



**Monitoring report form for CDM programme of activities
(version 01.0)**

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form for CDM programme of activities" at the end of this form.

MONITORING REPORT

Title of the programme of activities (PoA)	Fuel Efficient Stoves for Ethiopia Programme of Activity	
UNFCCC reference number of the PoA	10045	
Version number(s) of the PoA-DD(s) applicable to this monitoring report	2.2	
Coordinating/managing entity (CME)	World Food Programme Ethiopia	
Version number of this monitoring report	2.2	
Completion date of this monitoring report	22/07/2016	
Monitoring period number and dates covered by this monitoring report	1 st Monitoring period, 15/11/2014-14/11/2015	
Monitoring report number for this monitoring period	1	
Host Party(ies)	Host Party(ies) of the PoA	Is this a host Party to a specific-case CPA covered in this monitoring report?(yes/no)
	Federal Democratic Republic of Ethiopia	yes
Sectoral scope(s)	3: Energy Demand	
Selected methodology(ies)	AMS-II.G version 05. "Energy efficiency Measures in Thermal Applications of Non Renewable Biomass"	
Selected standardized baseline(s)	na	
Total amount of GHG emission reductions or net GHG removals by sinks for all specific-case CPAs in the PoA covered in this monitoring report	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0	24,458 tCO ₂

PART I - Programme of activities

SECTION A. Description of PoA

A.1. Brief description of the PoA

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a) Policy/measure or stated goal that the PoA seeks to promote

The objective of the Programme of Activities (PoA) is to distribute over 200,000 fuel efficient cooking stoves (improved cookstoves, called "ICSs" further on) to particularly rural households or institutions in Ethiopia.

Besides saving greenhouse gases, the programme aims at

- bringing wood consumption down so as to allow natural recovery of forests and/or reforestation to take place (Fuel Wood Use is the main driver for deforestation and greenhouse gas emissions in Ethiopia¹),
- diminishing Indoor Air Pollution from wood smoke and avoiding its harmful health consequences,
- diminishing the fuel wood bill for households

(b) Framework for the implementation of the proposed PoA

The Fuel Efficient Stoves for Ethiopia Programme of Activity is a voluntary initiative of the World Food Programme Ethiopia (WFP), who will act as CME. For the implementation of the programme, the WFP will cooperate with different governmental institutions of Ethiopia, such as Environmental Protection Agency (EPA), the Ministry of Agriculture and Rural Development (MoARD) and its local offices at the level of Woredas (administrative units at the municipal level), the Ministry of Water and Energy, the Ministry of Education, and the Ministry of Finance and Economic Development.

The PoA will facilitate the procurement of ICSs from domestic production so that the end user can obtain them for free or at prices below 50% of the unsubsidized price. Carbon revenues will be used to fund ICS distribution and to cover monitoring costs.

Households and possibly also institutions will be targeted, for example using the infrastructure within *Woredas* that are participating in the successful long-running MERET WFP programme (Managing Environmental Resources to Enable Transitions to more sustainable livelihoods). In case of households under the MERET framework, the MoARD at the *Woreda* level will buy ICSs, and development agents working for the MoARD will distribute the stoves in the *Kebeles* (administrative units at the village level). The WFP will provide 100% of funding to buy the ICSs from the producers. End users will receive ICSs for free or pay only a small contribution far below 50% of the unsubsidized price into a fund for the maintenance of stoves and community issues to be managed by *Woreda* offices.

¹ Environmental Protection Authority. 2003. *State of the Environment Ethiopia*. Addis Ababa: Environmental Protection Authority. <http://www.epa.gov.et/Download/Publications/State%20of%20Environment%20Report%20of%20Ethiopia-%202003.pdf>.

A.1.1. Generic CPA(s)

Title, identification/reference number and/or version number of the generic CPA(s) of the PoA	Sectoral scope(s)	Applied methodology(ies) or combination of methodologies and/or standardized baseline(s)
Generic component project activity (CPA) on ICS for households: Fuel Efficient Stoves for Ethiopia Programme of Activity CPA XXX	3: Energy Demand	AMS-II.G version 05. "Energy efficient Measures in Thermal Applications of Non Renewable Biomass"
Generic component project activity (CPA) on ICS for institutions: Fuel Efficient Stoves for Ethiopia Programme of Activity CPA xxx	3: Energy Demand	AMS-II.G version 05. "Energy efficient Measures in Thermal Applications of Non Renewable Biomass"

A.1.2. Specific-case CPA(s) covered in this monitoring report

Reference number of the specific-case CPA included in the PoA as of the end of this monitoring period	Title, identification/reference number and version number of the generic CPA to which the specific-case CPA applies	Crediting period dates of the specific-case CPA	Is this specific-case CPA covered in this monitoring report? (yes/no)
10045-0001	Generic component project activity (CPA) on ICS for households	15 Nov 2014 - 14 Nov 2021	yes

A.2. Contact information of the coordinating/managing entity (CME) and/or responsible persons(s)/entity(ies)

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The CME is the World Food Programme Ethiopia.

Contact information:

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World Food Programme Ethiopia Country office

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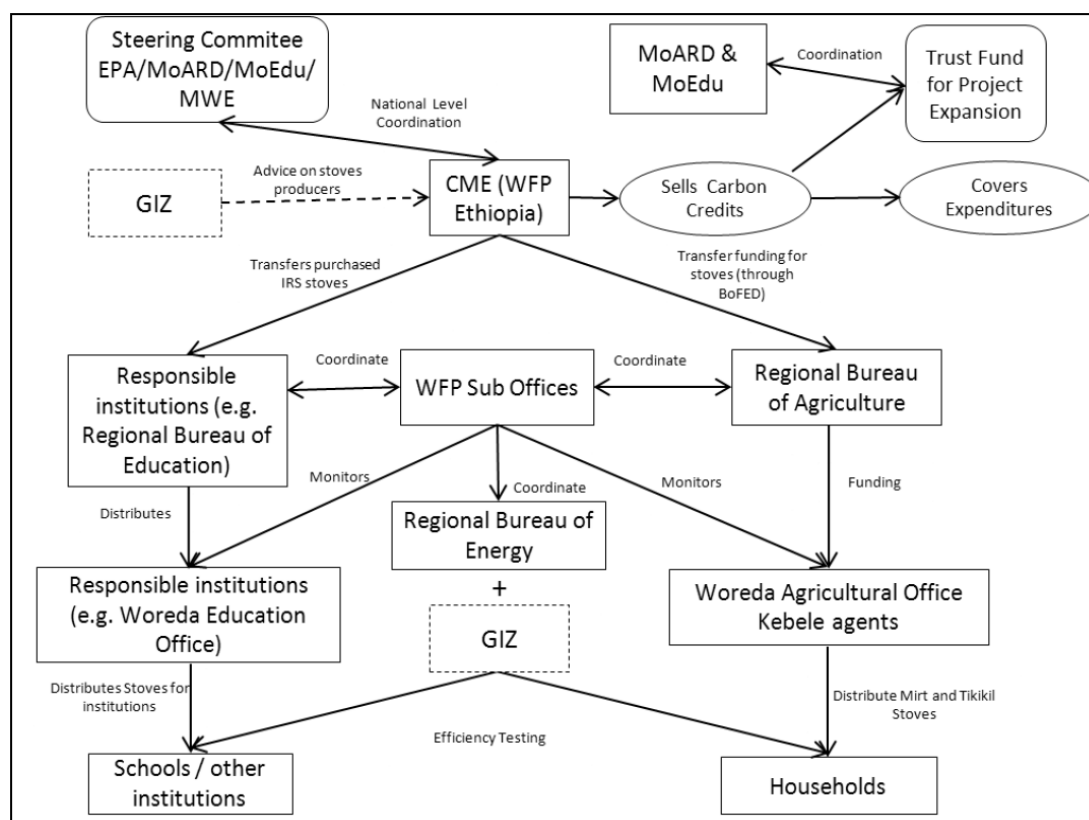
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SECTION B. Implementation of PoA**B.1. Implementation of the management system of the PoA****Management system**

>> The following diagram represents the planned management structure of the PoA as of the registered PDD and refers to the planned distribution of Mirt and Tikikil stoves to households and the possible distribution of other ICS to institutions such as schools (Figure 6). When implementing future CPAs, the structure may be amended and adapted.



Since the only included CPA targets distribution of stoves to households, the sections of the management system referring to schools are not applicable.

According to the validated management system, the WFP as the CME, was responsible for channeling funding for stove procurement, monitoring and selling CERs. The funding was transferred on 10/03/2014.

Funding for the first implementation phase was channeled through the regional level bureaus of Finance to the Regional Bureaus of the Ministry of Agriculture. The latter acknowledged the receipt of the money on 26/07/2014.

ICS distribution to households was conducted in cooperation with the *Woreda* offices of the Ministry of Agriculture, through development agents at the *Kebele* level. Distribution schedule was as follows:

Table distribution schedule of ICS:

Month of distribution	N _{Mirt} * distributed	N _{Tikikil} * distributed	N _{ISC} * distributed
Aug 14	1,398	1,398	2,796
Sep 14	1,212	1,212	2,424
Oct 2014	2,071	2,071	4,142
Nov 14	1,764	1,764	3,528
Dec 2014	900	900	1,800
Jan 2015	523	523	1,046
March 2015	872	872	1,744
Apr 15	908	908	1,816
May 2015	578	578	1,156
June 2015	429	429	858
July 2015	429	429	858
Total	11,084	11,084	22,168

*As defined in the registered CPA-DD, the subscript ICS always refers to both Mirt and Tikikil stoves. For example, N_{ICS}, the number of ICS distributed, refers to the sum of N_{Mirt}, the numbers of Mirt stoves distributed, and N_{Tikikil}, the number of Tikikil stoves distributed.

The CME has prepared a CPA Inclusion Management System that satisfies all criteria as outlined in EB 74 Annex 5, paragraph 19.

No additional CPA was included during Monitoring Period 1

Annual procedures, to be conducted together with annual monitoring campaigns

Records and documentation control process for each CPA under the PoA (monitoring and data manager).

No additional CPA was included. All stoves distributed are under CPA 1.

Procedure for regular training (coordinated by training focal point)

The CME or an entity assigned by the CME has conducted training and capacity building exercises for CME and implementing personnel as well as stove producers based on any identified needs to ensure that continuous improvements of the PoA management system are taking place.

Measures for continuous improvement of the PoA management system (General CME manager)

The CME holds meetings with staff (internal and with consultant) to review the performance of the PoA management system, in order to identify issues that need to be addressed for obtaining continuous improvements of the PoA management system.

Detailed description of specific parts of the management system

(i) A record keeping system for each CPA under the PoA

An electronic record keeping system for CPA 1 is operated and maintained by the managing entity. The system contains the following information:

- Name and ID of the CPA
- Technology deployed (Name of the ICS type or types)
- Details of the agents/institutions distributing ICS at the local level for the CPA
- Date of inclusion of the CPA
- Serial numbers (Stove-ID) of the ICSs belonging to the CPA
- Start of CPA crediting period

The following corresponding information to the stove IDs and ICS users required for monitoring, will be collected:

- Stove type
- Unique number (Stove-ID) of system
- Commissioning date of appliance (at the user's place)
- User details (Name, Address, etc.)
- Distributing Entity /Contact Person

The record keeping system was constantly updated as per the progress of the CPA and the distribution of the stoves.

Each ICS will start to generate emission reductions after the date of implementation in the user's household or the date of CPA inclusion, whichever is later. Stove implementation date is conservatively defined as one week after stove sales date, since users may need a few days to transport and install ICSs in their houses in order to properly use it.

Data will be kept for the whole crediting period of the CPA and for additional two years.

(ii) A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA

Procedure to avoid double counting:

The CME stated that the CPA has not been and will not be registered either as a single CDM project activity or as a CPA under another PoA.

The unique numbers allocated to each ICS under the PoA allow unique identification and tracking of the stove. Based on the serial numbers, a stove can only count in one CPA.

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

According to the “Guidelines on assessment of debundling for SSC project activities, v03 (EB 54, Annex 13, par. 10 for determining the occurrence of debundling under a Programme of Activities (PoA))”, the CPA of the PoA is exempted from performing a de-bundling check, i.e. considered as being not a de-bundled component of a large scale activity, if each of the independent subsystem/measures included in the CPA of a PoA is no larger than 1% of the small scale threshold defined by the methodology applied.

The small-scale threshold defined by the methodology applied, AMS-II.G, is 180 GWh thermal energy savings per year (threshold as per clarification request SSC_233). Thus, 1% corresponds to 1.8 GWh thermal energy savings per year.

The calorific value of each ton of firewood is assumed as 15 GJ/t (or 4.17 MWh/t, source: AMS-II.G). In order to reach the threshold of 1.8 GWh, an ICS would need to save over 400 tons of firewood ($1800 \text{ MWh} / 4.167 \text{ MWh/t} = 431.97 \text{ t}$) which is highly above the baseline values applied per household of 0.75 t annually (see generic CPA-DD section B.6.1).

B.2. Implementation of single sampling plan(s)

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Not applicable since only one CPA is registered under this PoA so far. Therefore, the sampling plan does not cover several specific case CPAs. Please find detailed information on the sampling plan and the single random sampling conducted for this CPA1 in section G.3 of part II of this monitoring report.

SECTION C. Post-registration changes to the PoA (including the generic CPA(s))

C.1. Corrections

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No corrections to project information or parameters fixed at validation have been approved during this monitoring period or submitted with this monitoring report.

C.2. Inclusion of a monitoring plan to the registered PoA-DD (including its generic CPA-DD(s)), if a monitoring plan was not included at the time of registration

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No inclusion of a monitoring plan to the registered PoA-DD (including its generic CPA-DD(s)), has been approved during this monitoring period or submitted with this monitoring report.

C.3. Permanent changes to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline

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No permanent changes to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline have been approved during this monitoring period or submitted with this monitoring report.

C.4. Changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA

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No changes of the Programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA have been approved during this monitoring period or submitted with this monitoring report.

C.5. Types of changes specific to afforestation and reforestation activities

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Not applicable

PART II - Specific-case component project activity(ies)

SECTION D. Description of specific-case CPA(s)

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D.1. Brief description of implemented specific-case CPA(s)

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a) Purpose of the specific-case CPA

The CPA entitled “Fuel Efficient Stoves for Ethiopia Programme of Activity CPA 001” consists in the distribution of a combination of two improved cookstoves (ICS) to particularly rural households: Slim type of Mirt stoves for *injera* baking (further only referred to as “Mirt stove”) and Tikikil rocket stoves for other cooking tasks. Both ICS types have efficiency improvements in thermal applications of non-renewable biomass as compared to the baseline technology, as per AMS-II.G, ver. 5. Generally, participating households will receive a pair of ICS, consisting in a Mirt stove and a Tikikil stove. However, the distribution of a single ICS to a household is possible under this CPA 1.

The purpose of the CPA 1 is to reduce GHG emissions and indoor air pollution by the dissemination of efficient cookstoves in households in Ethiopia.

The boundary of the CPA 1 will correspond to the national borders of Ethiopia.

b) Technologies, systems and equipment involved

The CPA consists in the distribution of a combination of two improved cookstoves (ICS) to households that are designed particularly for Ethiopian cooking habits. The stove types to be disseminated are:

- 1) fixed Mirt stoves (slim type, further only referred to as “Mirt stove”) designed for *injera* baking (Figure 1a),
- 2) Tikikil portable household cookstove for household cooking other than *injera* baking (Figure 1b)

It is planned to distribute 18,000 Mirt stoves and 18,000 Tikikil stoves under this CPA. The two stove types are distributed to households in pairs (one Mirt and one Tikikil stove).



Figure 1: a), b): Stove types disseminated within this CPA²

1) Mirt stoves (slim type) – Stoves for injera baking

Injeras are large flat breads made of teff flour or other cereals such as maize or barley. They are baked on a large plate, which is traditionally heated over a three stone fire with very low thermal efficiency. The Mirt stove (Figure 2) is a closed stove that allows for *injera* baking at highly improved efficiency; additionally, it allows for the simultaneous preparation of sauces. The Mirt stove is a structure of ~0.6 x 1.0 m made out of cement, sand and mud with an enclosed heating chamber and a biomass fuel inlet opening in its front (Figure 3). It has two heating zones: a big one for baking *injera* and a small one for cooking sauces or stews. Smoke is led out via an opening above the stove. It is locally manufactured in six pieces using metal moulds. The *Woreda* offices will buy the Mirt stoves and subsequently distribute the stoves to the end users. End users transport and install the stoves inside the kitchens after having been instructed by the MoARD staff.

In this CPA only the slim type of Mirt stove will be distributed. The slim Mirt has its quadrant parts as well as its 'U' chimney stack, and a wall thickness of all 4 cm. The chimney stack releases the smoke next to the wall where it rises and escapes through the roof. This leads to a significant reduction of indoor air pollution since traditionally, *injera* baking is done on three stone fires inside the house³; thereby larger quantities of smoke are generated and distributed all around the hut. The average lifetime of Mirt is about five to seven years⁴.

² GIZ (2011): GIZ Stove Projects in Kenya, Ethiopia, Uganda, Improved cookstove Colloquium, Nairobi, <https://energypedia.info/images/a/a6/GIZ.pdf>

³ Kebede, Faris. 2002. "Survey of Indoor Air Pollution Problems in the Rural Communities of Jimma, Southwest Ethiopia." *Ethiopian Journal of Health Science* 12 (1).

⁴ Bewket, Woldeamlak. 2011. Ethiopia's Climate-Resilient Green Economy and the Importance of Fuel Efficient Stoves. Submitted to WFP- Ethiopia Addis Ababa.



Smooth surface
of slim mirt stove



Figure 2: Mirt stove with baking plate (“mitad”) and cover⁵ and slim Mirt without baking plate⁶

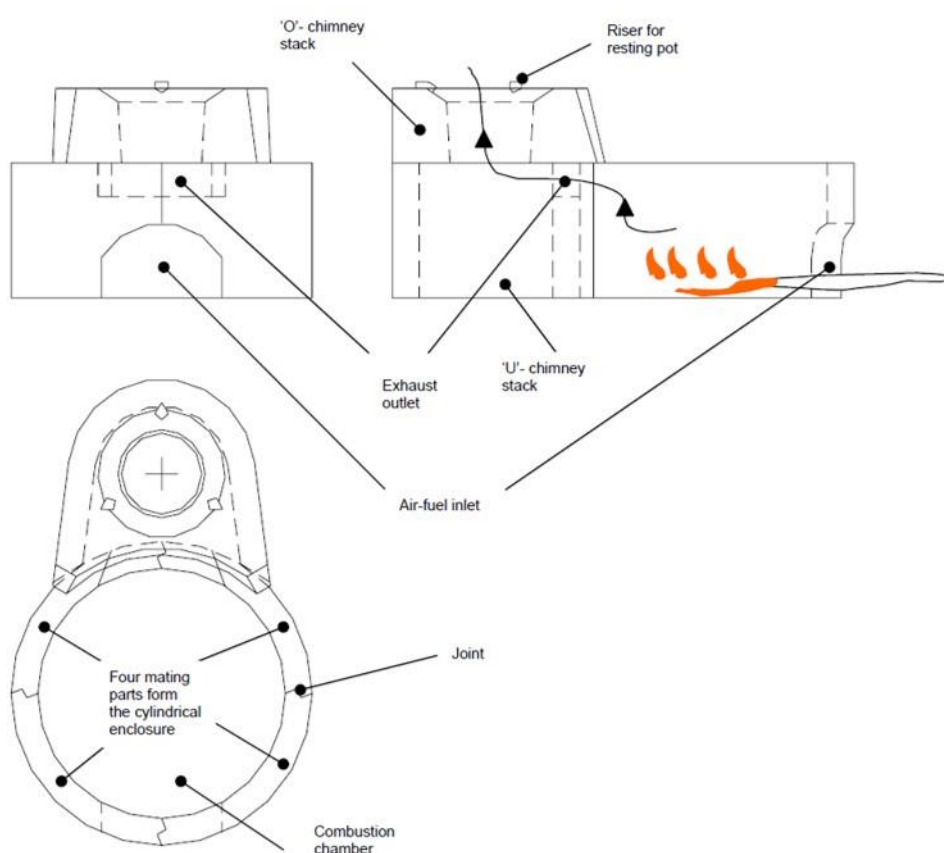


Figure 3: Orthographic views of Mirt stove (not to scale)⁷

2) Tikikil stove - Portable household cook stove

Tikikil stove is a rocket stove, which is used for cooking (Figure 4 a). It uses firewood as fuel, which is continuously fed to the combustion chamber. Tikikil is available in two types: single-skirt and double-

⁵GIZ HERA (2011): “Mirt Stove Ethiopia.”

https://energypedia.info/images/a/a0/GIZ_HERA_2012_Mirt_stove.pdf.

⁶ GTZ SUN ENERGY (2011)_Memo, Result of stove testing

skirt. Single-skirt Tikikil is designed to accommodate a 25 cm diameter pot (hence fixed size), which is a typical size used in most Ethiopian households. Double-skirt Tikikil can accommodate 27 cm and 31 cm diameters of pots. Smaller sized pots can also be accommodated but not with as much efficiency. Either of the types can be used for up to a 10 liters pot so long as it fits within the skirt⁷.

Both single and double skirt stoves have the same stove body, consisting of a cylindrical inner clay liner as combustion chamber, covered with galvanized sheet metal on the outside. The 4 cm thick liner has internal diameter of 11 cm and is 23.5 cm high. The total stove is 36 cm high. At its bottom is an 11 cm x 11 cm opening as fuel and air inlet. A fuel shelf made of a 6 mm steel round bar also constitutes part of the stove. The clay liner is produced by local potters while the metal cladding is done by metal artisans. The stove has a non-removable skirt. The fuel shelf is made up of a 5 mm radius round metal bar (Figure 4 b). Slight variations of the measures given here or small design changes are possible.

The skirt diameter is 27cm for the single-skirt stove and 29 cm and 33cm for the double-skirt model. No difference is expected in the lifetime of the two Tikikil models⁹.

According to GIZ HERA. 2011. "Tikikil Stove Ethiopia." Product information sheet, "conservative estimates suggest a life of 2 years for some of the stove parts such as the skirt and top plate which are exposed to high temperature and flame. These parts can easily be replaced whenever they wear"⁹.

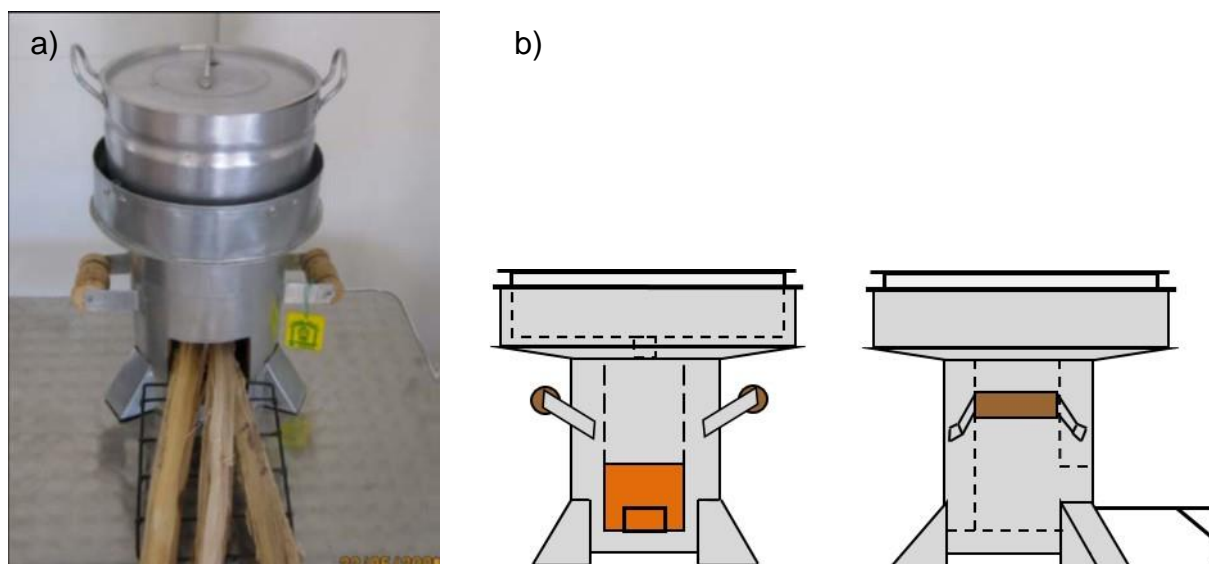


Figure 4: Photograph (a) and technical drawing (b) of Tikikil portable household cook stove.⁸

c) Relevant dates for the specific-case CPA (e.g. construction, commissioning, continued operation periods, etc.)

Date	Milestone
18/09/2013 – 17/09/2041	PoA duration
13/10/2014	PoA registration date and inclusion date of CPA #1
15/11/2014	Starting date of crediting period CPA 1
15/11/2014 – 14/11/2015	First Monitoring Period

⁸ GIZ HERA. 2011. "Tikikil Stove Ethiopia."
https://energypedia.info/images/2/2c/GIZ_HERA_2012_Tikikil_Stove_ET.pdf.

- d) Total GHG emission reductions or net GHG removals by sinks achieved in this monitoring period for the specific-case CPA(s), including information on how double counting is avoided.

CPA1: 24,458 t of CO₂e

Ensuring avoidance of double counting

Each ICS obtains a unique number which facilitates its identification in the data base and avoid double counting. These unique numbers are provided by the CME and were inserted in the distribution contract at the moment of distributing the stove.

The unique numbers are visible on the ICSs, by punching numbers on the stove material for Tikikil stoves. For Mirt stoves that are built-in, IDs are attached at the house where the Mirt stove is installed in.

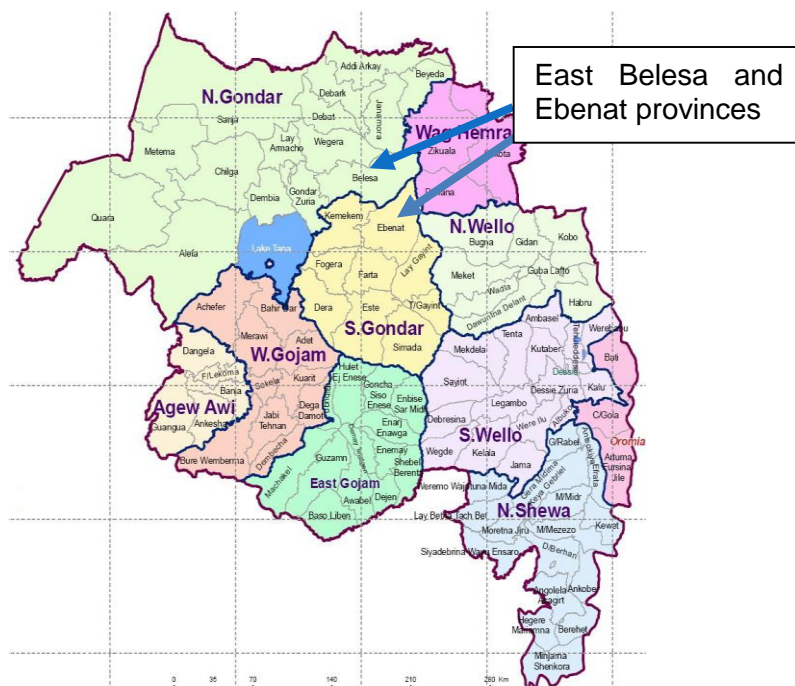
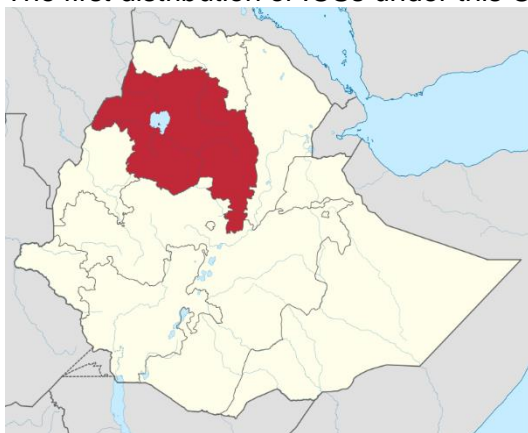
D.2. Geographical references or other means of identification of the location of the specific-case CPA(s)

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- (a) Host Party:
Federal Democratic Republic of Ethiopia

- (b) Region/ State/ Province:
The first distribution of ICSs under this CPA will occur in the Amhara region in the Woredas of East Belesa and Ebenat. Coordinates of the Amhara region are Latitude: 13.659960, Longitude: 36.449777 (upper left corner of Amhara Region).

- (c) City/ Town/ Community:
The first distribution of ICSs under this CPA took place in East Belesa and Ebenat.



Stove distribution in Amhara region of Ethiopia

(d) Physical/ Geographical location:

The geographical area within which this CPA 1 is implemented is the territory of the Federal Democratic Republic of Ethiopia.

SECTION E. Post-registration changes to specific-case CPA(s)**E.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline**

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No temporary deviation from the registered monitoring plan or applied methodology have been applied during this monitoring period.

E.2. Corrections

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No correction has been made

E.3. Changes to the start date of the crediting period of the specific-case CPA(s)

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No changes to the start date of the crediting period have been approved during this monitoring period or are submitted with this monitoring report

E.4. Inclusion of a monitoring plan into the specific-case CPA(s) that was not included at registration

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No inclusion of a monitoring plan into the specific-case CPA(s) that was not included at registration has been approved during this monitoring period or submitted with this monitoring report.

E.5. Permanent changes to the monitoring plan as described in the registered specific-case CPA-DD(s), applied methodology or standardized baseline

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No permanent changes to the monitoring plan as described in the registered specific-case CPA-DD(s), applied methodology or standardized baseline have been approved during this monitoring period or submitted with this monitoring report.

E.6. Changes to project design of the specific-case CPA(s)

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No changes to project design of the specific-case CPA(s) have been approved during this monitoring period or submitted with this monitoring report.

E.7. Types of changes specific to afforestation and reforestation specific-case CPA(s)

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Not applicable

SECTION F. Description of the monitoring system of specific-case CPA(s)

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There is a continuous documentation of all ICS distributions in a centralized database. For the preparation of monitoring reports, samples were drawn from the centralized database and the corresponding stoves were examined regarding efficiency and usage.

The CME holds the responsibility for all procedures related to monitoring, but cooperates with regional or local institutions involved in ICS distribution.

The flow chart below describes the general monitoring procedure (see Figure below).

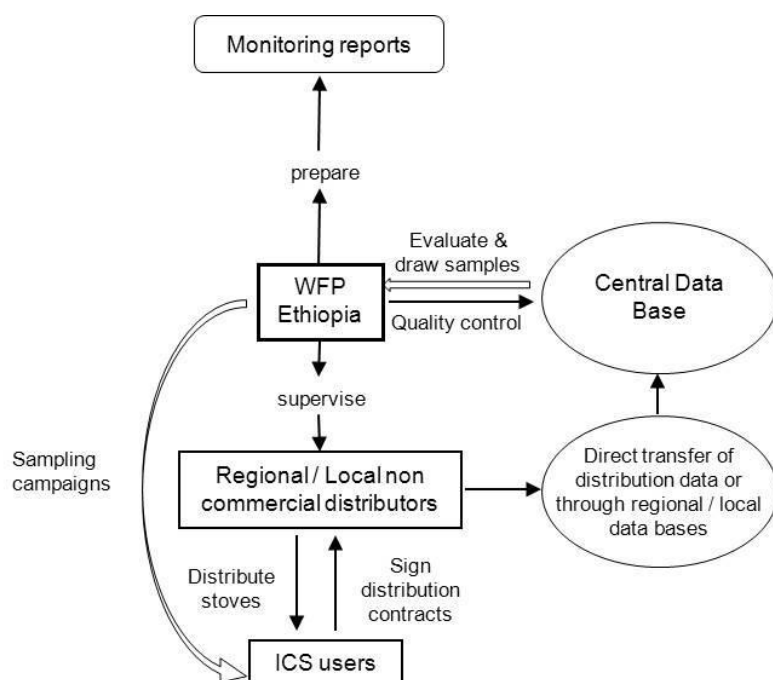


Figure: Flow chart of monitoring procedure

Central databases

Central database is operated and maintained by the CME to ensure completeness and accuracy of monitoring information

The basic information included is:

- Stove type
- Unique number (Stove-ID) of system
- Distribution date of appliance
- User details (Name, Address, etc.)
- Distributing Entity /Contact Person

The information in these databases is updated continuously, whenever new data (distribution contracts) are available. Original copies of the distribution contracts (or whatever format is used to collect the data required) are kept and maintained for two years after the end of the crediting period.

Example of the fields of an electronic database for household distribution

Stove type	Stove ID	Date of distribution	Region	Woreda	Kebele	End user Name	End user address	End user Phone (if available)	GPS coordinates (if available)	Kebele Agent
XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX

Stove IDs

Each ICS obtains a unique number which facilitates its identification in the data base and avoid double counting. These unique numbers are provided by the CME and are inserted in the distribution contract at the moment of distributing the stove.

The unique numbers are made visible on the ICSs, by punching numbers on the stove material for Tikikil stoves. For Mirt stoves that are built-in, IDs are attached at the house where the Mirt stove is installed in.

Physical labels shall facilitate stove identification and shall be used where possible, but identification may also be achieved through other data indicated in the data base in the case of the built-in Mirt stoves.

Sampling campaigns

Sampling campaigns consist in generating extracts of the central database for checks in order to prepare the monitoring reports. A representative number of ICSs was selected randomly for site visits in order to check the following monitoring parameters:

- operability (yes/no), in order to determine the drop-out rates for a specific stove ($DO_{ICS,y}$). Under this parameter, it will also be monitored that traditional stoves are not used for cooking purposes anymore. Please note that traditionally the householders may use the baseline stove for non-cooking purposes such as the production of alcohol, therefore the proportion of fuel wood consumed by cooking for each stove type is factored into the calculation of 49.91% (for Injera baking) and 41.50% (for other cooking) to ensure that the emissions arising from cooking activities only will be considered for emissions reduction calculations. Where continued use of baseline stoves for cooking is detected, the corresponding ICS will be counted as drop-out.
- thermal efficiency ($\eta_{Tikiki,y}$) and specific fuelwood consumption ($SC_{Mirt,y}$) of a specific stove, tested according to the Water Boiling Test protocol, or the Controlled Cooking Test respectively.

Different sample sizes can be selected for each of these parameters.

SECTION G. Data and parameters

G.1. Data and parameters fixed ex ante, at registration, inclusion or renewal of crediting period

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

Data / Parameter	cons_{capita,HH}
Unit	Tonnes/year
Description	Quantity of biomass per capita consumed in households in absence of the project activity per person and year
Source of data	Official sources are used for the total fuelwood consumption in Ethiopia in m ³ , average wood density and the population of Ethiopia, all for 2007. (http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW%3btrID%3a06) and the wood density factor as given by the FAO (http://www.fao.org/docrep/009/j8227e/j8227e11.htm#P1131_70563) This is the population of Ethiopia at the time of the last census in 2007 (http://www.csa.gov.et/surveys/Population%20and%20Housing%20census/ETH-pop-2007/survey0/data/Doc/Reports/National_Statistical.pdf)
Value(s) applied	0.75
Choice of data or Measurement methods and procedures	The value is derived by multiplying the total fuelwood consumption in m ³ with the density factor and then dividing by the population: cons_{capita,HH} = 76,311,000m ³ * 0.725t/m ³ / 73,750,932
Purpose of data	Calculation of baseline emissions

Additional comment	Applicable when CPA includes households
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Data / Parameter	SC_{old}
Unit	g/kg
Description	Specific fuelwood consumption of the baseline system (three stone fire) for injera baking
Source of data	CCT Results: Open Fire (specific fuel consumption). Please refer to page 6 of GTZ-SUN Energy (2011): Energy Mirt stove test report.
Value(s) applied	1,031
Choice of data or Measurement methods and procedures	The use of a pre-existing test report produced by GTZ-SUN: Energy for traditional open fires have been used to determine SC_{old} The same value is used in the registered PoA 9769 on Mirt stove distribution in Ethiopia
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable for Mirt stoves

Data / Parameter	η_{old}
Unit	%
Description	Efficiency of the baseline system being replaced
Source of data	AMS-II G, version 5 default value
Value(s) applied	0.10
Choice of data or Measurement methods and procedures	According to AMS-II.G., ver. 5 a default value of 0.10 can be used "if the replaced system is the three stone fire or a conventional system lacking improved combustion air supply mechanism and flue gas ventilation system i.e., without a grate as well as a chimney".
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable for all ICS

Data / Parameter	$EF_{projected_fossilfuel}$
Unit	tCO ₂ /TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data	AMS II G., ver. 5 default value for fossil substitution fuels.
Value(s) applied	81.6
Choice of data or Measurement methods and procedures	According to AMS-II.G, ver. 5, par.11, the value of 81.6 t CO ₂ /TJ is to be taken as emission factor for the substitution fuel likely to be used instead of fuelwood
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$f_{NRB,y}$
Unit	%
Description	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass

Source of data	UNFCCC default value
Value(s) applied	88
Choice of data or Measurement methods and procedures	UNFCCC default value
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	L_y
Unit	Fraction
Description	Leakage adjustment factor
Source of data	Default value
Value(s) applied	0.95
Choice of data or Measurement methods and procedures	According to AMS-II G ver 5: Para 20, B_{old} can be multiplied by a net to gross adjustment factor 0.95 to account for leakage in which case surveys are not required.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$FW_{Mirt,y}$
Unit	%
Description	The proportion of household fuel wood consumed by Mirt stove, used as a discount factor for continued use of baseline stoves or non-Mirt stoves in the monitoring period y .
Source of data	Letter from the Alternative Energy Technology Promotion And Dissemination Directorate, Ministry of Water and Energy, The Federal Democratic Republic of Ethiopia, from 10/01/2013.
Value(s) applied	49.91
Choice of data or Measurement methods and procedures	Mirt stoves are fixed stoves exclusively used for a specific purpose: baking <i>injera</i> and preparing sauces. All over Ethiopia, injera is the staple food. Therefore an average percentage can be given for fuelwood use for injera baking.
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable when CPA includes the distribution of Mirt stoves to households.

Data / Parameter	$FW_{Tikil,y}$
Unit	%

Description	The proportion of household fuel wood consumed by Mirt stove, used as a discount factor for continued use of baseline or non-Tikikil stoves in the monitoring period y.
Source of data	Letter from the Alternative Energy Technology Promotion And Dissemination Directorate, Ministry of Water and Energy, The Federal Democratic Republic of Ethiopia, from 10/01/2013.
Value(s) applied	41.50
Choice of data or Measurement methods and procedures	Tikikil stoves are suitable for all cooking tasks except from <i>injera</i> baking, therefore, it is sensible to use an average value. The official letter from the Alternative Energy Technology Promotion And Dissemination Directorate, Ministry of Water and Energy, confirms the survey results from the Woody Biomass Inventory and Strategic Planning Project (WBISPP) for other types of cooking.
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable when CPA includes the distribution of Tikikil stoves to households.

Data / Parameter	<i>eaters_{HH}</i>
Unit	-
Description	Average number of eaters (residents) per household
Source of data	UN Data
Value(s) applied	6
Choice of data or Measurement methods and procedures	An average household size of 6 based on a fertility rate of 3.9 live births per woman in 2010-2015, as per UN Data available at: http://data.un.org/CountryProfile.aspx?crName=Ethiopia . It is assumed that households are composed of two adults and four children on average. This is conservative, since no other adult household members are considered for the household size. The same value is used in the registered PoA 9769 on Mirt stove distribution in Ethiopia.
Purpose of data	Calculation of baseline emissions
Additional comment	-

G.2. Data and parameters monitored

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

Data / Parameter	<i>SC_{Mirt,y}</i>
Unit	g/kg
Description	Specific fuel consumption in year y of the Mirt stove as part of the project that is fuel consumption per quantity of item/s processed (e.g. food cooked)
Measured/calculated/default	Calculated from Sampling campaign results
Source of data	Sampling campaign. The data will be derived from applying the CCT CCT protocol version 2.0 as by AMS-II.G to a representative sample of Mirt stoves distributed.
Value(s) of monitored parameter	405.80

Monitoring equipment	<p>As per paragraph 12 and 23(c) of AMS-II.G Version 5.0.</p> <p>The CCT will be carried out in accordance with national standards (if available) or international standards or guidelines (e.g. the CCT procedures specified by the Partnership for Clean Indoor Air (PCIA) <http://www.pciaonline.org/node/1050>)</p> <p>The equipment used for the CCT will fulfill the accuracy and calibration requirements stated in CCT protocol version 2.0 and in the EB 79 Annex 3: Project standard vers.07 par 64 f:</p> <table><tr><td></td><td>Weighscale</td><td>Thermometer</td></tr><tr><td>Accuracy</td><td>± 1 gramm</td><td>Not specified</td></tr><tr><td>Calibration</td><td colspan="2">According to the EB 65 Annex 5: Project standard vers.07 par 64 f: equipment is calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.</td></tr></table> <p>Weigh scale: The weigh scale used for the monitoring was purchased on 20.10.2015 and was calibrated by the manufacturer MyWeigh. Efficiency tests have been carried out between 26.11.2015 and 03.12.2015. Prior to the conduction of the monitoring the monitoring team conducted a calibration check to make sure the scale is correctly calibrated. The test revealed an accuracy of below ± 1 gramm.</p> <p>Thermometer: The calibration requirements for the thermometer are not specified in the CCT protocol version 2.0, since it is only used for determination of ambient air temperature. However, we used the same thermometer as for the WBT. For this thermometer an accuracy of 0.5 °C was shown. Please see below.</p>		Weighscale	Thermometer	Accuracy	± 1 gramm	Not specified	Calibration	According to the EB 65 Annex 5: Project standard vers.07 par 64 f: equipment is calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.	
	Weighscale	Thermometer								
Accuracy	± 1 gramm	Not specified								
Calibration	According to the EB 65 Annex 5: Project standard vers.07 par 64 f: equipment is calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.									
Measuring/reading/recording frequency	Once for this monitoring period (i.e. annual inspection at 90/10 confidence/precision since monitoring period = 1 year and no across CPA sampling)									

Calculation method (if applicable)	<p>The applied value is the average from 14 CCT tests.</p> <table border="1"> <thead> <tr> <th>Serial number of Mirt stove</th><th>Specific fuel consumption</th></tr> </thead> <tbody> <tr><td>AEA0439</td><td>431.04</td></tr> <tr><td>AEBD651</td><td>453.02</td></tr> <tr><td>AEBG263</td><td>533.54</td></tr> <tr><td>AEBG279</td><td>407.78</td></tr> <tr><td>AEBK180</td><td>364.18</td></tr> <tr><td>AEBK339</td><td>582.17</td></tr> <tr><td>AED0086</td><td>314.08</td></tr> <tr><td>AED0925</td><td>339.87</td></tr> <tr><td>AED1097</td><td>303.49</td></tr> <tr><td>AEJ0161</td><td>387.09</td></tr> <tr><td>AEM0124</td><td>403.44</td></tr> <tr><td>AEM0588</td><td>471.21</td></tr> <tr><td>AEM0771</td><td>363.00</td></tr> <tr><td>AEZ0921</td><td>327.25</td></tr> <tr> <td>Average</td><td>405.80</td></tr> </tbody> </table>	Serial number of Mirt stove	Specific fuel consumption	AEA0439	431.04	AEBD651	453.02	AEBG263	533.54	AEBG279	407.78	AEBK180	364.18	AEBK339	582.17	AED0086	314.08	AED0925	339.87	AED1097	303.49	AEJ0161	387.09	AEM0124	403.44	AEM0588	471.21	AEM0771	363.00	AEZ0921	327.25	Average	405.80
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QA/QC procedures	<p>All formulae applied to determine the statistical precision are standard formula. Furthermore, according to AMS-II.G., par.28 the sampling error has to be deducted (“...the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen...”) in the event that 90/10 or 95/10 precision could not be achieved because of a small sample size. No deductions have to be made if 90/10 or 95/10 precision is achieved by sampling an appropriate number of appliances.</p> <p>Data will be collected using the standard procedures and will be stored for the CPA crediting period and an additional two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.</p> <p>A traceable “identity check” of the appliances visited during sampling will be performed and recorded (e.g. a picture of the appliance clearly showing its serial no., etc.).</p> <p>Cross-checks: The monitoring team will cross-check results with literature values, or specifications from manufacturer, if available.</p> <p>Results of the CCT will be stored in an electronic database and will be stored for a minimum of 2 years after the end of the crediting period of the CPA.</p>																																
Purpose of data	Calculation of baseline emissions																																
Additional comment																																	

Data / Parameter	$\eta_{Tikil,y}$
Unit	Fraction
Description	Thermal efficiency of the Tikikil stoves deployed in monitoring period y. This parameter is monitored during the crediting period.

Measured/calculated/default	Calculated from Sampling campaign results.									
Source of data	Sampling campaign. The data will be derived from applying the WBT ver. 4.2.3 ⁹ as by AMS-II.G to a representative sample of Tikikil stoves distributed.									
Value(s) of monitored parameter	30.65%									
Monitoring equipment	<p>The equipment used for the WBT fulfills the accuracy and calibration requirements stated in WBT protocol version 4.2.3 and in the EB 79 Annex 3: Project standard vers.07 par 64 f:</p> <table border="1"> <thead> <tr> <th></th><th>Weighscale</th><th>Thermometer</th></tr> </thead> <tbody> <tr> <td>Accuracy</td><td>± 1 gramm</td><td>0.5 °C</td></tr> <tr> <td>Calibration</td><td colspan="2">According to the EB 65 Annex 5: Project standard vers.07 par 64 f: equipment is calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.</td></tr> </tbody> </table> <p>Weigh scale: The weigh scale used for the monitoring was purchased on 20/10/2015 and was calibrated by the manufacturer. Efficiency tests have been carried out between 26/11/2015 and 03/12/2015. Prior to the conduction of the efficiency tests, the monitoring team conducted a calibration check to make sure the scale is correctly calibrated. The test revealed a accuracy of below ± 1 gramm.</p> <p>Thermometer: The Greisinger thermometer GMH3710 used for the monitoring (Serial number 32403915) was bought on 21/10/2015 and was calibrated by the manufacturer stating an accuracy of ± 0.03 °C ± 1 diget. Prior to the conduction of the monitoring survey the monitoring team conducted a calibration check to make sure the thermometer is correctly calibrated. The test from 24/11/2015 revealed a accuracy of well below ± 0,5 °C. Efficiency tests have been carried out between 26/11/2015 and 03/12/2015.</p>		Weighscale	Thermometer	Accuracy	± 1 gramm	0.5 °C	Calibration	According to the EB 65 Annex 5: Project standard vers.07 par 64 f: equipment is calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.	
	Weighscale	Thermometer								
Accuracy	± 1 gramm	0.5 °C								
Calibration	According to the EB 65 Annex 5: Project standard vers.07 par 64 f: equipment is calibrated either in accordance with the local/national standards, or as per the manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.									
Measuring/reading/recording frequency	Once for this monitoring period (i.e. annual inspection at 90/10 confidence/precision since monitoring period = 1 year and no across CPA sampling)									

⁹ <http://www.cleancookstoves.org/our-work/standards-and-testing/learn-about-testing-protocols/>

Calculation method(if applicable)	The applied value is the average from 11 WBT tests.	
	Serial number of Tikikil stove	Thermal efficiency
	AEBD651	28.72%
	AEBG263	35.44%
	AEBG279	29.13%
	AEBK180	31.17%
	AEBK339	29.36%
	AED0086	29.58%
	AED0925	28.36%
	AED1097	27.99%
	AEJ0161	36.14%
	AEM0588	30.95%
	AEZ0921	30.30%
	Average	30.65%
QA/QC procedures	<p>Results of the WBT will be stored in an electronic database and will be stored for a minimum of 2 years after the end of the crediting period of the CPA.</p> <p>All formulae applied to determine the statistical precision are standard formula. Furthermore, according to AMS-II.G., par.28 the sampling error has to be deducted (“...the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen...”) in the event that 90/10 or 95/10 precision could not be achieved because of a small sample size. No deductions have to be made if 90/10 or 95/10 precision is achieved by sampling an appropriate number of appliances.</p> <p>Data will be collected using the standard procedures and will be stored for the CPA crediting period and an additional two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.</p> <p>A traceable “identity check” of the appliances visited during sampling shall be performed and recorded (e.g. a picture of the appliance clearly showing its serial no., etc.).</p> <p>Cross-checks: The monitoring team will cross-check results with literature values, or specifications from manufacturer, if available.</p>	
Purpose of data	Calculation of baseline emissions	
Additional comment		

Data / Parameter	$N_{Mirt,y}$
Unit	n/a
Description	Number of efficient Mirt stoves distributed until the end of the monitoring period y adjusted by implementation dates. The adjustment accounts for the fact that stoves do not start to save CO ₂ simultaneously, but each stove starts saving CO ₂ as soon as it is sold and implemented.
Measured/calculated/default	Measured and adjustment calculation
Source of data	Sales Record Database
Value(s) of monitored parameter	9,271
Monitoring equipment	n.a
Measuring/reading/recording frequency	Continuously updated in the distribution database. Adjustment calculation Once for this monitoring period (i.e. annual monitoring)

Calculation method(if applicable)	$N_y = \sum_{i=1}^{i=I_y} \frac{daystotal}{mp_{length}}$ <p>Where: I_y total number of Mirt stoves distributed till the end of the monitoring period y $daystotal_i$ sum of days since appliance i has been operational in the monitoring period y. Start of operation is assumed as one week after sales.</p>
QA/QC procedures	Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to CPAs including Mirt stoves

Data / Parameter	$N_{Tikil,y}$
Unit	n/a
Description	Number of efficient Tikikil stoves distributed until the end of the monitoring period y adjusted by implementation dates. The adjustment accounts for the fact that stoves do not start to save CO ₂ simultaneously, but each stove starts saving CO ₂ as soon as it is sold and implemented.
Measured/calculated/default	Measured and adjustment calculation
Source of data	Sales Record Database
Value(s) of monitored parameter	9,271
Monitoring equipment	n.a
Measuring/reading/recording frequency	Continuously updated in the distribution database. Adjustment calculation Once for this monitoring period (i.e. annual monitoring)
Calculation method(if applicable)	$N_y = \sum_{i=1}^{i=I_y} \frac{daystotal}{mp_{length}}$ <p>Where: I_y total number of Tikikil stoves distributed till the end of the monitoring period y $daystotal_i$ sum of days since appliance i has been operational in the monitoring period y. Start of operation is assumed as one week after sales.</p>
QA/QC procedures	Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.
Purpose of data	Calculation of baseline emissions
Additional comment	Applicable to CPAs including Tikikil stoves

Data / Parameter	DO_{Mirt,y}
Unit	%
Description	Discount factor, statistically adjusted drop out from total population of a specific Mirt stoves in period y
Measured/calculated/default	Monitored during the sampling campaign.
Source of data	Sampling campaign
Value(s) of monitored parameter	0 %
Monitoring equipment	n.a
Measuring/reading/recording frequency	Once for this monitoring period (i.e. annual inspection at 90/10 confidence/precision since monitoring period = 1 year and no across CPA sampling)
Calculation method(if applicable)	All formulae applied to determine the statistical precision are standard formula. Furthermore, according to AMS-II.G., par.28 the sampling error has to be deducted (<i>"...the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen..."</i>) in the event that 90/10 or 95/10 precision could not be achieved because of a small sample size. No deductions have to be made if 90/10 or 95/10 precision is achieved by sampling an appropriate number of appliances.
QA/QC procedures	Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. A traceable "identity check" of the appliances visited during sampling shall be performed and recorded (e.g. a picture of the appliance clearly showing its serial no., etc.).
Purpose of data	Calculation of baseline emissions
Additional comment	Under this parameter, it will also be monitored that traditional stoves are not used for daily cooking purposes anymore. Please note that traditionally the householders may use the baseline stove for non-daily cooking purposes such as the production of alcohol, therefore the proportion of fuel wood consumed by cooking for each stove type is factored into the calculation of 49.91% (for Injera baking) and 41.50% (for other cooking) to ensure that the emissions arising from cooking activities only will be considered for emissions reduction calculations. Where continued use of baseline stoves for daily cooking is detected, the corresponding ICS will be counted as drop-out.

Data / Parameter	DO_{Tikil,y}
Unit	%
Description	Discount factor, statistically adjusted drop out from total population of a specific Tikikil stoves in period y
Measured/calculated/default	Monitored during the sampling campaign.
Source of data	Sampling campaign
Value(s) of monitored parameter	3.33%
Monitoring equipment	n.a

Measuring/reading/recording frequency	Once for this monitoring period (i.e. annual inspection at 90/10 confidence/precision since monitoring period = 1 year and no across CPA sampling)
Calculation method(if applicable)	All formulae applied to determine the statistical precision are standard formula. Furthermore, according to AMS-II.G., par.28 the sampling error has to be deducted (" <i>...the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen...</i> ") in the event that 90/10 or 95/10 precision could not be achieved because of a small sample size. No deductions have to be made if 90/10 or 95/10 precision is achieved by sampling an appropriate number of appliances.
QA/QC procedures	Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. A traceable "identity check" of the appliances visited during sampling shall be performed and recorded (e.g. a picture of the appliance clearly showing its serial no., etc.).
Purpose of data	Calculation of baseline emissions
Additional comment	Under this parameter, it will also be monitored that traditional stoves are not used for daily cooking purposes anymore. Please note that traditionally the householders may use the baseline stove for non-daily cooking purposes such as the production of alcohol, therefore the proportion of fuel wood consumed by cooking for each stove type is factored into the calculation of 49.91% (for Injera baking) and 41.50% (for other cooking) to ensure that the emissions arising from cooking activities only will be considered for emissions reduction calculations. Where continued use of baseline stoves for daily cooking is detected, the corresponding ICS will be counted as drop-out.

G.3. Implementation of specific-case CPA level sampling plan

>>

1. Description of the implemented Sampling Plan

The Sampling Plan is in accordance with Appendix 3 of the standard for sampling and surveys for CDM project activities and programme of activities (EB 69 Annex 4).

- a. Objective and Reliability Requirements
 - i. Objective of the sampling effort

Due to the high number of appliances to be deployed an annual check of all appliances is not feasible. Sampling was utilized to indicate that all the appliances deployed are still operating or to record end of operation which allows determination of the statistically adjusted annual value for drop out ($DO_{ICS,y}$). No efficient stove had to be replaced during this monitoring period.

Sampling methods were also applied to determine the annual values for the thermal efficiencies of the ICSs in use ($\eta_{Tikikil}$ and SC_{Mirt}).

Therefore the sampling effort was used to collect data for the following parameters:

$DO_{i,y}$, $\eta_{Tikikil}$ and $SC_{Mirt,y}$.

- ii. Timeframe

The time frame for the parameters, annual inspection frequency was chosen with the corresponding confidence/precision requirements of 90/10, according to AMS-II.G., par. 28.

iii. Estimated parameter values

The estimated parameter values are as per the values used for ex-ante calculation of emission reductions (please refer to Section B.6.2. of the CPA-DD).

iv. Sampling requirements as per sampling standard and applicable methodology

Precedence of methodology

Par. 3 of the Sampling Standard, EB 50 Annex 30 STAN, version 4.1 including Amendment to version 4.1 EB 80 Annex 07 clarifies that “[...] any requirements specified in the applicable methodologies having precedence”.

Coverage of sampling requirements in the applicable methodology:

As per applicable methodology AMS-II.G. ver 5, par. 28, *“On the other hand when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters. In cases where survey results indicate that 90/10 precision or 95/10 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 95/10 precision”*.

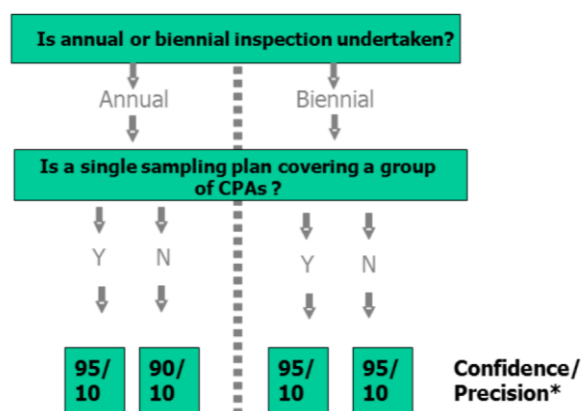
Additional requirement for PoAs as per sampling standard:

In case a single sampling plan for more than one CPA is used, *“parameter values shall be estimated by sampling in accordance with the requirements in the applied methodology separately and independently for each of the CPAs included in a PoA except when a single sampling plan covering a group of CPAs is undertaken applying 95/10 confidence/precision for the sample size calculation”, as per sampling standard, EB 50 Annex 30 STAN, version 4.1 including Amendment to version 4.1 EB 80 Annex 07.*

Only one CPA is included and monitored during this monitoring period.

v. Confidence/precision criteria to be met

As mentioned above, according to AMS-II.G, ver 5, par. 28, confidence/precision criteria to be met is determined as follows:



*due to methodology precedence

Note: As per par. 28 of AMS-II.G ver5, the lower bound can also be used instead of repeating the survey efforts to achieve the required confidence/precision level.

Since we applied annual monitoring of only one CPA, the required confidence/precision is 90/10.

b. Target Population

i. Definition

For the monitoring parameters $DO_{i,y}$, $\eta_{Tikil,y}$ and SC_{Mirt} , the target population consists in all household end users which are included in the sampling database until the end of the specific monitoring period.

ii. Description of particular features associated with it (if applicable)

There are no particular features associated with the target population.

c. Sampling method

i. Description and justification of selected sampling method

The sampling procedure is a simple random sampling process which samples households from the entire sampling database of CPA1.

To reduce monitoring efforts a common sample is drawn from the sampling database. The largest number for the sample size was chosen for the sampling effort with one common survey for all parameters except for $\eta_{Tikil,y}$ and $SC_{Mirt,y}$. For the monitoring of $\eta_{Tikil,y}$ and $SC_{Mirt,y}$ a random sub-sample from the common sample was drawn according to the calculated sample size of the parameters.

However this does not imply that for each of the parameters the same number of users/appliances has to be monitored during sampling. The CME will determine the number of users/appliances monitored during sampling for each of the parameters separately. The reason is that the variation within the values obtained will be different for each parameter. Since the precision of a sampled parameter depends on the variation of its values, the necessary number of users/appliances to be monitored in order to achieve the confidence/precision as mentioned above will also depend on the variation of values. Therefore, although the monitoring team will undertake monitoring of various parameters simultaneously and on the same sample group, the CME may decide to stop monitoring of a particular parameter during the campaign once the required precision for this parameter is achieved. The monitoring team will continue to monitor appliances in the sample with respect to the remaining parameter(s) until the required precision for these parameters is achieved.

d. Sample size: Estimated target number of units and justification

For sample size calculation, we used up to date figures from an internal monitoring study in the project region, which was carried out between 13 and 15th of August 2015. Applying those data for sample size calculation is in accordance with the monitoring plan of the registered PoA DD and specific CPA DD. It allows for more accurate sampling and determination of the sample size.

Equations used for calculation of sample size according to EB 75, Annex 8, version 3.0 (Best practice examples focusing on sample size and reliability calculations) for simple random sampling:

Parameter $DO_{ics,y}$

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

Where:

n Sample size

- z Z value for confidence level (e.g. 1.645 for 90% confidence level)
 N Total number of households
 p Expected proportion
 E Relative precision (e.g. 0.1 for 10% precision)

Parameter $\eta_{Tikil,y}$ and $SC_{Mirt,y}$:

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

$$n \geq \frac{z^2 N \left(\frac{SD}{mean} \right)^2}{E^2 (N-1) + z^2 \left(\frac{SD}{mean} \right)^2}$$

Where:

V	$\left(\frac{SD}{mean} \right)^2$
n	Sample size
N	Total number of households
mean	Our expected mean
SD	Our expected standard deviation
E	Relative precision (e.g. 0.1 for 10% precision)
z	Z value for confidence level (e.g. 1.645 for 90% confidence level)

Estimated sample size for simple random sampling according to equations above:

Table Sample size calculation

Parameter	Estimate value (ex-ante value)	Standard Deviation	Calculated sample size	Applied sample size
$DO_{Mirt,y} (1-DO_{ICS,y})$	0.9	n.a.	30	30
$DO_{Tikil,y} (1-DO_{ICS,y})$	0.9	n.a.	30	30
$SC_{Mirt,y}$	522.43*	110.92*	13	14
$\eta_{Tikil,y}$	0.28	0.05	9	11

* from monitoring study from 13-15th August 2015

The sample size for the common sample was 30 (largest calculated sample size). For the monitoring of SC_{Mirt} the calculated sample size was 13. According to EB30 Annex 30 par 12: "If the parameter of interest is a numeric mean value (i.e. not a proportion or percentage) the Student's t-distribution shall be used if the resulting sample size is less than 30." Therefore applied sample sizes for the parameter SC_{Mirt} increased to 14.

For the monitoring of η_{Tikil} the calculated sample size is 9, but according to EB30 Annex 30 par 12 the applied sample size for the parameter η_{Tikil} increased to 11.

Note: Response rate is assumed to be 80%. The response rate was not included in the sample size calculation.

e. Sampling Frame

i. Identification or description of sampling frame

The sampling frame is the Sampling database containing all ICSs included until the end of the monitoring period.

Fuel Efficient Stoves Sampling Data Base												
		stove type			distribution date				GPS Coordinate			
End user Name	sex	Mirt	Tikil	stove ID	GC	EC	woreda	kebele	X	Y	Altitude	Contact person
												Phone contact person

2. Collected Data

a. Field Measurement

i. Identification of all variables to be measured

The following variables are measured for determining the parameter values of:

Parameter	Description
$DO_{Mirt,y}$	Discount factor, statistically adjusted drop out from total population of Mirt stoves in period y
$DO_{Tikil,y}$	Discount factor, statistically adjusted drop out from total population of Tikil stoves in period y
SC_{Mirt}	Specific fuel consumption in year y of the Mirt stove
η_{Tikil}	Thermal efficiency of the Tikil stoves deployed in monitoring period y.

$DO_{Mirt,y}$ and $DO_{Tikil,y}$: Drop outs are recorded when users are found to not use the stove any longer. The values of the parameters were determined through interviews where it was asked if the appliances are used regularly. Interviews are reported in a questionnaire.

$\eta_{Tikil,y}$: The WBT protocol was applied to measure the efficiency of the Tikil stove deployed. Tests are reported in spreadsheet templates.

$SC_{Mirt,y}$: The Controlled Cooking test (CCT) protocol was applied to measure the efficiency of the Mirt stoves deployed. Tests are reported in spreadsheet templates.

3. Demonstration of whether the samples were randomly selected and are representative of the population.

The users in the sample were selected via a computerized randomizer from the sampling database. Since the calculated sample size for the common sample was 30 and the expected response rate was 80%, the computerized randomizer produced an unsorted sample list of 38 ICS users including 80% of non-response rate.

Since the sample was drawn out of the entire sampling database, which contains all stoves included for the ER calculation, and the sample size was calculated according to EB30 Annex 30, the sample is representative.

4. Analysis of the collected data

Out of the 38 sampled ICS users, 30 users could be contacted and an interview was performed to determine $DO_{Mirt,y}$ and $DO_{Tikikil,y}$. This corresponds to the required minimum sample size for these parameters.

In order to determine $SC_{Mirt,y}$ and $\eta_{Tikikil,y}$ a common subsample was drawn from the list of users monitored for $DO_{ICS,y}$. For $SC_{Mirt,y}$ and $\eta_{Tikikil,y}$ the sample sizes of 14 and 11 were calculated respectively. Using the larger sample size (14) and an estimated 80% non response rate, a subsample of 18 users was drawn. Out of this list 14 CCTs and 11 WBTs were conducted. This corresponds to the required minimum sample size for these parameters.

Table of results and achieved precision

Parameter	n*	Assumed response rate	Result	Standard deviation	Confidence	Precision	Required precision achieved?
$DO_{Mirt,y}$	30	0.80	0%	n/a	90%	0%	yes
$DO_{Tikikil,y}$	30	0.80	3.33%	n/a	90%	5.57%	yes
SC_{new}	14	0.80	405,80	85.73	90%	9.28%	yes
η_{new}	11	0.80	30.65%	2.73%	90%	4.42%	yes

*valid responses

a. Quality Assurance/ Quality Control

i. Procedures for conducting the data collection and/or field measurements

Data collected and processed by the field staff was checked by the CME or a person dedicated by the CME.

Training of field personnel

All personnel involved in the monitoring was trained by the CME or by or a person dedicated by the CME before performing the monitoring activities to ensure that each of them undertakes an appropriate monitoring assignment according to the Monitoring Plan.

Provisions for maximizing response rates

Documentation of out-of-population cases, refusals, other sources of non-responses

Refusals and non-respondents (i.e. households where the contact could not be established) were recorded by the monitoring team as well as the reason for the refusal.

ii. Procedure for defining outliers and under what circumstances outlier data/measurements may be excluded and/or replaced

No data were excluded.

b. Analysis: Describe how the data will be used

Data will be used to calculate emission reductions achieved during the specific monitoring period according to the equations. See calculations below in section H.

5. Implementation Plan

a. Schedule for implementing the sampling effort

As mentioned above, the schedule for implementing the sampling effort shall be: within 6 months after the end of the specific monitoring period the sampling effort can be finalized.

- b. Skills and resources required for data collection and the analyses, general description of qualifications and experience

The CME assigned people, entities or qualified third parties responsible for the data collection and analysis. The CME ensures that the qualification and experience of the person or entity involved is adequate for the specific tasks to be performed by the person or entity.

SECTION H. Calculation of GHG emission reductions or net GHG removals by sinks

H.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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$$ER_{Mirt,y} = cons_{capita,HH} * eaters_{HH,y} * FW_{Mirt,y} * (1-SC_{Mirt}/SC_{old} * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel} * N_{Mirt,y} * mp_{length,y} / 365 * (1-DO_{Mirt,y}) * L_y$$

$$ER_{Tikikil,y} = cons_{capita,HH} * eaters_{HH,y} * FW_{Tikikil,y} * (1-\eta_{old}/\eta_{Tikikil}) * f_{NRB,y} * NCV_{biomass} * EF_{projected_fossilfuel} * N_{Tikikil,y} * mp_{length,y} / 365 * (1-DO_{Tikikil,y}) * L_y$$

Total emission reductions will be calculated as:

$$ER_y = ER_{Mirt,y} + ER_{Tikikil,y}$$

Mirt

Parameter ID	r	Derived as	Unit	Value
A	Cons _{capita} , Ethiopian fuelwood consumption per capita	Woody Biomass Inventory of Ethiopia 2004	tons/a	0.75
B	eaters _{HH} : average number of eaters per stove	preliminary value based on average household size (Megen/GTZ 2008)		6
C	FW _{Mirt} : Proportion of household fuel wood consumed by Mirt stove, used as a discount factor for continued baseline use for non-Mirt purpose	see generic CPA-DD D.7.1		49.91%
D	B _{old} per stove	A*B*C	tons/a	2.25
E	Efficiency gain	monitored	%	60.64%
F	B _{savings per stove}	F*G	tons/a	1.36
G	f _{NRB}	see generic CPA-DD D.6.1		0.88

<i>H</i>	$EF_{projected_fossilfuel}$	default AMS-II.G	tCO ₂ /TJ	81.6
<i>I</i>	$NCV_{biomass}$	default AMS-II.G	TJ/t	0.015
<i>J</i>	<i>DOy</i> : Discount for drop-out	monitored	%	0%
<i>K</i>	<i>L</i> : leakage adjustment	default AMS-II.G		0.95
	<i>Ny</i> : adjusted number of stoves	monitored		9,271
ER_{Mirt}		$H*I*J*K$	tons/a	12,920

Tikikil

Parameter ID	Description	Derived as	Unit	Value
<i>A</i>	$Cons_{capita}$, Ethiopian fuelwood consumption per capita	Woody Biomass Inventory of Ethiopia 2004	tons/a	0.75
<i>B</i>	$eaters_y$, average number of eaters per stove	preliminary value based on average household size (Megen/GTZ 2008)		6
<i>C</i>	$FW_{Tikikil}$: Proportion of household fuel wood consumed by Mirt stove, used as a discount factor for continued baseline use for non-Mirt purpose	see generic CPA-DD D.7.1		41.5%
<i>D</i>	B_{old} per stove	$A*B*C$	tons/a	1.87
<i>E</i>	Efficiency gain	monitored	%	67.37%
<i>F</i>	$B_{savings}$ per stove	$F*G$	tons/a	1.26
<i>G</i>	f_{NRB}	see generic CPA-DD D.6.1		0.88
<i>H</i>	$EF_{projected_fossilfuel}$	default AMS-II.G	tCO ₂ /TJ	81.6
<i>I</i>	$NCV_{biomass}$	default AMS-II.G	TJ/t	0.015
<i>J</i>	<i>DOy</i> : Discount for drop-out	monitored	%	3.33%
<i>K</i>	<i>L</i> : leakage adjustment	default AMS-II.G		0.95
	<i>Ny</i> : adjusted number of stoves	monitored		9,271
ER_{Tikikil}		$H*I*J*K$	tons/a	11,227

$$ER_{Total,y} = ER_{Mirt,y} + ER_{Tikikil,y}$$

ER_{total,y} = 24,458 tCO₂e (rounded conservatively)

H.2. Calculation of project emissions or actual net GHG removals by sinks

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Not applicable, as methodology ASM II.G., ver. 5 does not consider project emissions.

H.3. Calculation of leakage

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According to AMS-II G ver 5: Para 20, $cons_{capita}$ can be multiplied by a net to gross adjustment factor 0.95 to account for leakage in which case surveys are not required.

H.4. Summary of calculation of GHG emission reductions or net GHG removals by sinks

Specific-case CPA reference number	Baseline emissions or baseline net GHG removals by sinks (tCO ₂ e)	Project emissions or actual net GHG removals by sinks (tCO ₂ e)	Leakage (tCO ₂ e)	GHG emission reductions or net GHG removals by sinks (tCO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
001	24,458	0	0	0	24,458	24,458
Total	24,458	0	0	0	24,458	24,458

H.5. Comparison of GHG emission reductions or net GHG removals by sinks with estimates in the included CPA-DD(s)

Specific-case CPA reference number	Value estimated in ex ante calculation in the included CPA-DD(s)	Actual values achieved by the specific-case CPA(s) during this monitoring period
001	43,097	24,458
Total	43,097	24,458

H.6. Remarks on difference from the estimated value in the included CPA-DD(s)

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Actual values achieved are lower than the estimated ex-ante values, since lesser number of efficient stoves have been distributed to the households. Instead of 18,000 stove pairs as assumed in the CPA-PDD only 11,084 stove pairs have been distributed till the end of the monitoring period.

Appendix 1. Contact information of coordinating/managing entity and/or responsible persons/entities

Coordinating/managing entity and/or responsible person/entity	<input checked="" type="checkbox"/> Coordinating/managing entity <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	World Food Programme Ethiopia
Street/P.O. Box	25584 Code 1000 Addis Ababa
Building	River Side Hotel plc
City	Addis Ababa Kirkos sub-city
State/Region	Addis Ababa Administration
Postcode	251
Country	Ethiopia
Telephone	+251115515188
Fax	+251115514433
E-mail	-
Website	www.wfp.org
Contact person	Kassu Kebede
Title	Programme Officer
Salutation	Mr.
Last name	Kebede
Middle name	-
First name	Kassu
Department	Programme
Mobile	+251911339116
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Direct tel.	+251115515188 ext. 2464
Personal e-mail	beyene1965@gmail.com

Coordinating/managing entity and/or responsible person/entity	<input type="checkbox"/> Coordinating/managing entity <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	atmosfair gGmbH
Street/P.O. Box	Zossener Str 55-58
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