MONITORING REPORT FORM (F-CDM-MR)
Version 02.0

MONITORING REPORT

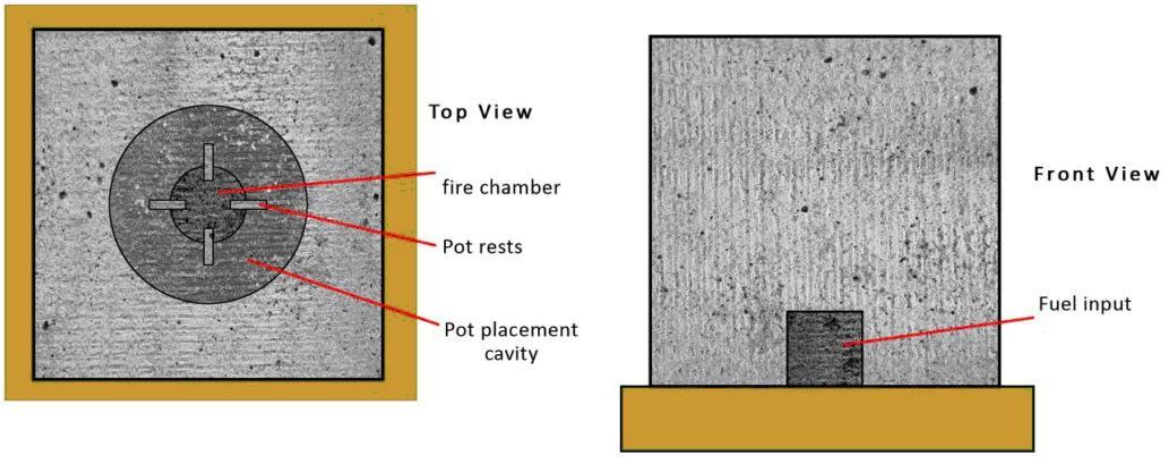
Title of the project activity	Aberdares Improved Cook Stoves
Reference number of the project activity	GS883
Version number of the monitoring report	Version 6
Completion date of the monitoring report	08/07/2013
Registration date of the project activity	30/12/2011
Monitoring period number and duration of this monitoring period	Monitoring period 2 01/04/2012 – 31/03/2013 [12 months]
Project participant(s)	Co2balance UK Ltd
Host Party(ies)	Republic of Kenya
Sectoral scope(s) and applied methodology(ies)	Energy Efficiency – Domestic Methodology for improved cook-stoves and kitchen regimes V.02
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	73,833 tCo2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	24,191 tCo2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The 'Aberdares Improved Cook Stove project' will address issues of deforestation, greenhouse gas (GHG) emissions and indoor air pollution by the distribution of domestic wood-burning improved cook stoves in households within the project area. Pilot studies indicated that our stove reduces fuel consumption by at least 50%. This will result in an improved living environment for recipients and reduced pressure on local forests, with a reduction of wood being burnt annually as a result of the project. By reducing fuel consumption, carbon dioxide emissions from the combustion of non-renewable biomass will be correspondingly reduced.

The improved stoves (known as the Carbon Zero Kenya or CZK stove) are a fixed construction of an inner ceramic liner surrounded by clay bricks and mortar, using a 'rocket' style design. This consists of a horizontal (combined) fuel and air intake, terminating in a firebox with a vertical outlet on which the cooking pot rests. Relative to the three stone fire, this type of stove allows higher combustion temperatures to be reached and improved fuel/air mixing, hence higher levels of combustion are achieved. This reduces the amount of smoke produced. There is no chimney, however, a draft is created by the temperature difference between the low inlet and the outlet, and the hot combustion gasses pass out of the top directly onto the cooking pot in order to achieve high levels of thermal transfer.



Geographic Location of Project Activity

[a] Host Party: Republic of Kenya

[b] Region/State/Province: Central Province

[c] City/Town/Community: District: Lari District

Divisions: Lari and Gatamaiyu (Total of 30,779 HHS)

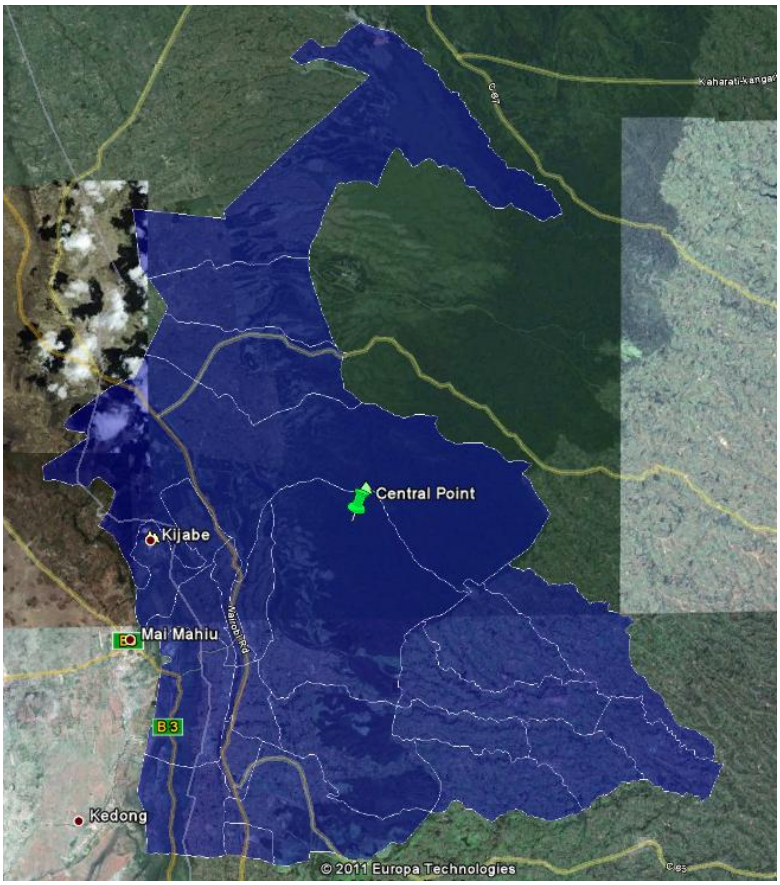
Locations/Sub-location breakdown as below:

Lari Division	
Location	**Kamae**
Sub location	Kamae Kamukombini
Location	**Kinale**
Sub location	Kinale Mukeu
Location	**Kijabe**
Sub location	Bathi Magina Mbauini Kijabe
Location	**Gitithia**
Sub location	Gitithia Nyambari
Location	**Lari**
Sub location	Lari Scheme Githirioni
Location	**Kirenga**
Sub location	Kirenga Gituamba Kambaa Escarpment

Gatamaiyu Division	
Location	**Gatamaiyu**
Sub location	Kagwe Kamuchege
Location	**Nyanduma**
Sub location	Nyanduma Gachoire
Location	**Kamburu**
Sub location	Kamburu Kagaa Matimbei

[d] Physical/Geographic location

For the purposes of this project the boundaries have been defined as the political boundary to include all sub-locations as illustrated below. The central point (shown with a pin on the map is at -0.938073°, 36.669109°.



The stoves have been individually tracked using GPS co-ordinates to ensure they fall within the project boundary. In some instances Carbon Transfer Forms (CTFs) have been collected but GPS coordinates are missing. Work is still ongoing to update the Distribution Record with these details but based on guidance from the Gold Standard credits can be claimed for these stoves. Furthermore, each stove is marked with a unique identification number that will be uploaded and kept on the electronic database; this includes household occupants and GPS co-ordinates. That will allow the individual tracking of each stove to avoid double counting and boundary issues.

A.2. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A (host) Republic of Kenya	N/A	No
Party B United Kingdom	Private entity B co2balance UK Ltd	No
…	…	

A.3. Reference of applied methodology

The small-scale project activity falls within the Energy Efficiency – Domestic category and utilises the Gold Standard 'Methodology for improved cook-stoves and kitchen regimes V.02'

It also applies the guidance of the UNFCC CDM 'Tool for demonstration and assessment of additionality (version 05.2.1)' as required by the above methodology.

A.4. Crediting period of project activity

The type and length of crediting period applied to this project is 7 years, twice renewable. This Monitoring Report covers the 1st April 2012 – 31st March 2013 [12 months].

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

In Kenya 70% of the national energy supply is met through use of biomass fuels, with 90% of this demand coming from the domestic sector.[1] Traditional cooking involves the use of a 3-stone fire, which amongst other shortfalls is only able to produce 10% thermal efficiency.[2] Combined with a population growth rate of 2.7%[3] it is not surprising to find that between 1990 and 2005 Kenya lost forest coverage at a rate of 0.3-0.5%/year, with protected forest making up only 1.6% of land coverage by 2005.[4] This situation is not sustainable and Kenya's ability to meet future energy needs under a business-as-usual scenario is questionable, as highlighted by the Kenyan Ministry of Energy in a 2002 report.[5] The burning of significant quantities of non-renewable biomass also gives rise to large quantities of greenhouse gasses, contributing to anthropogenic climate change.

Added to environmental pressures is the poor quality of life experienced by the rural poor, using traditional wood stoves which generate a large amount of smoke within the home due to poor combustion efficiencies. A WHO report concluded *'Indoor air pollution is a major environmental and public health hazard for many of the world's poorest, most vulnerable people.'* Biomass smoke has been linked to a range of health problems such as acute respiratory infections (ARI) in children, chronic obstructive lung diseases (such as chronic bronchitis and asthma), lung cancer and pregnancy-related outcomes. It is estimated that 4-5% of global deaths occur as a result of exposure to smoke particulates.[6]

The 'Aberdares Improved Cook Stove project' has started to address these issues by the construction of the first 9,311 of approximately 23,033 domestic wood-burning 'improved cook stoves' in households within the project area. However data collection and uploading is still occurring for some of these stoves and only 7,946 stoves will be credited in this monitoring period. This is a slight increase on the previous monitoring period but does not represent new construction, only additional tracking and data collection which has resulted in 173 additional Carbon Transfer forms (CTFs) being located. Recipients have received stoves free of charge and have been directed in correct use of the stove by local community groups engaging with the project developers. Pilot studies have shown the stoves to reduce fuel consumption by approximately 50%. This has resulted in an improved living environment for recipients and reduced pressure on local

[1] "Kenya: Integrated assessment of the Energy Policy", UNEP, 2006 : http://www.unep.ch/etb/areas/pdf/Kenya%20ReportFINAL.pdf
[2] UNFCCC Methodology AMS-II-G http://cdm.unfccc.int/UserManagement/FileStorage/AUBHMWJVKFSY9D1380NOI5ET26ZQLG
[3] "State of the world's forests 2009", FAO, 2009 : http://www.fao.org/docrep/011/i0350e/i0350e00.HTM
[4] "State of the world's forests 2009", FAO, 2009, "Kenya: Integrated assessment of the Energy Policy", UNEP, 2006
[5] "Study on Kenya's energy demand, supply and policy strategy for households, small scale industries and service establishments", Republic of Kenya Ministry of Energy, 2002.
[6] "The health effects of indoor air pollution exposure in developing countries", WHO, 2002 : http://whqlibdoc.who.int/hq/2002/WHO_SDE_OEH_02.05.pdf

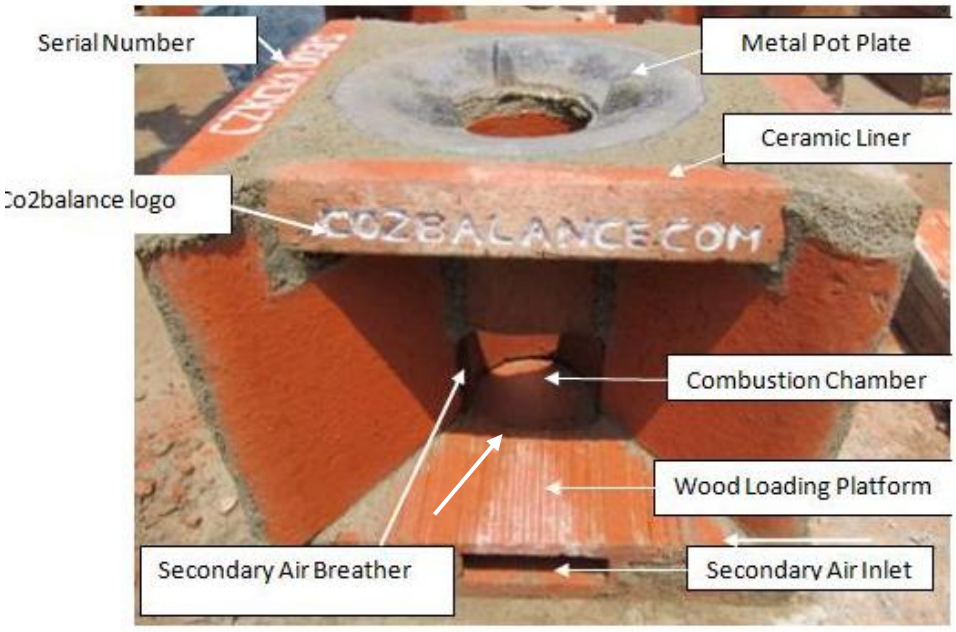
forests, with approximately 14,302 tonnes of wood saved in this crediting period. By reducing fuel consumption, CO_2 emissions from combustion of non-renewable biomass have been correspondingly reduced by 24,191 tCO2e. As the stoves have been distributed for free, the project has started to achieve high levels of market saturation in the area, allowing as many households as possible to benefit from the improved stove.

Pilot studies and subsequent monitoring have shown the large majority of households within the project area to be cooking for domestic purposes only, on three-stone fires using wood fuel. This has resulted in one main representative household cluster. For these reasons the project employed a single model of wood-burning stove, which was distributed for domestic use only.

The improved stoves (known as the Carbon Zero Kenya or CZK stove) are fixed constructions of an inner ceramic liner surrounded by clay bricks and mortar, using a 'rocket' style design. This consists of a horizontal (combined) fuel and air intake, terminating in a firebox with a vertical outlet on which the cooking pot rests. Relative to the three stone fire, this type of stove allows higher combustion temperatures to be reached and improved fuel/air mixing, hence higher levels of combustion are achieved. This reduces the amount of smoke produced. There is no chimney as such, draft is created by the temperature difference between the low inlet and the outlet, and the hot combustion gases pass out of the top directly onto the cooking pot in order to achieve high levels of thermal transfer. Despite the combustion gasses remaining in the house, the improved combustion efficiencies mean that smoke levels are dramatically reduced.

The stove consists of an inner firebox being a standardised fired-ceramic liner, made locally where possible; a grey cast iron plate that is specifically shaped for optimum efficiency; an open front ease of viewing whilst operating the fire; a secondary air intake to assist with the fire starting, maximising air flow during combustion and keeping the wood on a brick loading platform; and the outer skin of fired bricks. It is a high performance, ergonomically designed cook stove that was designed with both the builder and the user in mind.

Research into the environmental impact of producing construction materials suggests that the greenhouse gas emissions generated as a result of this would be insignificant in relation to the reductions made over the lifespan of the stoves.



The Carbon Zero Kenya Cook-Stove (CZK)

Project construction/operation and monitoring schedule

Date	Monitoring Task / Event	Stoves Crediting
April 2012	Monitoring Period 2 Begins	7946
May 2012	Monitoring Kitchen Survey 5	7946
June 2012	Usage Survey	7946
July 2012	Revised Baseline KPTs	7946
	Aging Stove KPT	7946
Aug 2012	Monitoring Kitchen Survey 6	7946
Sept 2012		7946
Oct 2012		7946
Nov 2012		7946
Dec 2012	Monitoring Kitchen Survey 7	7946
Jan 2013		7946
Feb 2013	Monitoring Kitchen Survey 8	7946
March 2013	Monitoring Period 2 Ends	7946

Co2balance have constructed 10,000 improved stoves in the project area to date (between December 2010 and July 2011). Of these we currently have records for 9,311 stoves in the Distribution Record, meaning that the location of 689 stoves is currently unknown. As all stoves are serialised and uniquely identifiable co2balance staffs have been instructed to attempt to locate them while conducting surveys in the project area as part of their daily activities. As these stoves are found the household details are collected and a CTF completed allowing them to be credited as part of the project. This therefore means the number of recorded and crediting stoves between monitoring periods may increase without additional stoves being constructed in the project area (up to a maximum of 10,000). In addition to this there has been a lag in data collection and upload which means that not every stove in the Distribution Record has a CTF. As per GS guidance the project proponent is not allowed to claim credits for these stoves. In total 1,365 stoves do not currently have CTFs and have been removed from emission reduction calculations resulting in 7946 crediting stoves.

	Monitoring Period 1	Monitoring Period 2
Total Stoves Recorded	9245	9311
Total Stoves Crediting	7773	7946

Since installation it has been found that a number of stove beneficiaries have 'modified' their stoves. This modification usually involves altering the vent or liner with the presumed aim of increasing the size of the opening allowing more varied sizes of wood to be used in the stove. It has been observed that in this project area, beneficiaries tend to favour using fewer larger pieces of wood than in other areas that tend to use many small pieces. It is thought that this 'modification,' by increasing the size of the wood loading area, will not negatively affect secondary air flow due to a larger overall opening.

co2balance have been conducting an ongoing study in the project area to determine the ratio of modified to unmodified stoves. In the last monitoring period it was found that out of out the 443 homes visited 267 (60%) were found to have modified stoves and the remaining 176 (40%) households had not altered their stoves. Based on this a further round of KPTs was commissioned, the results eventually forming part of the revised baseline (reported on in Monitoring Period 1). It was found that there was no statistical difference between the two groups with beneficiaries consuming practically the same amount of fire wood during the KPT period (please see Section *D.2 Data and Parameters Monitored – Modified Stoves*). This study has been ongoing and the PP has now visited a total of 2801households (including those in the first monitoring period) and has identified a total of 446 modified stoves (16%). The reduction in the percentage of modified stoves is most likely due to the larger sample size and does not impact emissions reductions as illustrated by the findings of the updated baseline report.

B.2. Post registration changes
B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There have been no deviations to the registered Sustainability Monitoring Plan as described in the GS Passport in this monitoring period. The PP is only required to report on these criteria biennially.

B.2.2. Corrections

B.2.3. Permanent changes from registered monitoring plan or applied methodology

There have been no permanent changes from the registered monitoring plan or applied methodologies during this monitoring period.

B.2.4. Changes to project design of registered project activity

There have been no changes to the project design of the project activity during this monitoring period.

B.2.5. Changes to start date of crediting period

There has been no change to the start date of the crediting period during this monitoring period.

B.2.6. Types of changes specific to afforestation or reforestation project activity

This section is not applicable to this project type.

SECTION C. Description of monitoring system
The project proponents will supervise and assist stove contractors in generating the appropriate records during the construction phase of the project. The monitoring tasks continually undertaken are:

1. Maintenance of pilot & Total Distribution Record (TDR)
Accurate distribution records have been kept and stored both electronically and in paper format. The stove builders created paper records for each stove built; these were then transferred to a computer system belonging to the project proponents and the original documentation stored in the local office (Kenya). In addition a GPS tagged photo was taken of each stove. The following information was collected:

Distribution Record Information	Source Document	Hard/Soft Copy	Entity Responsible For Collection
Stove serial number	Builders Form	Hard Copy	Contractor
Project region	Builders Form	Hard Copy	Contractor
Stove Construction Company Name	Builders Form	Hard Copy	Contractor
Name of builder's trainer (Training entity is co2balance)	Builders Form	Hard Copy	Contractor
Stove building date	Builders Form	Hard Copy	Contractor
Resident's name	Builders Form	Hard Copy	Contractor
Resident address (where possible)	Builders Form	Hard Copy	Contractor
Resident phone number (where possible)	Builders Form	Hard Copy	Contractor
Stove Model	Photo	Soft Copy	co2balance
Mode of use (domestic in all cases)	Data collectors form	Hard Copy	co2balance
Type of fuel used	Data collectors form	Hard Copy	co2balance
Pilot stove (Y/N)	Data collectors form	Hard Copy	co2balance
GPS Coordinates	Photo	Soft Copy	co2balance

2. Data Management and Storage

The results of all Kitchen Surveys (KS's), Monitoring Kitchen Surveys (MKS), Usage Surveys and Kitchen Performance Tests (KPT's) are collated in excel spreadsheets and stored on a central server in an electronic format. Initially the baseline KS & KPT data was stored; followed by the results of monitoring KS's & monitoring KPT's.

Monitoring Kitchen Surveys MKSs have been selected through a Random Sample Group (RSG). This will be reselected for every survey to ensure the selection remains random. Monitoring KS's have been carried out for a minimum of 25 randomly selected beneficiaries from the TDR, per cluster, per quarter according to the methodology. When selecting households the project proponents selected beneficiaries that had received a stove in the previous three months first and then from the remainder if this number was not sufficient. The households were then grouped based on Stove Model, Mode of Use (domestic/institutional) and Fuel Type to determine clusters. During this monitoring period there was only a single cluster of CZK stove users cooking domestically on wood fuel. Using a web based number generator the desired amount of random numbers were generated per cluster and added to the spreadsheet. This column was then sorted into ascending/descending order and the first 90 households per cluster chosen as the sample. From this the survey teams were instructed to choose 45 households to survey. The MKS was administered by trained co2balance staff (occasionally supplemented from a pool of casuals who worked closely with a co2balance lead), local to the area and conversant in the local dialects to ensure that responses were consistent and not biased by any regional language barriers. Field staffs were provided with an English and Swahili version of the questionnaire to provide for the greatest possible standardisation of responses. It was explained that the answers to the survey are analysed as a group and that no individual names are used in this analysis; the only reason we take peoples' names and addresses is so that we can find them again to conduct further monitoring tasks.

The MKS provides information regarding the ongoing relevance of Baseline KPT results and sustainable development indicators to the project scenario. All MKSs were carried out face to face. They were conducted by expert full time co2balance staff (occasionally supplemented from a pool of casuals who worked closely with a co2balance lead) based in Kenya that have been trained by co2balance UK Ltd.

Data collected during an MKS contains the following type of data:

- General information - Name, address, telephone number etc
- Household socio-demographic information
- Cooking behaviour, fuel type & mix
- Sources of fuel, prices or labour input (person-hours, distances)

All surveyors used the same standardised questionnaire and answer sheet in this monitoring period, containing 70 questions each. The answer sheets completed in the field were returned to the Kenya office for transcribing into an excel spreadsheet. Once completed this was returned to the UK office for analysis.

3. Updating of Project Results

The conclusions drawn from MKS's and KPT's are continuously added to the central server and are used to inform cluster changes and changes in emissions reductions (if any). Emission reductions calculations have been documented here as well.

4. Calculation of emissions reductions

Emissions reductions will be calculated (according to new cluster adjustments if necessary) using the results of the Monitoring KS's and KPT's, **using updated values for biomass savings (**$B_{bl,y} - B_{pj,y}$**), NRB, leakage, usage, age, new stove models.**

Periodic monitoring tasks

The periodic tasks are as follows:

- NRB fraction assessed by literature review every two years
- Leakage estimates (identified in the PDD and possible new sources) will be surveyed every two years
- Drop-off in usage rates by beneficiaries in the first year will be surveyed every two years, random sampling as in the KS
- An aging stove KPT to assess performance of ageing stoves will be carried out every two years to assess any changes in performance of the project stoves
- A baseline monitoring KPT will be carried out every two years IF: The KS reveals that baseline parameters measured by the KPT's may have changed significantly.
- New stove KPT will be carried out for new models if launched.
- Sustainable Development Assessment of wider social and economic impact and contribution to local sustainable development of the project will be made every two years. This will be assessed through a study supported by desktop research, field work in the local area and all the information/documentation produced during the monitoring period as described above.

Monitoring Tasks and Project Events Conducted To Date – Although conducted after the end of the previous monitoring period the Usage survey, Aging Stove KPT and Revised Baseline KPTs have been reported on in the first monitoring period (please see Monitoring Report 1).

Date	Monitoring Task / Event	Frequency	Stoves Crediting
June 2010	LSCR to Gold Standard	Once	0
July 2010			0
Aug 2010			0
Sept 2010	Kitchen Surveys	Once	0
Oct 2010	Kitchen Performance Tests	Once	0
Nov 2010			0
Dec 2010	Monitoring 1 Period Begins		149
Jan 2011			1687
Feb 2011			2584
Mar 2011	Monitoring Kitchen Survey 1	Quarterly	5122
Apr 2011			6538
May 2011			7075
June 2011	Monitoring Kitchen Survey 2	Quarterly	7767
July 2011			7772
Aug 2011			7773
Sept 2011	Monitoring Kitchen Survey 3	Quarterly	7773
Oct 2011			7773
Nov 2011			7773
Dec 2011	Monitoring Kitchen Survey 4	Quarterly	7773
Jan 2012			7773
Feb 2012	Sustainable Development Assessment	Biennially	7773
Mar 2012	Monitoring Period 1 Ends		7773
April 2012	Monitoring Period 2 Begins		7946
May 2012	Monitoring Kitchen Survey 5	Quarterly	7946
June 2012	Usage Survey	Biennially	7946
July 2012	NRB Assessment Revised Baseline KPTs	Once	7946
	Aging Stove KPT	Biennially	7946
Aug 2012	Monitoring Kitchen Survey 6	Quarterly	7946
Sept 2012			7946
Oct 2012			7946
Nov 2012			7946
Dec 2012	Monitoring Kitchen Survey 7	Quarterly	7946
Jan 2013			7946
Feb 2013	Monitoring Kitchen Survey 8	Quarterly	7946
March 2013	Monitoring Period 2 Ends		7946

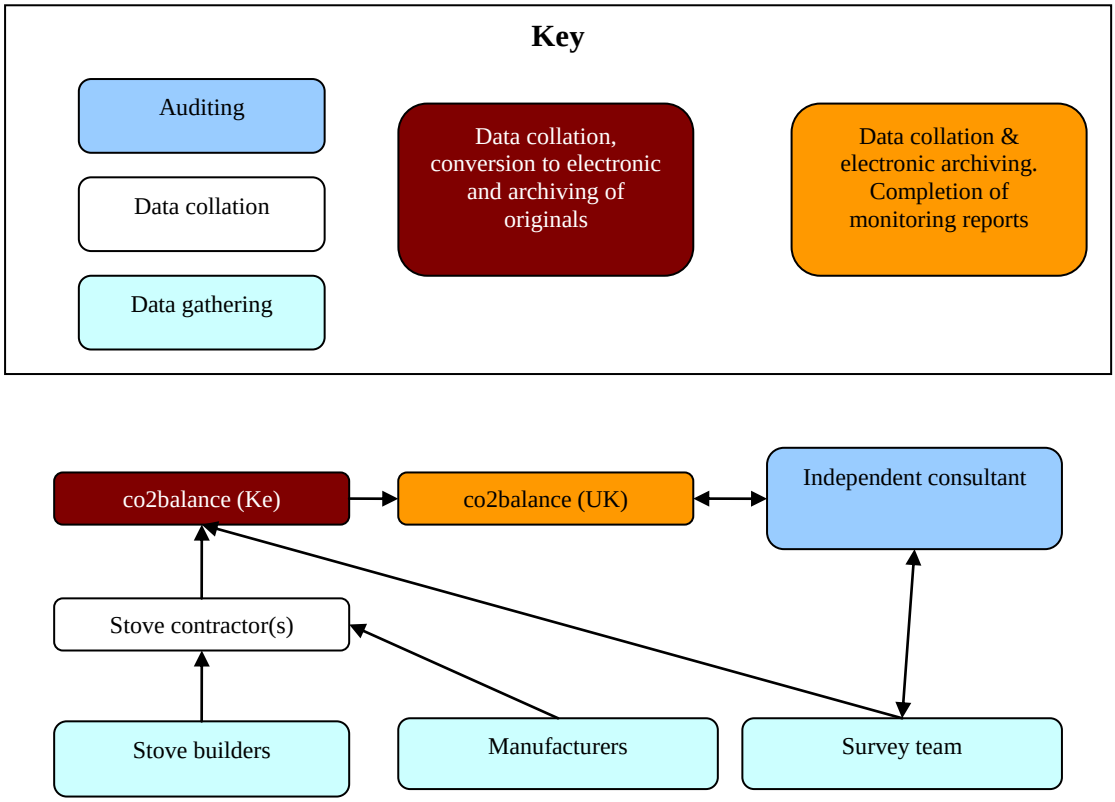
NOTE: MKS 7 was conducted a month late due to staff illness

Measurement equipment (scales)

- Sets of digital hanging scales
- As the scale manufacturer has not stipulated a calibration interval, we will calibrate or replace (whichever is cheaper) all of our weighing scales every three years[7]. Scales were originally purchased in May 2011 and will be replaced in April 2014.
- All staff using scales have had adequate on the job instruction on their use.

[7] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf

The diagram below shows the organisational responsibilities for the monitoring plan; arrows show the flow of monitoring information.



SECTION D. Data and parameters

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

Data/Parameter	$EF_{bl.bio,co2}$
Unit	$tCO_2/t\_biomass$
Description	CO_2 emission factor arising from use of wood-fuel in baseline scenario
Source of data	Calculated from IPCC defaults
Value(s) applied	1.7472
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$EF_{pj.bio,co2}$
Unit	$tCO_2/t\_biomass$
Description	CO_2 emission factor arising from use of wood-fuel in project scenario
Source of data	Calculated from IPCC defaults
Value(s) applied	1.7472
Purpose of data	Calculation of project emissions
Additional comment	-

Data/Parameter	$EF_{bl.bio,non-co2}$
Unit	$tCO_2/t\_biomass$
Description	Non-CO_2 emission factor arising from use of wood-fuel in baseline scenario
Source of data	Calculated from IPCC defaults
Value(s) applied	0.1176
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$EF_{pj.bio,non-co2}$
Unit	$tCO_2/t\_biomass$
Description	Non-CO_2 emission factor arising from use of wood-fuel in project scenario
Source of data	Calculated from IPCC defaults
Value(s) applied	0.1176
Purpose of data	Calculation of project emissions
Additional comment	-

Data/Parameter	$X_{nrb,bl,y}$
Unit	Fraction
Description	Non-renewability status of woody biomass fuel in year in baseline scenario
Source of data	Report compiled by Anthony Mills (PhD) and Diane Southey (MSc) C4 EcoSolutions (Pty) Ltd., Cape Town, South Africa
Value(s) applied	0.95
Purpose of data	Calculation of emissions
Additional comment	Assessment carried out by third party according to GS methodology for Improved Cook-Stoves and Kitchen Regimes v.02.

Data/Parameter	$EF_{bio,prod,co2}$
Unit	tCO_2/t_fuel
Description	CO_2 emission factor arising from production of wood-fuel
Source of data	IPCC defaults or project-relevant measurement reports
Value(s) applied	N/A
Purpose of data	Calculation of emissions
Additional comment	As revealed in the baseline Kitchen Surveys fuel is harvested and transported manually (walking and/or donkey cart) by each individual household and so does not generate any production related CO_2 emissions.

Data/Parameter	$EF_{bio,prod,non-co2}$
Unit	$tCO_2/t\_biomass$
Description	Non-CO_2 emission factor arising from production of wood-fuel
Source of data	IPCC defaults or project-relevant measurement reports
Value(s) applied	N/A
Purpose of data	Calculation of emissions
Additional comment	As revealed in the baseline Kitchen Surveys fuel is harvested and transported manually (walking and/or by donkey cart) by each individual household and so does not result in any transport related production CO_2 emissions.

Data/Parameter	$EF_{af,co2}$
Unit	tCO_2/t_fuel
Description	CO_2 emission factor arising from use of alternative fuel
Source of data	N/A
Value(s) applied	N/A
Purpose of data	N/A
Additional comment	The Kitchen Survey identified some alternative fuel use by project beneficiaries however the KPT only measures consumption of the primary fuel, therefore any secondary fuel is treated as zero.

Data/Parameter	$EF_{af,\ non\text{-}co2}$
Unit	tCO_2/t_fuel
Description	Non-CO_2 emission factor arising from use of alternative fuel
Source of data	N/A
Value(s) applied	N/A
Purpose of data	N/A
Additional comment	The Kitchen Survey identified some alternative fuel use by project beneficiaries however the KPT only measures consumption of the primary fuel, therefore any secondary fuel is treated as zero.

Data/Parameter	$EF_{af,prod,co2}$
Unit	tCO_2/t_fuel
Description	CO_2 emission factor arising from production of alternative fuel
Source of data	N/A
Value(s) applied	N/A
Purpose of data	N/A
Additional comment	The Kitchen Survey identified some alternative fuel use by project beneficiaries however the KPT only measures consumption of the primary fuel, therefore any secondary fuel is treated as zero.

Data/Parameter	$EF_{af,prod,non\text{-}co2}$
Unit	tCO_2/t_fuel
Description	Non-CO_2 emission factor arising from production of alternative fuel
Source of data	N/A
Value(s) applied	0
Purpose of data	N/A
Additional comment	The Kitchen Survey identified some alternative fuel use by project beneficiaries however the KPT only measures consumption of the primary fuel, therefore any secondary fuel is treated as zero.

Data/Parameter	$AF_{bl,i,y}$
Unit	t_fuel/unit-year
Description	The mass of alternative fuel i combusted in the baseline year
Source of data	Baseline Kitchen Surveys
Value(s) applied	N/A
Purpose of data	Calculation of emissions
Additional comment	The Kitchen Survey identified some alternative fuel use by project beneficiaries however the KPT only measures consumption of the primary fuel, therefore any secondary fuel is treated as zero.

D.2. Data and parameters monitored

Data/Parameter	$AF_{pj,i,y}$
Unit	t_fuel/unit-year
Description	Mass of alternative fuel i combusted in the project in year y
Measured/Calculated /Default	Measured
Source of data	Monitoring Kitchen Surveys
Value(s) of monitored parameter	N/A
Monitoring equipment	Surveys
Measuring/Reading/ Recording frequency	Quarterly
Calculation method (if applicable)	N/A
QA/QC procedures	Full training is provided to survey staff
Purpose of data	
Additional comment	Baseline Kitchen Surveys show that there is a certain degree of fuel and stove type mixing in the project area. In response to this the KPT was appropriately designed to measure fuel consumption of the primary fuel only, while the households involved are carrying on a degree of typical fuel and stove-type mixing during the KPT itself. Therefore, any secondary fuel is treated as zero in both the baseline and the project scenarios. MKS have confirmed this scenario and continue to monitor it for significant change.

Data/Parameter	$X_{af,pj,y}$
Unit	Fraction
Description	Woody biomass combustion avoided due to alternative fuels in year y in project
Measured/Calculated /Default	Measured
Source of data	Monitoring Kitchen Surveys
Value(s) of monitored parameter	0
Monitoring equipment	Survey
Measuring/Reading/ Recording frequency	Quarterly
Calculation method (if applicable)	N/A
QA/QC procedures	Kitchen Surveying will be overseen by an independent third party.
Purpose of data	
Additional comment	Baseline Kitchen Surveys show that there is a certain degree of fuel and stove type mixing in the project area. In response to this the KPT was appropriately designed to measure fuel consumption of the primary fuel only, while the households involved are carrying on a degree of typical fuel and stove-type mixing during the KPT itself. Therefore, any secondary fuel is treated as zero in both the baseline and the project scenarios. MKS have confirmed this scenario and continue to monitor it for significant change. NOTE: As approach 1 in the methodology has been chosen this parameter is not in fact relevant for calculation of ERs. However it is included in the PDD and will therefore be included in the Monitoring Report.

Data/Parameter	$X_{re,pj,y}$
Unit	Fraction
Description	Woody biomass combustion avoided due to renewable energy form in year y in project
Measured/Calculated /Default	Measured
Source of data	Monitoring Kitchen Survey
Value(s) of monitored parameter	0
Monitoring equipment	Survey
Measuring/Reading/ Recording frequency	Quarterly
Calculation method (if applicable)	N/A
QA/QC procedures	Kitchen Surveying will be overseen by an independent third party.
Purpose of data	
Additional comment	Baseline Kitchen Surveys show that there is a certain degree of fuel and stove type mixing in the project area. In response to this the KPT was appropriately designed to measure fuel consumption of the primary fuel only, while the households involved are carrying on a degree of typical fuel and stove-type mixing during the KPT itself. Therefore, any secondary fuel is treated as zero in both the baseline and the project scenarios. MKS have confirmed this scenario and continue to monitor it for significant change. NOTE: As approach 1 in the methodology has been chosen this parameter is not in fact relevant for calculation of ERs. However it is included in the PDD and will therefore be included in the Monitoring Report.

The previous three data parameters [$AF_{pj,i,y}$ / $X_{re,pj,y}$ / $X_{af,pj,y}$] are associated with alternative fuel types and can all be explained using the same justifications.

Data from the Baseline Kitchen Survey (*Figures 1 and 2*) shows that there is a certain degree of fuel and stove type mixing in the project area. In response to this the KPT was appropriately designed following the third form to calculate the baseline (refer to page 12 of the methodology). So, the KPT measures fuel consumption of the primary fuel only, while the households involved are carrying on a degree of typical fuel and stove-type mixing and/or typical use of RE forms during the KPT itself. Therefore, any secondary fuel is treated as zero in both the baseline and the project scenarios. Therefore, all alternative fuels, $AF_{bl,i,y}$ and $AF_{pj,i,y}$ were set to zero.

Figure1: Stove use prior to installation of CZ stove: Dry season

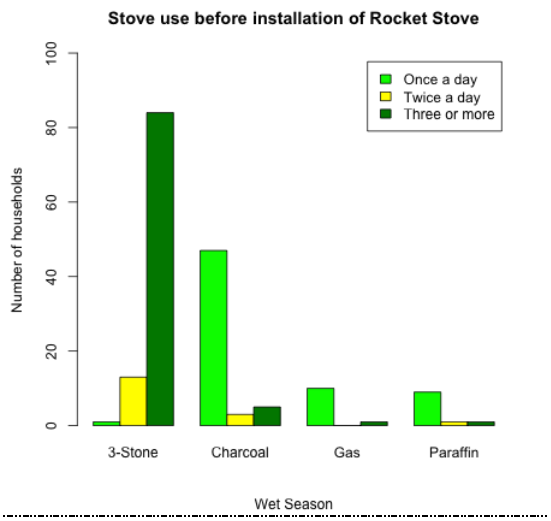


Figure 2: Stove use prior to installation of CZ stove: Wet season

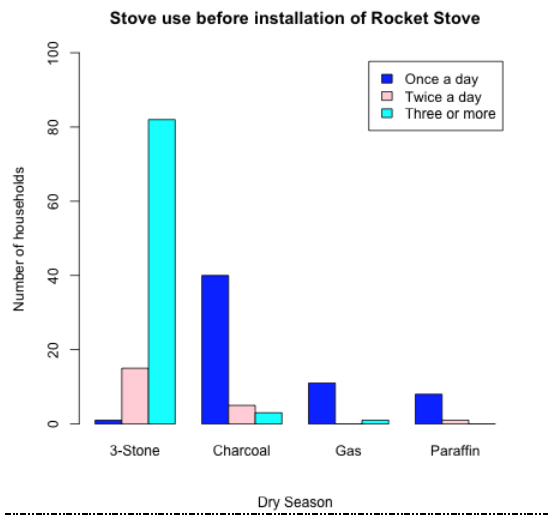


Table A below indicates that since the adoption of the improved CZK stove the occurrence of other fuel and stove use has remained relatively consistent with the baseline level. This is especially true for charcoal. As charcoal is a much more emissions intensive fuel source than wood, it was conservatively assumed that any net emissions benefit to reduced charcoal usage as a result of this project is 0.

Q40 - What type of fuel do you use for cooking?							
Survey	n	Wood	Gas	Charcoal	Paraffin/Kerosene	Other	Husks
KS	100	99	1	0	0	0	0
MKS 5	45	45	0	0	0	0	0
MKS 6	45	44	0	0	0	0	0
MKS 7	45	44	1	0	0	0	0
MKS 8	45	45	0	0	0	0	0

Table A: Number of households using various fuel types [MKS & KS Data]

Data/Parameter	Usage in year y
Unit	Fraction
Description	Percentage of stoves of age x remaining in use in year y
Measured/Calculated /Default	Measured
Source of data	Usage Survey
Value(s) of monitored parameter	0.95
Monitoring equipment	Survey
Measuring/Reading/ Recording frequency	Biennially
Calculation method (if applicable)	N/A
QA/QC procedures	Random selection of households and full training provided to staff
Purpose of data	
Additional comment	Surveyed and reported on in Monitoring Period 1, valid for 2 years, next update 2014

Data/Parameter	Age KPT
Unit	Fraction
Description	Adjustment to values of $B_{pj,,y}$ and $AF_{pj,i,y}$ for stoves of age x
Measured/Calculated /Default	Measured
Source of data	Ageing Stove KPT
Value(s) of monitored parameter	1
Monitoring equipment	Training provided for all field staff as well as calibration / replacement of equipment when necessary as per EB 61, Annex 21[8].
Measuring/Reading/ Recording frequency	Biennially
Calculation method (if applicable)	N/A
QA/QC procedures	Training provided for all field staff as well as calibration of equipment
Purpose of data	
Additional comment	Conducted in July 2012 as part of revised baseline, not due to be updated until 2014. Procedure for Aging Stove KPT is the same as for Baseline KPT however analysis is different. Fraction considered to be 1 until 2014 as the revised baseline conducted in 2012 effectively measured aging as it was conducted on stoves that were between 1-2 years old. Therefore a separate Aging stove KPT is not necessary and the parameter is treated as 1.

[8] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf

Data/Parameter	Leakage
Unit	t_CO_2e per year
Description	Potential GHG emissions outside project boundary caused by project activity
Measured/Calculated /Default	Calculated
Source of data	Kitchen Surveys supported by desk-based research
Value(s) of monitored parameter	L2=0
Monitoring equipment	Surveys
Measuring/Reading/ Recording frequency	Biennially
Calculation method (if applicable)	N/A
QA/QC procedures	
Purpose of data	To account for tco2e that occur during the crediting period as a result of the project activity
Additional comment	Applied during years in which stoves are constructed; however this will be reviewed biennially.

Data/Parameter	$X_{nrb,pj,y}$
Unit	Fraction
Description	Non-renewability of woody biomass fuel in year y in project scenario
Measured/Calculated /Default	Calculated
Source of data	Report compiled by Anthony Mills (PhD) and Diane Southey (MSc) C4 EcoSolutions (Pty) Ltd., Cape Town, South Africa
Value(s) of monitored parameter	0.95
Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	Calculated at the start of each crediting period and then reviewed Biennially by literature review
Calculation method (if applicable)	N/A
QA/QC procedures	Study commissioned by an independent third party
Purpose of data	
Additional comment	NRB fraction was assessed in June 2012 as part of Monitoring period 1 as requested in a Forward Action Request at registration. Project NRB fraction is supported by the WISDOM Report (2005).

Data/Parameter	$B_{bl,y}$
Unit	t_biomass/stove/year
Description	Mass of woody biomass combusted in the baseline in year
Measured/Calculated /Default	Measured
Source of data	Kitchen Performance Tests
Value(s) of monitored parameter	3.97* A Revised Baseline KPT was conducted in June 2012 which is the figure presented here
Monitoring equipment	Digital scales – accurate to 2 decimal places.
Measuring/Reading/ Recording frequency	Biennially – if MKS suggests any significant changes in patterns
Calculation method (if applicable)	N/A
QA/QC procedures	Training provided for all field staff as well as calibration / replacement of equipment when necessary as per EB 61, Annex 21[9].
Purpose of data	
Additional comment	Figure remains relevant until MKS suggests significant change in fuel use patterns or crediting period ends. Due to small sample size of original third party approved baseline KPTs, and with permission from the Gold Standard, a revised baseline KPT was conducted by co2balance field staff and verified by ERM during first verification.

[9] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf

Data/Parameter	$B_{pj,y}$
Unit	t_biomass/stove/year
Description	Mass of woody biomass combusted in the project in year y
Measured/Calculated /Default	Measured
Source of data	Kitchen Performance Tests
Value(s) of monitored parameter	2.17* A Revised Baseline KPT was conducted in June 2012 which is the figure presented here
Monitoring equipment	Digital scales – accurate to 2 decimal places.
Measuring/Reading/ Recording frequency	Biennially – if MKS suggests any significant changes in patterns
Calculation method (if applicable)	N/A
QA/QC procedures	Training provided for all field staff as well as calibration / replacement of equipment when necessary as per EB 61, Annex 21.
Purpose of data	
Additional comment	Figure remains relevant until MKS suggests significant change in fuel use patterns or crediting period ends. Due to small sample size of original third party approved baseline KPTs, and with permission from the Gold Standard, a revised baseline KPT was conducted by co2balance field staff and verified by ERM during first verification.

Data/Parameter	New Stove KPT
Unit	Fraction
Description	Adjustment to values of ($B_{bl,y} – B_{pj,,y}$) and $AF_{pj,i,y}$ for new stove models
Measured/Calculated /Default	Measured
Source of data	New Stove KPT
Value(s) of monitored parameter	1
Monitoring equipment	Digital scales – accurate to 2 decimal places.
Measuring/Reading/ Recording frequency	When new stove designs are introduced and then biennially after that
Calculation method (if applicable)	N/A
QA/QC procedures	Training provided for all field staff as well as calibration / replacement of equipment when necessary as per EB 61, Annex 21[10]. 3rd party direction and assessment of study.
Purpose of data	
Additional comment	Fraction is assumed to be 1 until new stoves are introduced, or following biennial test

Sustainable Development Parameters

[10] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf

No		1
Indicator		Air Quality
Mitigation measure		None
Repeat for each parameter		
Chosen parameter 1.1		Total suspended particulate matter (TSPM) – measured indirectly by wood consumption
Current situation of parameter		As determined by research and field staff, traditional cooking methods produce large amounts of TSPM. It is not justifiable to measure this quantitatively but it will be measured qualitatively as described below.
Estimation of baseline situation of parameter		The baseline is determined by the current situation.
Future target for parameter		The project aims to reduce wood consumption and hence make a reduction in the defined parameter.
Way of monitoring	How	Kitchen Performance Tests & Kitchen Surveys
	When	Biennially and quarterly, respectively
	By who	Expert surveying team
Chosen parameter 1.2		Respirable suspended particulate matter (RSPM) – measured indirectly by wood consumption
Current situation of parameter		As determined by research and field staff, traditional cooking methods produce large amounts of RSPM. It is not justifiable to measure this quantitatively but it will be measured qualitatively as described below.
Estimation of baseline situation of parameter		The baseline is determined by the current situation.
Future target for parameter		The project aims to reduce wood consumption and hence make a reduction in the defined parameter.
Way of monitoring	How	Kitchen Performance Tests & Kitchen Surveys
	When	Biennially and quarterly, respectively
	By who	Expert surveying team

As outlined in the Gold Standard Passport it has been decided that based on the scale of the project and the associated cost of directly monitoring air quality parameters it will be sufficient to use the proxy measurement of wood fuel savings. The justification for this approach is made in the Passport in section F.2. Two monitoring techniques are employed to ascertain the ongoing effect our project has on air quality, the Monitoring Kitchen Survey and the Kitchen Performance Test. Three questions asked during the Monitoring Kitchen Surveys relate to air quality in the home. The first of these found that householders still predominately use wood fuel for their cooking needs (*Table 1*). It was observed that there was a minimal level of gas and charcoal use, however the vast majority continue to use wood-fuel as their primary heat energy source.

MKS Q40 Fuel use after receiving the CZK stove						
Survey	n	Wood	Gas	Charcoal	Other	Husks
KS	100	99	0	1	0	0
MKS 5	45	45	0	0	0	0
MKS 6	45	44	0	0	0	0
MKS 7	45	44	1	0	0	0
MKS 8	45	45	0	0	0	0

Table 1: Fuel Use

Respondents were then asked to comment on fuel savings due to the improved stove. An overwhelming majority reported a fuel saving since using the CZK stove (*Table 2*). This saving should then translate into reduced smoke levels and therefore improved air quality.

KS Q26 & MKS Q28:Since Receiving the CZK Stove How Much Firewood Do You Use?				
Survey	n	More	Less	Same
KS	100	0	97	2
MKS 5	45	0	44	1
MKS 6	45	0	44	1
MKS 7	45	3	41	0
MKS 8	45	0	45	0

Table 2: Reported Fuel Savings

As outlined above, the observed saving in wood fuel due to the improved CZK stove should translate into a corresponding reduction in levels of smoke. In fact this was more strongly reported than wood fuel savings with close to 100% of householders reporting this in all four surveys (*Table 3*).

MKS Q69 Compared to a 3-stone fire how much smoke?				
Survey	n	More	Less	Same
KS	100			
MKS 5	45	0	45	
MKS 6	45	0	44	
MKS 7	45	0	44	
MKS 8	45	0	43	2

Table 3: Reported smoke levels

So, in summary, householders' still use wood as their main fuel source, the majority have observed a reduction in the amount they use and virtually all of them report less smoke since using the improved stove. Combined with wood fuel measurements taken during the Baseline Survey it is clear that use of the stove results in a cleaner and healthier cooking environment. This parameter has been scored positive.

No		2
Indicator		Quality of employment
Mitigation measure		None
Repeat for each parameter		
Chosen parameter 2.1		Number of training workshops organised, number of attendees.
Current situation of parameter		3
Estimation of baseline situation of parameter		As defined by current situation.
Future target for parameter		3
Way of monitoring	How	Stove contractor records – collated
	When	Continuously
	By who	Project developer

co2balance UK LTd have records for two staff training sessions conducted during this monitoring period, the first was a companywide training day held in Nairobi, attended by all staff in Kenya covering a wide range of topics. The agenda and attendance records can be found in the document 'Agenda Training 5 July 2012.' The second training session was conducted by the Country Coordinator in the Project Area in January 2013, details of which can be found in the document 'Aberdares Training January 2013.'

Although this is one short of the future target for the parameter the PP is scoring the parameter as positive (+ve) as this is still an improvement over the baseline situation of zero training workshops.

No	3

Indicator		Livelihood of the poor
Mitigation measure		None
Repeat for each parameter		
Chosen parameter		Wood consumption
Current situation of parameter		Wood consumption is known to be high amongst the project area population
Estimation of baseline situation of parameter		As defined by current situation
Future target for parameter		It is anticipated that wood consumption amongst stove beneficiaries will be reduced by at least 50%
Way of monitoring	How	Kitchen Performance Tests & Kitchen Surveys
	When	Biennially and quarterly, respectively
	By who	Expert surveying team

Improvements in the livelihood of the poor can be assessed using KPT and MKS data as outlined above and in the Gold Standard Passport. KPT data from the Baseline Study illustrates that each stove saves 1.8 tonnes of wood fuel per year, this represents a 45% saving when compared to the baseline. By using less fuel (as reported by beneficiaries in *Table 1* above*)* the CZK stove impacts upon air quality and health as outlined in *Tables 2 and 3*. In addition to this the MKS identified a strong decreasing trend in the length of time householders spend collecting fuel and the distances they have to travel (*Table 4*). This allows for the time saved to be used for other activities related to education and income generation. This indicator is therefore scored positively as wood consumption is reduced which improves health standards in the home, it also reduces the amount of fuel that is collected which has knock on effects to collection time and distance travelled. This parameter has been scored as positive.

MKS Q59 & Q60 Livelihood of the poor			
Survey	n	Collection Time (Mins)	Collection Distance (Kms)
KS	100	192	3.37
MKS 5	45	60	0.99
MKS 6	45	195	2.47
MKS 7	45	73	1.73
MKS 8	45	91	1.34

Table 4: Fuel collection time and distance

No		4
Indicator		Access to affordable and clean energy services
Mitigation measure		None
Repeat for each parameter		
Chosen parameter		Change in volume of traditional fuel consumption
Current situation of parameter		Traditional fuel consumption (wood) is known to be high amongst the project area population
Estimation of baseline situation of parameter		As defined by current situation
Future target for parameter		It is anticipated that wood consumption amongst stove beneficiaries will be reduced by at least 50%
Way of monitoring	How	Kitchen Performance Tests & Kitchen Surveys
	When	Biennially and quarterly, respectively
	By who	Expert surveying team

By distributing improved cook stoves for free this parameter is inherent in the project. At the end of this monitoring period a total of 7,946 crediting stoves had been constructed and distributed. Furthermore, as demonstrated earlier, the stove reduces wood consumption and therefore smoke generation (*Tables 1, 2, 3*).

The wood saving also translates into a time saving for the householder (*Table 4*) which can be used to generate further income. This parameter has been scored as positive.

No		5
Indicator		Quantitative employment and income generation
Mitigation measure		None
Repeat for each parameter		
Chosen parameter		Household income generated from employment generated by the project
Current situation of parameter		100,000Ksh
Estimation of baseline situation of parameter		As defined by current situation
Future target for parameter		4,615,500Ksh
Way of monitoring	How	Stove contractor/project developer records – collated
	When	Continuously
	By who	Project developer

As a result of the stove project new employment opportunities will emerge related to the different phases and scopes of the project. The number of employment opportunities created and their specifications have been recorded for this purpose. The direct parameter used to measure the indicator is household income generated from employment created by the project. At the end of the current crediting period at total of 1,632,000 Ksh had been paid out in salaries to permanent members of staff located in the project area. The breakdown of this can be found in the 'Monitoring Report 2 Supplementary Data v1.' This figure is less than the projected amount as no stoves have been constructed in this monitoring period. This parameter has been scored as positive.

Modified Stoves

Since installation it has been found that a number of stove beneficiaries have 'modified' their stoves. This modification usually involves altering the vent or liner with the presumed aim of increasing the opening allowing more varied sizes of wood to be used in the stove. An ongoing survey of households in the project area has been undertaken to determine the proportion of modified to unmodified stoves; to date 2801 have been visited. It was found that 446 (16%) were modified and the remaining 2355 (84%) had not been. Compared to Monitoring Period 1 this is a significant change in percentage split and is most probably due to an increase in sample size. As illustrated in the previous monitoring report, beneficiaries save the same amount of fuel on both modified and unmodified stoves and emissions reductions are not affected. The PP will continue to periodically assess the proportions of modified to unmodified stoves.

						Welchs Unpaired t-Test				
							CI 90%			
		N	Mean	STDEV	SEM	t - Test	Mean Saving	-	+	CoV	Sample Size 90/10
Modified vs Unmodified	Unmodified CZK	34	5.8515	2.0256	0.3474	Not Signif	0.1969	-0.4695	0.8633	34.62%	32
	Modified CZK	55	6.0484	1.443	0.1946	(0.9710)				23.86%	15

KPT Results from Revised Baseline – Monitoring Period 1

Clustering Insights from Monitoring Kitchen Survey

Analysis of the Baseline Kitchen Surveys resulted in only one project cluster being identified: "As per the methodology, clusters are to be identified from the existing sales record. Thus based on the KS data, no distinct clusters are identified from within the pilot [project] group." However the 3rd Party Consultant did identify areas that should be specifically analysed in future surveys.

Main Fuel Use: During Baseline KS analysis HED Consulting identified a small occurrence of charcoal use in the project area (see table below) and stated that "data on main fuel use does not suggest that more than one cluster exists within the pilot group."

Types of fuel used	Pre-installation		Post-installation	
	Frequency	Percent	Frequency	Percent
Firewood	99	99.0	99	99.0
Charcoal	1	1.0	1	1.0
Total	100	100.0	100	100.0

Fuel use data from Baseline KS

During the Baseline Survey firewood accounted for 99% of fuel used in the project area and charcoal 1%. This pattern has largely continued over the course of the monitoring period and does not constitute a new cluster.

Q40 - What type of fuel do you use for cooking?							
Survey	n	Wood	Gas	Charcoal	Paraffin/Kerosene	Other	Husks
KS	100	99	1	0	0	0	0
MKS 5	45	45	0	0	0	0	0
MKS 6	45	44	0	0	0	0	0
MKS 7	45	44	1	0	0	0	0
MKS 8	45	45	0	0	0	0	0

Comparison of Fuel use data between Baseline KS and MKS

Fuel use for tasks other than cooking: The Baseline Survey identified that a significant percentage of people used their stoves for space and water heating both before and after the installation of the improved stove (93% and 89% respectively). This was not deemed as cluster defining because the majority of people exhibited this trend. But continued monitoring was recommended as this could 'potentially have a large impact on fuel consumption.' As illustrated by the table below this trend has continued and the majority of beneficiaries still exhibit this behaviour. There is therefore no need to define a new cluster.

MKS Q44 Other Stove Use			
Survey	n	Yes	No
KS	100	93	0
MKS 5	45	35	10
MKS 6	45	45	0
MKS 7	45	42	3
MKS 8	45	45	0

Beneficiaries reporting additional stove use (e.g. space heating etc)

Social and Demographic Factors: Aside from the specific areas highlighted by HED Consulting that are addressed above, social and demographic factors can also lead to the need for the creation of new clusters and need to be investigated.

The majority of cooking in the project area is historically done by women and the surveys therefore aim to target female respondents as it is expected that they will provide the most informed answers. Significant change in the ratio of male to female respondents may indicate a shift in cultural and socio-economic circumstances that may impact upon cooking practices and the associated woodfuel savings. As can be seen

from the table below the Baseline Survey respondents were predominantly female and this trend has continued throughout the monitoring period; there is therefore no need for the identification of any futher clusters.

Gender			
MKS	n	Male	Female
KS	100	9	91
MKS 5	45	9	36
MKS 6	45	2	43
MKS 7	45	2	43
MKS 8	45	8	37

Similarly, changing / rising education levels may indicate a change in socio-economic conditions which could have a resulting knock on effect on cooking practices. As illustrated by the table below the majority of respondents in the Baseline Survey were educated to Primary and Secondary school level. This trend has also continued throughout the monitoring period..

Education							
Survey	n	None	Primary	Secondary	Tertiary	University	Other
KS	100	8	67	22	3	0	0
MKS 5	45	1	21	20	2	0	1
MKS 6	45	0	9	31	3	2	0
MKS 7	45	7	26	10	1	1	0
MKS 8	45	3	20	20	2	0	0

Education Status of beneficiaries visited during the course of the monitoring period

An assessment of the number of people cooked for shows little change since the Baseline KS was conducted, with the average staying around 5 people. This is also consistent with the national average household size of 5.1 (FAO)[11] MKS 8 did exhibit a slight decrease however it is not clear why, the PP will continue to monitor this. Additional clustering is not required.

Number of People Cooked For				
Survey	n	Mean	Median	Mode
KS	100	5.67	5.00	5.00
MKS 5	45	4.89	5.00	5.00
MKS 6	45	4.33	4.00	5.00
MKS 7	45	4.98	5.00	5.00
MKS 8	45	4.07	4.00	4.00

Finally, employment and sources of income have the potential to impact cooking practices especially where rising standards of living are concerned. The table below shows Farming to be the consistently most common form of income generation / employment and there is therefore no need for additional clustering.

Income Generation					
Survey	n	Trade	Employment	Farming	Labour
KS	100	9	2	85	4
MKS 5	45	5	8	24	8
MKS 6	45	3	5	35	2
MKS 7	45	5	6	26	8
MKS 8	45	3	2	37	3

[11] http://www.fao.org/fileadmin/templates/riga/docs/Country_survey_information/04_Kenya05_Components_of_Income_Aggregate.pdf

Based on the findings of the MKS and the corresponding comparison to the Baseline KS it is reasonable to assume the continuation of one single cluster as identified in the Baseline Report.

Forward Action Requests From Monitoring Period 1

FAR 1: *Distribution data collection included manual data handling on 3 levels (builders, their supervisors, and co2balance office personnel). This increases risks of errors considerably. Please reduce the level of manual data handling and transfer and improve quality checks on the collected data*

Since the last stoves were constructed in the project area the PP has designed updated Standard Operating Procedures that reduce data handling and improve data quality. The PP is currently working on an additional SOP to cover Monitoring and this will be complete in time for next verification. When construction recommences in the project area these procedures will be implemented.

FAR2: *Although it is clear from the interviews that the personnel have been trained, keeping training records would give a picture of how many people were trained, and would present a verifiable evidence: Please record training events and maintain training material and lists of attendees.*

The PP is putting in place improved record keeping for training events. co2balance UK Ltd have records for two staff training sessions conducted during this monitoring period, the first was a companywide training day held in Nairobi, attended by all staff in Kenya covering a wide range of topics. The agenda and attendance records can be found in the document 'Agenda Training 5 July 2012.' The second training session was conducted by the Country Coordinator in the Project Area in January 2013, details of which can be found in the document 'Aberdares Training January 2013.' Moving forward the PP will conduct at least one major training event per year for all staff in Kenya. The last was conducted in July 2012 and the next is scheduled for July 2013. Smaller project area specific training events will happen on an ad hoc basis and reported on if/when they are happen.

FAR 3: *MKS questionnaires included a qualitative question on the difference in smoke level. This leads to either "more" or "less" response, potentially discouraging respondents to give a response "no difference". It can hardly be expected that smoke levels would be higher than with the 3-stone fire but similar levels could be observed including but not limited to cases where cookstove is not used properly. Please revise questionnaire to avoid leading the beneficiaries to give a response that smoke levels are reduced.*

MKS Q69 Compared to a 3-stone fire how much smoke?				
Survey	n	More	Less	Same
KS	100			
MKS 5	45	0	45	
MKS 6	45	0	44	
MKS 7	45	0	44	
MKS 8	45	0	43	2

Please see response to FAR 6 below for further explanation

FAR 4: *The sustainability parameters "Quality of employment" and "Technology transfer and self-reliance" have not been monitored in accordance with the sustainability monitoring plan. For this verification period, the parameters been scored as 'neutral', and the PP has suggested alternative monitoring: Please revise the monitoring plan in the GS passport accordingly before the next verification.*

Sustainable development criteria are reported biennially and as they were reported in the previous monitoring period they are not included in this one. However the PP will continue to score 'Quality of Employment' based on the parameter training workshops delivered as stated in the GS Passport as this simply requires improved record keeping in line with FAR2. However as stated by the DOE during first verification 'Technology transfer and self reliance' can only be scored positively if the general public is trained. Having reviewed the GS Passport v4 it appears that this parameter was already scored as neutral and therefore should not have been included in the Sustainable Monitoring

Plan of the Passport (v4). The Monitoring plan in the GS Passport has been amended and the PP will cease to monitor 'Technology transfer and self reliance.'

FAR 5: *The usage survey revealed conflicting messages, where, for example, 99% of the surveyed beneficiaries stated that their cook stoves were working correctly, but 87% also revealed that their cook stoves were damaged. Similarly confusing, 99% of beneficiaries stated that they knew how to use the stove correctly, yet 69% stated that their stove was either in need of repair, or that they were in need of training on how to use it. Please provide further investigation and explanation regarding these unclear results in the next monitoring period, including analysis of what kind of damage households reported, and modify questionnaire for usage survey if needed.*

The PP has changed some of the questions and layout of the Usage Survey to improve the quality and usefulness of results. Q8 – Is your CZ stove working correctly has been removed as it is effectively a duplicate of 'Is your stove damaged?' this should lead to less confusing results. Furthermore surveyors will now not ask if the stove is damaged but make a self assessment based on a visual inspection of the stove. Our surveyors are well placed to understand what constitutes damage that will affect efficiency and usefulness as opposed to the cosmetic damage that is often reported by users when asked. The PP is already conducting a project wide survey of stoves to ascertain if they are modified/damaged and this will continue as part of our monitoring procedure. Finally Q10 asking if the beneficiaries would like repair or training is no longer a question but an outcome of questions 7 and 10. Please see the attached excel that illustrates the original survey as well as the updated version.

FAR 6: *Verification team has noted that results of the first verification period indicate that MKS questionnaires may need a few additional questions or modifications:*

•MKS questionnaires so far have assumed that households continue either collecting or buying wood or questions ask only for trends in time or money spent. However, there is a possibility that some households would change from buying to collecting or vice verse. The questionnaire should include a way to record such change
• A considerable share of CZK stoves got modified or damaged. MKS questionnaires or their information collection sheets so far do not include a way to record whether a stove is damaged or modified in any way.

Please modify MKS questionnaire and/or its information collection sheet to include ways to record if households have changed a way of getting fuelwood, and whether stoves are modified/damaged.

The Verification Report for the first period was finalised and signed in November 2012 at which point the PP reviewed the Forward Action requests and began acting on them. At this point 2 Monitoring Kitchen Surveys for the period had already been conducted and the third was due imminently. It was therefore not possible to include the changes suggested in FAR 3 and 6 before December 2012. These changes were made in early 2013 and incorporated into MKS 8.

- Question 53 of the MKS asks whether beneficiaries buy or collect their fuel or use a mixture of both methods. This has been consistently asked since the Baseline Survey and by analysing the answers across time it is possible to understand if stove recipients in the project area as a whole are changing their fuel sourcing patterns. The MKS has therefore not been updated.

MKS Q53 Wood Source				
Survey	n	Buy	Collect	Both
KS	100	37	62	
1	40	10	24	5
2	45	19	22	4
3	45	15	19	11
4	45	7	37	1
5	45	12	31	2
6	45	27	17	1
7	45	13	31	1
8	45	10	33	2

- The PP has not included a section for recording whether the stove is modified/unmodified as we are already undertaking a project wide survey of each household to determine the current status of the stoves. This is discussed more in sections B.1 and D.2.

FAR07: *The PP shall study for the next KPT whether there is a difference in efficiency between broken and not broken stoves on a fuel use per person meal day basis*

During the next KPT the PP will analyse whether there is a difference in efficiency between the broken and not broken stoves as highlighted by the Usage Survey. This is scheduled to be conducted in June 2014 based on the biennial monitoring requirements of the methodology.

FAR08: *The PP shall report for the next verification the results of the incentive mechanism targeting households to surrender their baseline stove, by, e.g. by recording the reduction of households relying on baseline stoves.*

As noted on page 15 of the PDD and taken from the baseline survey: 'It is striking that 80% of households are still using three stone fires alongside the CZ stove, with nearly 30% cooking on them three times each day [……], given that the average number of meals cooked per day is less than three.'

As illustrated by the table below there has been a significant decrease in baseline stove usage alongside the CZK stove, with on average only 34% of people saying that they still use a supplementary stove as well as their CZK (compared to 80% in the baseline). On average the 34% of households that use more than one stove type still use the CZK more than 50% of the time. Based on this it can be said that since the beginning of the project beneficiaries are reducing their 3-stone fire use and increasing CZK use. Appropriately captured this will result in greater emissions reductions however this has been conservatively excluded.

Q20 Use for all cooking?					
Survey	**n**	**Yes**	**No**	**If no, how many times a day?**	**Average Number of Meals Cooked**
KS	100	98	2	N/A	2.82
MKS 1	40	8	31	1.5	2.80
MKS 2	45	22	23	1.4	2.98
MKS 3	45	14	31	1.5	2.93
MKS 4	45	25	20	1.6	2.93
MKS 5	45	34	11	2.0	3.09
MKS 6	45	29	16	1.5	2.97
MKS 7	45	36	7	1.4	2.87
MKS 8	45				
		65.36%	34.64%	**1.6**	2.92

D.3. Implementation of sampling plan

The parameters above have been monitored through a Random Sample Group (RSG). The size of the sample group has been selected to ensure the parameters measured satisfy 90/10 precision (90% confidence interval and 10% margin of error), according to the guidance: *Draft General Guidelines On Sampling And Surveys* (EB 37, Annex 27) and *General Guidelines For Sampling And Surveys For CDM Project Activities and Programme of Activities Version 02* (EB 69 Annex 5). The individual participants were selected at random from the stove information database. A random number generator ranked the unique serial numbers of the stoves in the project, generating a RSG. The size of the RSG varied depending on the variance of the parameter being monitored. The RSG was reselected for every monitoring period to ensure the selection remains random.

Monitoring Kitchen Survey

The MKS has been designed to collect data on the following characteristics: household demographics, seasonality, socio-economic factors, cooking and fuel use habits as well as sustainable development parameters. As required by the applicable Gold Standard Methodology the MKS is conducted every three months to capture any potential trends attributable to seasonality. The minimum sample size requirement of 25 households is exceeded with a typical survey capturing 40+ households; all interviews are conducted face-to-face in the respondents' home. Responses are analysed allowing population trends to be established and reported on. The minimum sample size requirements for Monitoring Kitchen Surveys as set out on page 22 of the methodology is 25 households or 10% of the cluster size if the cluster is less than 250.

SECTION E. Calculation of emission reductions or GHG removals by sinks

The project proponent has elected to use a fixed baseline, in-line with the chosen methodology. Each stove build date is individually recorded in the proponent's database and emission reductions calculated on an individual basis. A maximum one month lead time is accounted for between construction and operation of the stove, this leads to a conservative assessment of the emission reductions made and accurate calculation of emission reductions under a progressive distribution scenario.

Kitchen Performance Tests are calculated according to the third form as described on page 12 of the methodology which states: *The KT measures fuel consumption of the primary fuel only, while households involved are carrying on a degree of typical fuel and stove-type mixing and/or typical use of RE forms during the HT itself ("subsumed-fuel KT"). Where a secondary fuel or stove is subsumed, the quantity or fraction of secondary fuel or RE is treated as zero (AF and Xaf, Xre in the equations below) and the effect of fuel mixing is to reduce the saving made in primary fuel between baseline and project scenarios.*

Following from this 'approach 1' (pages 13 and 16 of the methodology) is used to calculate emissions reductions which is *specific to each representative unit of each cluster and applies values of mass for each fuel in the mix.* Calculations are therefore made on a per unit basis, resulting in an ER/stove/year figure which is applied to the number of stoves crediting based on the length of time each has been in operation.

$$ER_y = \sum BE_{i,y} - \sum PE_{i,y} - \sum LE_{i,y} \quad \text{……Eqn ER.1a}$$

Where:

ER_y = Emissions reductions in total project population in year y (tCO_2e/yr)
$BE_{i,y}$ = Baseline emissions of cluster i in year y (tCO_2e/yr)
$PE_{i,y}$ = Project emissions of cluster i in year y (tCO_2e/yr)
$LE_{i,y}$ = Leakage of cluster i in year y (tCO_2e/yr)

Within each cluster emissions are calculated thus:

$$BE_{i,y} = N_{i,y} \times BE_y \quad \text{……Eqn ER.1b}$$

$$PE_{i,y} = N_{i,y} \times PE_y \quad \text{……Eqn ER.1c}$$

Where:

$N_{i,y}$ = the number of Units in cluster i

$$BE_y = X_{nrb,bl,y} \times B_{bl,y} \times EF_{bl,bio,CO2} + \sum (AF_{bl,i,y} \times EF_{af,CO2,i})$$
$$+\sum(\text{Non-CO2 emissions during cooking})$$
$$+\sum(\text{GHG emissions during production of the fuels}) \quad \text{……Eqn B.1a}$$

Where:

BE_y = baseline emissions in year y (in tonnes CO2e per year) specific to cluster and Unit chosen

$X_{nrb,bl,y}$ = the non-renewable fraction of the woody biomass harvested in the project collection area in year y in the baseline scenario

$B_{bl,y}$ = the mass of woody biomass consumed during cooking in the baseline in year y (tonnes/year)

$EF_{bl,bio,co2}$ = the CO2 emission factor for use of the biomass fuel in the baseline scenario in tonnes CO2 per tonne fuel

$AF_{bl,i,y}$ = The mass of alternative fuel i in the baseline in year y in accordance with trends projected throughout the project period, in tonnes. This mass can be set to zero in cases where the KT is appropriately designed to subsume alternative fuels (approach 3).

$EF_{af,co2,i}$ = The CO2 emission factor for use of the alternative fuel i in the baseline in tonnes of CO2 per tonne fuel.

Non-CO2 emissions during cooking

$$= \sum(B_{bl,y} \times EF_{bl,bio,non-co2,i}) + \sum(AF_{bl,i,y} \times EF_{af,i,non-co2\_gas\_i}) \quad \text{.....Eqn B.1b}$$

GHG emissions during production of the fuels

$$\begin{aligned} &= X_{nrb} \times B_{bl,y} \times EF_{bio,prod,co2} \\ &+ \sum(AF_{bl,i,y} \times EF_{af,prod,co2,i}) \\ &+ \sum(B_{bl,y} \times EF_{bio,prod,non-co2\_gas\_i}) \\ &+ \sum(AF_{bl,i,y} \times EF_{af,i,prod,non-co2\_gas\_i}) \end{aligned} \quad \text{.....Eqn B.1c}$$

Where:

$EF_{bl,bio,non-co2,i}$ = Emission factor for GHG gas i in the baseline scenario in units of tonnes gas per tonne wood-fuel

$EF_{af,non-co2\ gas\ i}$ = Non-CO2 emission factor during cooking for alternative fuel i for GHG gas i in tonnes gas per tonnes fuel

$EF_{bio,prod,co2}$ = CO2 emission factor for wood-fuel during production in tonnes gas per tonnes fuel

$EF_{af,prod,co2,i}$ = CO2 emission factor for fuel I during production in tonnes gas per tonnes fuel

$EF_{bio,prod,non-co2\ gas\ i}$ = Non-CO2 emission factor for wood-fuel during production in tonnes gas per tonne fuel

$EF_{af,prod,non-co2\ gas\ i}$ = Non-CO2 emission factor for alternative fuel i for GHG gas i during production in tonnes gas per tonnes fuel

$$PE_y = X_{nrb,pj,y} \times B_{pj,y} \times EF_{pj,bio,CO2} + \sum(AF_{pj,i,y} \times EF_{af,CO2,i})$$
$$+\sum(\text{Non-CO2 emissions during cooking})$$
$$+\sum(\text{GHG emissions during production of the fuels}) \ldots\ldots\ldots\ldots \text{Eqn P.1a}$$

Where:

PE_y = project emissions in year y (in tonnes CO2e per year) specific to cluster and Unit chosen

$X_{nrb,pj,y}$ = the non-renewable fraction of the woody biomass harvested in the project collection area in year y in the project scenario

$B_{pj,y}$ = the mass of woody biomass consumed during cooking in the project each year (tonnes/year)

$AF_{pj,i,y}$ = The mass of alternative fuel i in the project in year y in accordance with trends projected throughout the project period, in tonnes. This mass can be set to zero in cases where the KT is appropriately designed to subsume alternative fuels (approach 3).

Non-CO2 emissions during cooking

$$= \sum(B_{pj,y} \times EF_{pj,bio,non-co2,i}) + \sum(AF_{pj,i,y} \times EF_{af,i,non-co2\_gas\_i}) \ldots\ldots\ldots\ldots \text{Eqn P.1b}$$

GHG emissions during production of the fuels

$$= X_{nrb} \times B_{pj,y} \times EF_{bio,prod,co2}$$
$$+ \sum(AF_{pj,i,y} \times EF_{af,prod,co2,i})$$
$$+ \sum(B_{pj,y} \times EF_{bio,prod,non-co2\_gas\_i})$$
$$+ \sum(AF_{pj,i,y} \times EF_{af,i,prod,non-co2\_gas\_i}) \ldots\ldots\ldots\ldots \text{Eqn B.1c}$$

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

Baseline emissions in tCO2e/stove/year are calculated as follows:

$$BE_y = X_{nrb,bl,y} \times B_{bl,y} \times EF_{bl,bio,CO2} + \sum(AF_{bl,i,y} \times EF_{af,CO2,i})$$
$$+\sum(\text{Non-CO2 emissions during cooking})$$
$$+\sum(\text{GHG emissions during production of the fuels}) \ldots\ldots\ldots\ldots \text{Eqn B.1a}$$

Baseline Emissions			
BEy		7.06	
Xnrb,bl,y	(fraction)	0.95	<< Third Party NRB Report
Bbl,y	(t/HH/year)	3.97	<< Baseline KPT Report
EFbl,bio,CO2	(tco2/t_wood)	1.7472	<< B62 Wood EF Calc
AFbl,i,y	(t/HH/year)	0	<< Set to zero as KPT Subsumes Alternative Fuels
EFaf,CO2	(tco2/t_fuel)	0	<< Set to zero as KPT Subsumes Alternative Fuels

Non-CO2 Emissions		0.46749053	
EFbl,bio,non-co2	(tco2e/t_wood)	0.117624	<< Sum of EF for CH4 and N2O
EFbio,CH4	(tco2e/t_wood)	0.09828	<< B62 Wood EF Calc
EFbio,N2O	(tco2e/t_wood)	0.019344	<< B62 Wood EF Calc
EFaf,i,non-co2 gas	(tco2e/t_fuel)	0	<< Set to zero as KPT Subsumes Alternative Fuels

GHG Emissions During Production		0	
EFbio,prod,co2	(tco2/t_wood)	0	<< Set to zero as fuel harvested and transported manually
EFaf,prod,co2	(tco2/t_fuel)	0	<< Set to zero as KPT Subsumes Alternative Fuels
EFbio,prod,non-co2 gas	(tco2e/t_wood)	0	<< Set to zero as fuel harvested and transported manually
EFaf,prod,non-co2 gas	(tco2e/t_fuel)	0	<< Set to zero as KPT Subsumes Alternative Fuels

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

Project emissions in tCO2e/stove/year are calculated as follows:

$$PE_y = X_{nrb,pj,y} \times B_{pj,y} \times EF_{pj,bio,CO2} + \sum(AF_{pj,i,y} \times EF_{af,CO2,i})$$
$$+\sum(\text{Non-CO2 emissions during cooking})$$
$$+\sum(\text{GHG emissions during production of the fuels}) \ldots\ldots\ldots\ldots \text{Eqn P.1a}$$

Project Emissions			
PEy		3.86	
Xnrb,pj,y	(fraction)	0.95	<< Third Party NRB Report
Bpj,y	(t/HH/year)	2.17	<< Baseline KPT Report
EFpj,bio,CO2	(tco2/t_wood)	1.7472	<< B62 Wood EF Calc
AFpj,i,y	(t/HH/year)	0	<< Set to zero as KPT Subsumes Alternative Fuels
EFaf,CO2	(tco2/t_fuel)	0	<< Set to zero as KPT Subsumes Alternative Fuels

Non-CO2 Emissions		0.255364056	
EFpj,bio,non-co2	(tco2e/t_wood)	0.117624	<< Sum of EF for CH4 and N2O
EFbio,CH4	(tco2e/t_wood)	0.09828	<< B62 Wood EF Calc
EFbio,N2O	(tco2e/t_wood)	0.019344	<< B62 Wood EF Calc
EFaf,i,non-co2 gas	(tco2e/t_fuel)	0	<< Set to zero as KPT Subsumes Alternative Fuels

GHG Emissions During Production		0	
EFbio,prod,co2	(tco2/t_wood)	0	<< Set to zero as fuel harvested and transported manually
EFaf,prod,co2	(tco2/t_fuel)	0	<< Set to zero as KPT Subsumes Alternative Fuels
EFbio,prod,non-co2 gas	(tco2e/t_wood)	0	<< Set to zero as fuel harvested and transported manually
EFaf,prod,non-co2 gas	(tco2e/t_fuel)	0	<< Set to zero as KPT Subsumes Alternative Fuels

E.3. Calculation of leakage

Leakage calculations originally completed at registration were determined on a per stove basis. The final leakage figure was then calculated based on the estimated number of stoves to be constructed in the project area. However stove construction in the project area has been paused and the leakage figure as calculated for this monitoring period has been calculated on the actual number of stoves built.

Please See 'Monitoring Report21 Supplementary Data v1' for full calculations

$$LE_2 = 0.01793 \times n$$
$$LE_2 = x$$

$$LE_{3,4...n} = 0$$

$$LE_2 = 0.01793 \times 0$$

$$LE2 = 0$$

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

$$ER_y = \sum BE_{i,y} - \sum PE_{i,y} - \sum LE_{i,y} \quad \text{.....Eqn ER.1a}$$

Emission Reductions	(tCO2e/year)	(tCO2e/stove/year)
ERy	24,191	3.21
BEi,y	56,124	7.06
PEi,y	30,660	3.86
LEi,y	0	0.0000

The results of the revised Baseline KPT were analysed to provide the average fuel saving per stove per year. This was then used to calculate the ex-ante emissions reductions per stove-year.

ERs Calculated Based on BE - PE						
Date	Stoves Constructed	Total Stoves Operational (End of Month)	Crediting Stoves	Baseline Emissions	Project Emissions	BE - PE
April 2012	0	9311	7946	4677	2555	2122
May 2012	0	9311	7946	4677	2555	2122
June 2012	0	9311	7946	4677	2555	2122
July 2012	0	9311	7946	4677	2555	2122
Aug 2012	0	9311	7946	4677	2555	2122
Sept 2012	0	9311	7946	4677	2555	2122
Oct 2012	0	9311	7946	4677	2555	2122
Nov 2012	0	9311	7946	4677	2555	2122
Dec 2012	0	9311	7946	4677	2555	2122
Jan 2013	0	9311	7946	4677	2555	2122
Feb 2013	0	9311	7946	4677	2555	2122
Mar 2013	0	9311	7946	4677	2555	2122
Totals	0	**9311**	**7946**	**56124**	**30660**	**25,464**
					0	**Leakage for Period**
					0.95	**Usage Factor**
					24,191	**Net ERs for Period**

ERs by Vintage		
Year	Date	ERs
2012	01/04/2012 - 31/12/2012	18,143
2013	01/01/2013 - 31/03/2013	6,048
	Total	24,191

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_2e)	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
Total	56,124	30,660	0	24,191*

*After usage [0.95] has been accounted for

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	73,833	24,191

E.6. Remarks on difference from estimated value in registered PDD

The estimated value calculated in the PDD is different from the actual value calculated in this Monitoring Period due to the construction schedule. The total original number planned to be constructed in the first year was 23,033, the actual number constructed to date is 9,311 but due to missing CTFs the number credited is 7,946. This has resulted in the final ER figure of 24,191 for a period of 12 months.

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History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
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