.

### SECTION F. Stakeholder inputs and legal disputes

#### F.1. List all inputs/grievances which have been received for the project during the monitoring period together with their respective answers/actions

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The updated input /grievance mechanism expression methods and details are given below:

	<b>Method Chosen</b>  (include all known details e.g. location of book, phone number)	<b>Justification</b>
Continuous Input / Grievance Expression Process Book	West Wollega Zone Cooperative Promotion Office, Room 2  PO Box 84, Gimbi Town near Grand Hotel on the road to Assossa	The cooperative office is centrally located to the project areas and is convenient for project households to access. This is also a secure and convenient place to store project documents for public access and to keep the continuous input book.



<p>Telephone access</p>	<p>Primary contact:</p> <p>Mr. Negusu Tefera (HoAREC carbon project facilitator)</p> <p>+251 91 177 5595</p> <p>Households can also provide feedback by directly calling their Development Agent (project's fieldworker), who will then convey the feedback to the central office for recording in the book.</p>	<p>Direct phone access is always possible for project households. However, since Development Agent (DAs) and kebele managers are found in each kebele, it is usually easier for the project households to pass their inputs and messages through them. The DAs will then pass on the message to the project coordinator, who will record the input in the Input/Grievance Expression Process Book.</p>
<p>Internet/email access</p>	<p>Primary contact:</p> <p>Mr. Negusu Tefera (HoAREC carbon project facilitator)</p> <p><a href="mailto:Negusu.tefera@gmail.com">Negusu.tefera@gmail.com</a></p> <p>Gold Standard contact:</p> <p><a href="mailto:info@goldstandard.org">info@goldstandard.org</a></p>	<p>Additional comments on the project can be submitted directly to HoAREC through the email address of the carbon project facilitator.</p>

No inputs or grievances have been received during this monitoring period.

**F.2. List all inputs/grievances from previous monitoring period where follow up action is to be verified in this monitoring period**

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n/a

This is the first monitoring period.

**F.3. Provide details of any legal contest or dispute that has arisen with the project during the monitoring period**

No legal contest or dispute has arisen with the project during this monitoring period.