Monitoring report form
(Version 03.1)

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 3
Completion date of the monitoring report	08/09/2014
Registration date of the project activity	30/12/2011
Monitoring period number and duration of this monitoring period	Monitoring period 3: 01-04-2013 to 31-03-2014 12 months including the first and last day
Project participant(s)	co2balance UK Ltd
Host Party(ies)	Republic of Kenya
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope: 1, 3 Domestic Energy Demand 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	73,833tCO_2
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	24,441 tCO_2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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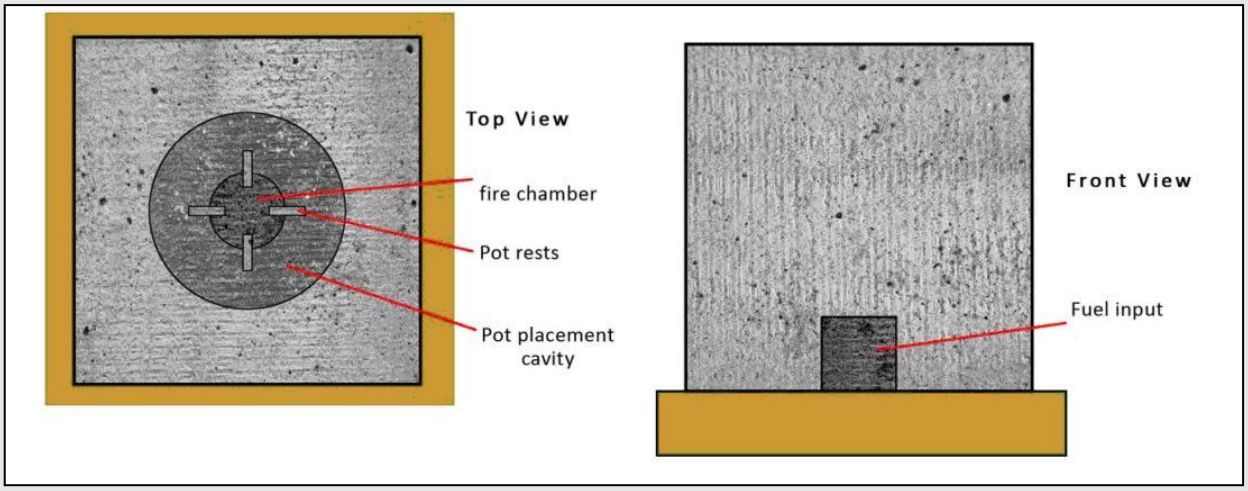
The 'Aberdares Improved Cook Stove project' will address issues of deforestation, greenhouse gas (GHG) emissions and indoor air pollution by the distribution of domestic wood-burning improved cook stoves in households within the project area. Pilot studies indicated that our stove reduces fuel consumption 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



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In total 10,000 stoves have been installed since the beginning of the project, all of which were installed during the first monitoring period. Beneficiaries received stoves free of charge and were directed in correct use of the stove by local community groups engaging with the project developers. The improved cook stoves significantly reduce fuel consumption, by approximately 50%, resulting in an improved living environment for recipients and reduced pressure on local forests, with approximately 14,302 tonnes of wood fuel saved in this monitoring period. By reducing fuel consumption, CO_2 emissions from combustion of non-renewable biomass have correspondingly been reduced by 24,441tCO_2/y.

Date	Milestone	Stoves Constructed	Total Stoves Operational	Stoves Crediting
Jun-10	LSCR to Gold Standard	0	0	0
July-10	Stove Construction Begins	149	149	0
Aug-10		0	149	0
Sept-10		0	149	0
Oct-10		0	149	0
Nov-10		0	149	0
Dec-10	Registration Review Complete Monitoring 1 Period Begins	1720	1869	149
Jan-11		996	2865	1687
Feb-11		3480	6345	2584
Mar-11		1633	7978	5122
Apr-11		569	8547	6538
May-11		758	9305	7075
Jun-11		5	9310	7767
July-11	Stove Construction Ends	1	9311	7772
Mar-12	Monitoring Period 1 Ends	0	9311	7773
Apr-12	Monitoring Period 2 Begins	0	9311	7946
Mar-13	Monitoring Period 2 Ends	0	9311	7946
Apr-13	Monitoring Period 3 begins	0	9311	7946
Mar-14	End of Monitoring period 3	0	9311	7946

A.2. Location of project activity

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[a] Host Party: Republic of Kenya

[b] Region/State/Province: Central Province

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

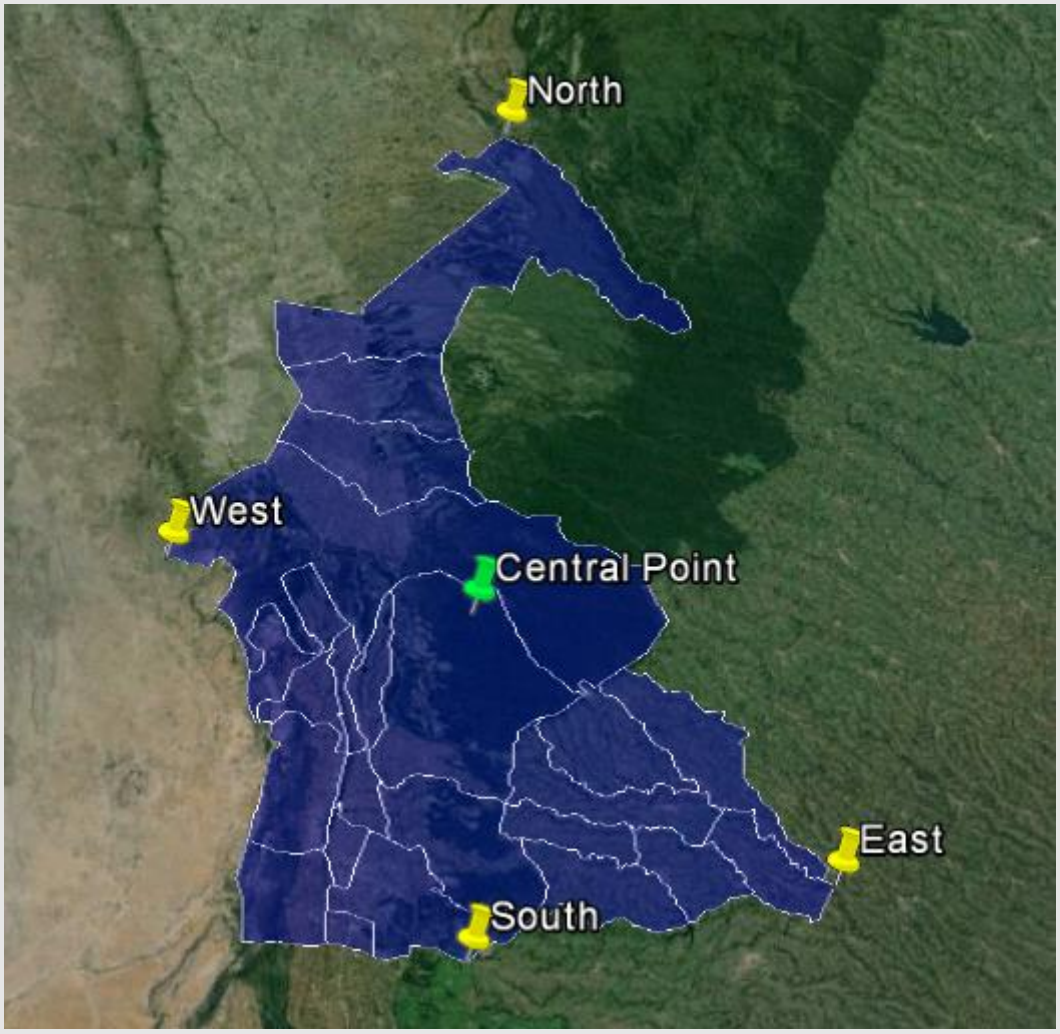
Divisions: Lari and Gatamaiyu (Total of 30,779 HHS)

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:

The Aberdares Range, in the central province of Kenya forms part of the Great Rift Valley and reaches a maximum altitude of 4,000m above sea level. The area is characterized by a diverse range of ecosystems including montane humid forest, sub montane forest, bamboo forests and moorland . Most households in the area are dependent on wood fuel to meet their household energy needs and most frequently use 3-stone fires for cooking.

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°21'42.42"S 37°44'31.26"E.



GPS coordinates:		
	Lat	**Long**
E	1° 1'46.04"S	36°48'24.74"E
S	1° 3'53.08"S	36°40'24.25"E
W	0°55'22.99"S	36°33'19.72"E
N	0°45'21.81"S	36°40'20.31"E

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.3. 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)
Kenya **(host)**	N/A	No
United Kingdom	co2balance UK Ltd	No

A.4. 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.5. Crediting period of project activity

>> The type and length of crediting period applied to this project is 7 years, twice renewable. The crediting period started on 1st December 2010 and finishes on 30th November 2017. This Monitoring Report covers the period 01/04/2013 to 31/03/2014(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. Traditional cooking involves the use of a 3-stone fire, which amongst other shortfalls is only able to produce 10% thermal efficiency. Combined with a population growth rate of 2.7% 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. 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. 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.

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. To date no further CTFs have been located since the last monitoring period and therefore the number of crediting stoves has remained the same. Furthermore, no additional stoves have been distributed in the project area since the end of the last monitoring period, as resources have had to be relocated to a different project area, however, it is hoped that construction will

restart in the next monitoring period.

Recipients received stoves free of charge and were directed in correct use of the stove by local community groups engaging with the project developers. Pilot studies demonstrated that the stoves reduce fuel consumption by approximately 50%. This has resulted in an improved living environment for recipients and reduced pressure on local forests, with approximately 14,303 tonnes of wood saved in this monitoring period. By reducing fuel consumption, CO_2 emissions from combustion of non-renewable biomass have been correspondingly reduced by 24,441 tCO_2. As the stoves have been distributed for free, the project has started to achieve high levels of 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.

Table 1: Project construction/operation and monitoring schedule

Date	Monitoring Task / Event	Frequency	Stoves Crediting
Jun-10	LSCR to Gold Standard	Once	0
Jul-10			0
Aug- 10			0
Sep-10	Kitchen Surveys	Once	0
Oct-10	Kitchen Performance Tests	Once	0
Nov-10			0
Dec-10	**Monitoring 1 Period Begins**		149
Jan-11			1687
Feb-11			2584
Mar-11	Monitoring Kitchen Survey 1	Quarterly	5122
Apr-11			6538
May-11			7075
Jun-11	Monitoring Kitchen Survey 2	Quarterly	7767
Jul-11			7772
Aug-11			7773
Sep-11	Monitoring Kitchen Survey 3	Quarterly	7773
Oct-11			7773
Nov-11			7773
Dec-11	Monitoring Kitchen Survey 4	Quarterly	7773
Jan-12			7773
Feb-12	Sustainable Development Assessment	Biennially	7773
Mar-12	**Monitoring Period 1 Ends**		7773
Apr-12	**Monitoring Period 2 Begins**		7946
May-12	Monitoring Kitchen Survey 5	Quarterly	7946
Jun-12	Usage Survey	Biennially	7946
	NRB Assessment		7946
Jul-12	Revised Baseline KPTs	Once	7946
	Aging Stove KPT	Biennially	7946
Aug-12	Monitoring Kitchen Survey 6	Quarterly	7946
Sep-12			7946
Oct-12			7946
Nov-12			7946
Dec-12	Monitoring Kitchen Survey 7	Quarterly	7946
Jan-13			7946
Feb-13	Monitoring Kitchen Survey 8	Quarterly	7946
Mar-13	**Monitoring Period 2 Ends**		7946
Apr-13	**Monitoring Period 3 begins**		7946
May-13	Monitoring Kitchen Survey 9 (27/05/13-31/05/13)	Quarterly	7946
Jun-13			7946
Jul-13			7946

Aug-13			7946
Sep-13	Monitoring Kitchen Survey 10 (03/09/13-06/09/13)	Quarterly	7946
Nov-13			7946
Dec-13			7946
Jan-14	Monitoring Kitchen Survey 11 (02/12/13-06/12/13)	Quarterly	7946
Feb-14			7946
Mar-14	**End of Monitoring period 3**		7946

co2balance UK Ltd 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 UK Ltd 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**	**Monitoring Period 3**
Total Stoves Recorded	9245	9311	9311
Total Stoves Crediting	7773	7946	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 opening allowing more varied sizes of wood to be used in the stove. Prior to the last verification, a survey of households in the project area was undertaken to determine the proportion of modified to unmodified stovesduring which 2801 households were visited. It was found that 446 (16%) were modified and the remaining 2355 (84%) had not been. However, as illustrated in the Monitoring Period 1, beneficiaries save the same amount of fuel on both modified and unmodified stoves and emissions reductions are therefore not affected.

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.

B.2.2. Corrections

>> There have been no corrections to project information or parameters fixed at Validation in this monitoring period.

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.

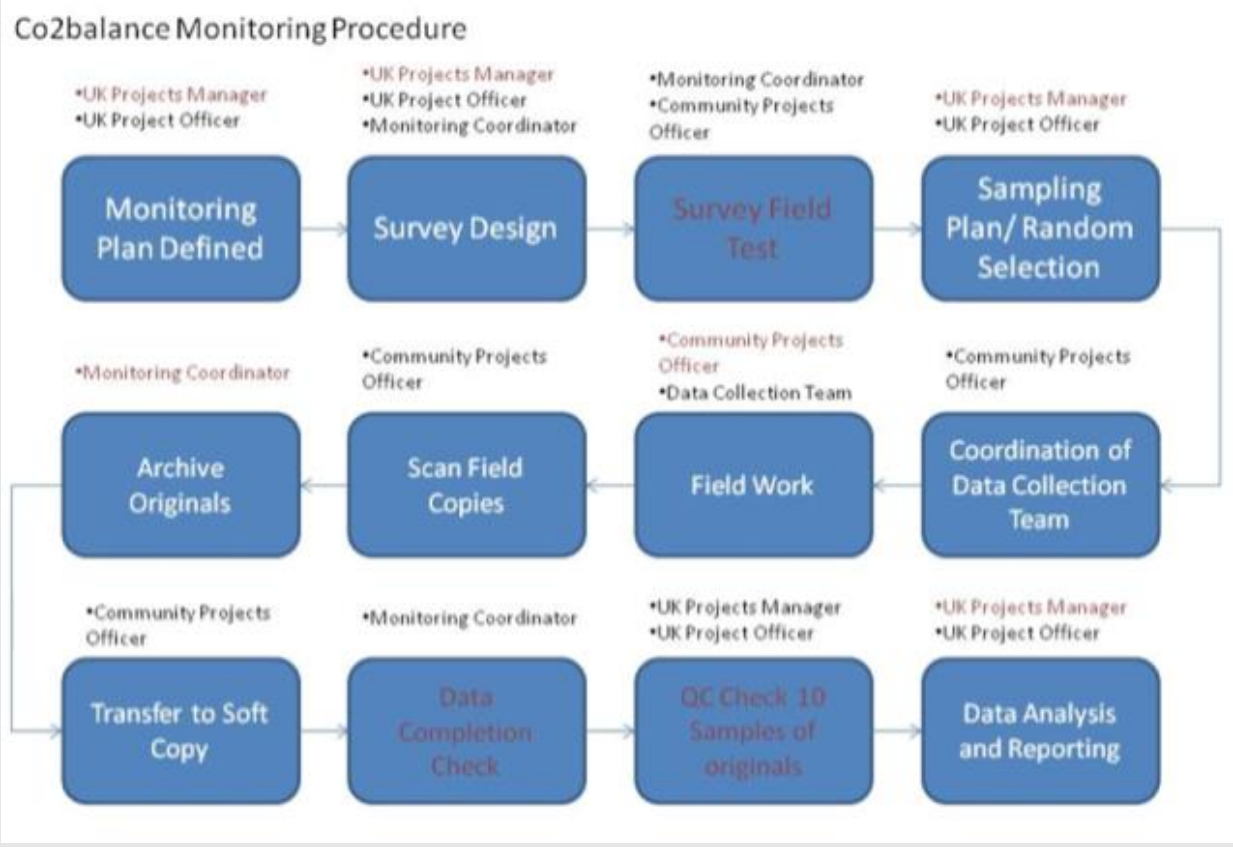
B.2.6. Types of changes specific to afforestation or reforestation project activity

>> This section is not applicable to this project type.

SECTION C. Description of monitoring system

>> The survey process is summarised by the flow diagram below, which shows the origin and transfer of data and the employee responsible for each phase. Items that are highlighted in red indicate a quality control point, which may be an actual process itself – or indicated by the manager or coordinator responsible for internal quality control. To aid in the comprehension of the flow diagram, the roles and responsibilities of each employee involved in the process are summarised below:

- **UK Projects Manager** - Programme management, UK Staff Training, Internal Quality Control, Defining Job Descriptions
- **UK Carbon Projects Developer** - Defining Parameters, Completion of Monitoring Plan, Coordinating Project Monitoring, Data quality check, Monitoring Analysis and Calculation, Training Host Country Staff, Producing Training Literature
- **Monitoring Coordinator** - Coordinating Monitoring Programme, Data quality check, Reporting Data to UK, Employee Training, Scanning Originals, Archiving Originals
- **Head Community Project Officer** - Leading Monitoring Operations, Training Data Collection Team, Operational Quality Control, Transferring Data to Soft Copy
- **Data Collection Team** - Gathering Field data (hard copy)



1. Maintenance of pilot & Total Distribution Record (TDR)

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)

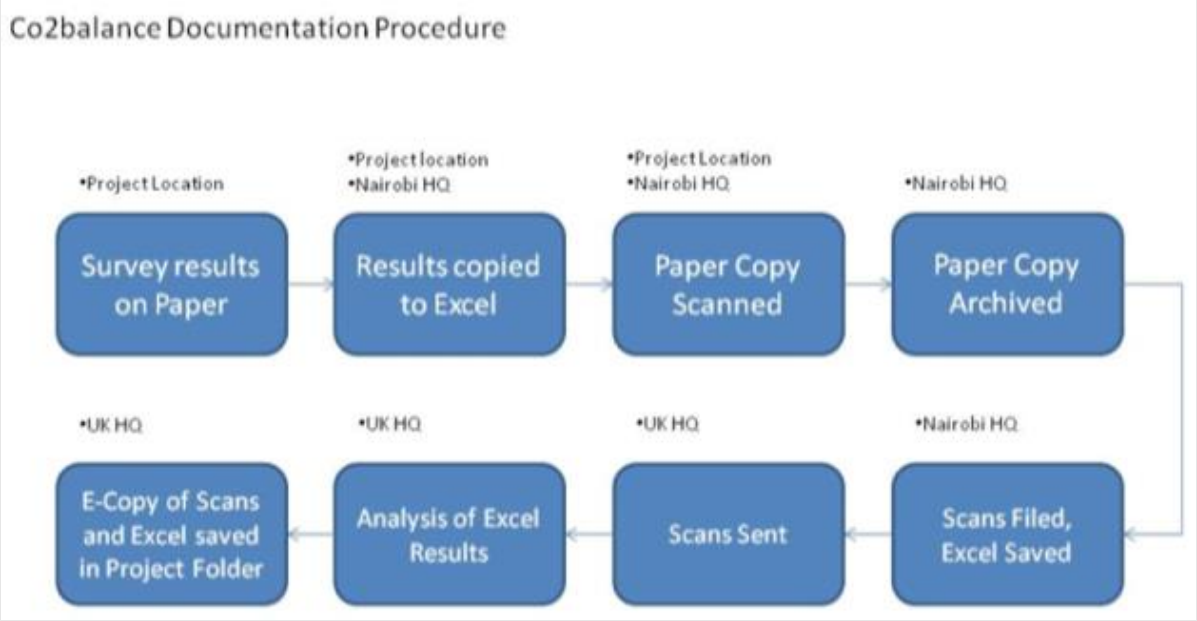
Accurate distribution records have been kept and stored both electronically and in paper format. The stove builders created paper records for each stove built; these were then transferred to a computer system belonging to the project proponents and the original documentation stored in the local office (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

1. Data Management and Storage

The results of all Kitchen Surveys (KS's), Monitoring Kitchen Surveys (MKS), Usage Surveys, Project Technology Days, and Kitchen Performance Tests (KPT's) are collated in excel spreadsheets and stored on a central server in an electronic format.

The documentation procedure that co2balance UK Ltd has devised ensures a minimum chance of original data being lost – all original copies of our project documentation are retained in our Nairobi HQ (rather than being posted to the UK). The diagram below summarises the processes involved and the locations where data is stored at each stage in its transfer from the field to the UK office.



All surveys are administered by trained co2balance UK Ltd staff (occasionally supplemented from a pool of casuals that work closely with a co2balance UK Ltd lead), local to the area and conversant in the local dialects to ensure that responses are consistent and not biased by any regional language barriers. Field staff are provided with an English and Swahili version of the questionnaire to ensure the greatest possible

standardisation of responses. It is important when conducting the survey to explain its purpose to the respondent and to assure them that the answers to surveys are analysed as a group and that no individual names are used in this analysis.

When selecting households for the survey the UK office will select beneficiaries that have received a stove in the previous three months first and then from the remained if this number was not sufficient. The households are then grouped based on Stove Model, Mode of Use (domestic/institutional) and Fuel Type to determine clusters. Using a web based number generator the desired amount of random numbers are generated per cluster and added to the spreadsheet. This column is then sorted into ascending/descending order and the first 90 households per cluster chosen as the sample. From this sample the survey teams should choose no fewer than 25 households but ideally 45 to survey.

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 questionnaires and answer sheets. 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. Monitoring Kitchen Surveys provide information regarding the ongoing relevance of Baseline KPT results and sustainable development indicators to the project scenario.

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 are calculated according to the 'Gold Standard Energy Efficiency – Domestic Methodology for improved cook-stoves and kitchen regimes V.02' using the results of the fixed and Monitored parameters; KS's and KPT's, NRB, leakage, (stove models, if required) and usage survey.

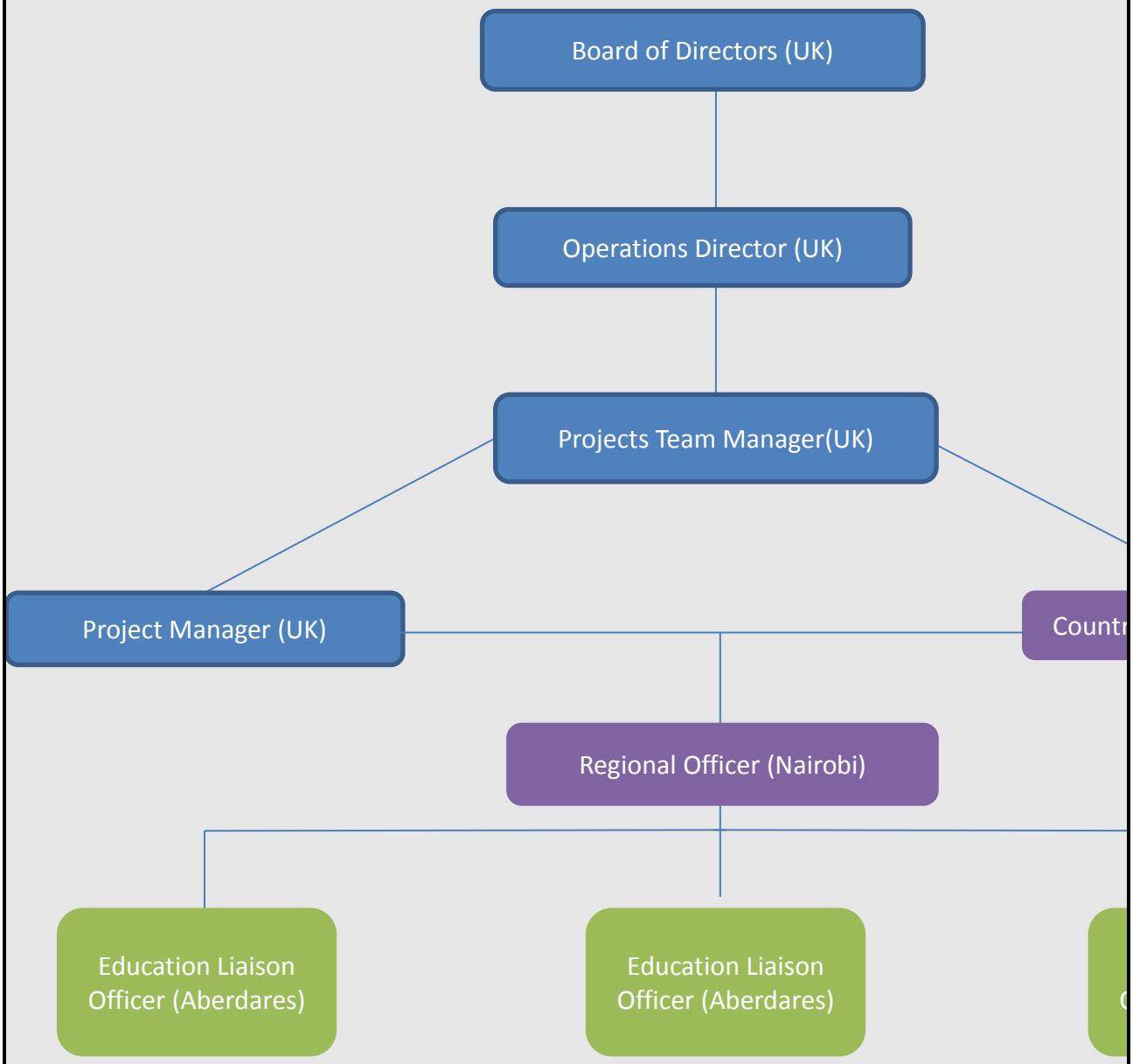
Periodic monitoring tasks

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 reviewed 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 Kitchen Surveys are conducted quarterly to determine emerging trends in demographics, fuel use and sustainability indicators.

All data recorded will be stored by the project proponents for a minimum of two years after the end of the crediting period or the last issuance of VERs, whichever occurs later.

The organogram below provides an overview of the Aberdares project organizational structure.



SECTION D. Data and parameters

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

Data / Parameter:	N_y
Data unit:	Number
Description:	Number of stoves in year
Source of data:	Total distribution record
Value (s) applied:	7,946
Purpose of Data:	Calculation of emissions reductions
Additional comment:	-

Data / Parameter:	$EF_{bl.bio,co2}$
Data 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:	$EF_{pj.bio,co2}$
Data unit:	$tCO_2/t\_biomass$
Description:	CO2 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:	Value updated to post 2012 IPCC defaults

Data / Parameter:	$EF_{bl.bio,non-co2}$
Data unit:	$tCO_2/t\_biomass$
Description:	Non-CO_2 emission factor arising from use of wood-fuel in baseline scenario
Source of data used:	Calculated from IPCC defaults – refer to 'PDD supplementary data Aberdares v.02'.
Value applied:	0.1355952
Purpose of data:	Calculation of baseline emissions
Additional comment:	Value updated to post 2012 IPCC defaults

Data / Parameter:	$EF_{pj.bio,nonco2}$
Data unit:	$tCO_2/t\_biomass$
Description:	Non CO_2 emission factor arising from use of wood-fuel in project scenario
Source of data used:	Calculated from IPCC defaults – refer to 'PDD supplementary data Aberdares v.02'.
Value applied:	0.1355952
Purpose of data:	Calculation of baseline emissions
Additional comment:	Value updated to post 2012 IPCC defaults

Data / Parameter:	$X_{nrb,bl,y}$
Data unit:	Fractional non-renewability
Description:	Non-renewability status of woody biomass fuel scenario i during year y
Source of data used:	Report compiled by Anthony Mills (PhD) and Diane Southey (MSc) C4 EcoSolutions (Pty) Ltd., Cape Town, South Africa
Value applied	0.95
Purpose of data:	ER calculation
Additional comment:	The PDD states that the NRB will be monitored biennually and is therefore also included under the monitored parameters. The original NRB study was reviewed in August 2013 by co2balance UK Ltd in correspondence with the PDD and in time for verification. Literature pertaining to patterns and rates of deforestation, tree plantation and population figures was examined in order to determine whether the NRB figure may have changed (See Supplementary Data 'NRB Review'). In addition, population figures were updated in the calculation to determine the new figure. The fraction remains at 0.95

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-CO2 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 CO2 emissions.

Data/Parameter	$EF_{af,co2}$
Unit	tCO_2/t_fuel
Description	CO2 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	$EF_{af,\ non-co2}$
Unit	tCO_2/t_fuel
Description	Non-CO2 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	CO2 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	$EF_{af,prod,non-co2}$
Unit	tCO_2/t_fuel
Description	Non-CO2 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	$AF_{bl,i,y}$
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	0
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.

Data/Parameter	$X_{re,bl,y}$
Unit	Fraction
Description	Woody biomass combustion avoided due to renewable energy fuels form in baseline year (i.e. solar cookers, agricultural residues, etc)
Source of data	Baseline Kitchen Surveys
Value(s) applied	0
Purpose of data	N/A
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.

Data/Parameter	$X_{af,bl,y}$
Unit	Fraction
Description	Woody biomass combustion avoided due to alternative fuels in baseline
Source of data	Baseline Kitchen Surveys
Value(s) applied	0
Purpose of data	Calculation of emissions
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.

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 co2balance UK Ltd field 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. **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 co2balance UK Ltd field 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. **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 [AFpj,i,y / Xre,pj,y / Xaf,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. Hence, all alternative fuels, AFbl,i,y and AFpj,i,y were set to zero.

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

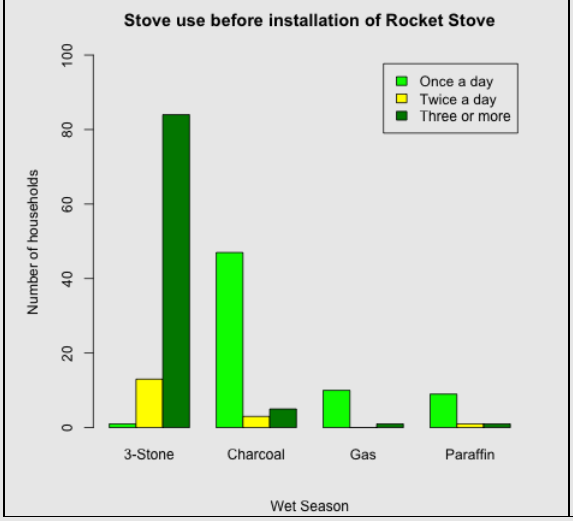


Figure 2: Stove use prior to installation of CZ stove: Wet season

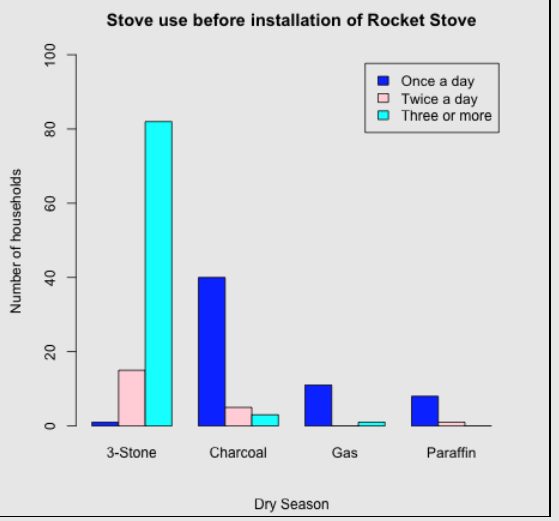


Table A below indicates that since the adoption of the improved CZK stove the occurrence of other fuel and stove use has remained relatively consistent with the baseline level. This is especially true for charcoal. As charcoal is a much more emissions intensive fuel source than wood, it was conservatively 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	0	1	0	0	0
MKS 9	45	44	1	0	0	0	0
MKS 10	45	45	0	0	0	0	0
MKS 11	45	45	0	0	0	0	0

Table 1: 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:	% of recipients using improved cookstoves
QA/QC procedures:	Random selection of households and full training provided to staff
Purpose of data:	ER calculation
Additional comments:	Surveyed and reported on in June 2012, valid for 2 years, next update June 2014

Data / Parameter:	Age
Unit:	Fraction
Description:	Adjustment to values of Bpj,,y and AFpj,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 .
Measuring/Reading/Recording frequency:	Biennially
Calculation method:	N/A
QA/QC procedures:	Training provided for all field staff as well as calibration of equipment
Purpose of data:	
Additional comments:	Conducted in August 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.

Data / Parameter:	Leakage
Unit:	t_CO2e per year
Description:	Potential GHG emissions outside project boundary caused by project activity
Measured/ Calculated / Default:	Calculated if necessary
Source of data:	Kitchen surveys supported by desk-based research.
Value (s) of monitored parameter:	L3=0
Monitoring Equipment:	Surveys
Measuring/Reading/Recording frequency:	Biennually
Calculation method:	N.A
QA/QC procedures:	N.A
Purpose of data:	To account for tCO_2 that occur during the crediting period as a result of the project activity

Additional comments:	Applied during years in which stoves are constructed; however this will be reviewed biennially.

Data / Parameter:	$X_{nrb,pj,y}$
Unit:	Fractional non-renewability
Description:	Non-renewability status of woody biomass fuel scenario i during year y
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:	According to the methodology, the project proponent can choose to renew the NRB at any time as per Gold Standard Rules. In the case of this project the PDD states that the NRB is reviewed biennially.
Calculation method:	Average fuel use per household
QA/QC procedures:	N.A
Purpose of data:	ER calculation
Additional comments:	The original NRB study was reviewed in August 2013 by co2balance UK Ltd in correspondence with the PDD and in time for verification. Literature pertaining to patterns and rates of deforestation, tree plantation and population figures was examined in order to determine whether the NRB figure may have changed (See Supplementary Data 'NRB Review'). In addition, population figures were updated in the calculation to determine the new figure. The fraction remains at 0.95

Data / Parameter:	$B_{bl,y}$
Unit:	t_biomass/stove/year
Description:	Mass of woody biomass that is combusted in the baseline in year y
Measured/ Calculated / Default:	Measured
Source of data:	Kitchen Performance Tests
Value (s) of monitored parameter:	3.97* A Revised Baseline KPT was conducted in August 2012 which is the figure presented here
Monitoring Equipment:	The FT will utilise digital weighing scales accurate to 2dp.
Measuring/Reading/Recording frequency:	Biennially – if MKS suggests any significant changes in patterns
Calculation method:	Average fuel use per household
QA/QC procedures:	New scales are purchased for each KPT and therefore no calibration is required.
Purpose of data:	ER calculation
Additional comments:	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 UK Ltd field staff and verified by ERM during first verification.

Data / Parameter:	$B_{pl,y}$
Unit:	t_biomass/stove/year
Description:	Mass of woody biomass that is 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:	The FT will utilise digital weighing scales accurate to 2dp.
Measuring/Reading/Re	Biennially – if MKS suggests any significant changes in patterns

cording frequency:	
Calculation method:	Average fuel use per household
QA/QC procedures:	The scales are calibrated prior to each use by measuring against a known weight.
Purpose of data:	ER calculation
Additional comments:	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 UK Ltd field staff and verified by ERM during first verification.

Data / Parameter:	New stove
Unit:	Fraction
Description:	Adjustment to values of Bpj,y and AFpj,i,y for new stove models
Measured/ Calculated / Default:	Measured
Source of data:	Measurements of sample or whole of cluster population
Value (s) of monitored parameter:	0
Monitoring Equipment:	N/A
Measuring/Reading/Recording frequency:	Bi- annual
Calculation method:	Sales Record
QA/QC procedures:	3rd party study and report
Purpose of data:	ER Calculation
Additional comments:	N/A

Data/Parameter	New Stove KPT
Unit	Fraction
Description	Adjustment to values of (Bbl,y – Bpj,,y) and AFpj,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 211. 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

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

Sustainability Indicators:

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	Bi-annually 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 (see table above) 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	Biennually 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. 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.

Q40 - What type of fuel do you use for cooking?							
Survey	n	Wood	Gas	Charcoal	Paraffin/Kerosene	Other	Husks
KS	100	99	0	1	0	0	0
MKS 9	45	44	1	0	0	0	0
MKS 10	45	45	0	0	0	0	0
MKS 11	45	45	0	0	0	0	0

Table 1: Fuel Use

Respondents were then asked to comment on whether there was a noticible difference in smoke levels due to the improved stove. As can be seen from the table below, close to 100%, reported a reduction in smoke.

MKS Q69 Compared to a 3-stone fire how much smoke?				
Survey	n	More	Less	Same
KS	100			
MKS 9	44	0	44	0
MKS 10	45	1	44	0
MKS 11	45	1	44	0

Table 2: Reported smoke levels

So, in summary, householders' still use wood as their main fuel source and the vast majority have observed a reduction in 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		2
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 programme held in Nairobi, which covered a wide range of topics. The agenda and training record can be found in the document 'Eco Frontier.' The second training session was a community groups education meeting conducted by the Regional Coordinator in the Project Area in January 2014, which was designed to remind beneficiaries of the correct usage and maintenance of the stoves. Please see Minutes Kanubunge Village which also includes a participants list with mobile phone numbers and photos of the meeting 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, which has continued into monitoring period 3 (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,and reduces collection time and distance. This parameter has been scored as positive.

MKS Q59 & Q60 Livelihood of the poor		
Survey	Collection Time (Mins)	Collection Distance (Kms)
KS	192.0	3.4
MKS 9	73.9	0.9
MKS 10	61.2	1.0
MKS11	39.4	1.0

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,). 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		4,858,236Ksh
Estimation of baseline situation of parameter		As defined by current situation
Future target for parameter		4,858,236Ksh
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. In total, 5 people have been employed for the project activity in this Monitoring Period including the Country Coordinator, the Finance Coordinator &HR, the Regional Coordinator and the 2 Education Liaison Officer. The direct parameter used to measure the indicator is household income generated from employment created by the project. At the end of the current monitoring period at total of 4,858,236 Ksh had been paid out in salaries to members of staff that worked on the project. The breakdown of this can be found in the 'Monitoring Report 2 Supplementary Data v1.' Although marginally less than the projected amount, this parameter has been scored as positive as it is significantly better than the original situation.

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. Prior to the last verification, a survey of households in the project area was undertaken to determine the proportion of modified to unmodified stovesduring which 2801 households were visited. It was found that 446 (16%) were modified and the remaining 2355 (84%) had not been. Compared to Monitoring Period 1 this was a significant change in percentage split, most probably due to an increase in sample size. However, as illustrated in the Monitoring Period 1, beneficiaries save the same amount of fuel on both modified and unmodified stoves and emissions reductions are therefore not affected.

							Welchs Unpaired t-Test				
		N	Mean	STDEV	SEM	t - Test	Mean Saving	CI 90% -	CI 90% +	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	Hus
KS	100	99	0	1	0	0	0
MKS 9	45	44	1	0	0	0	0
MKS 10	45	45	0	0	0	0	0
MKS 11	45	45	0	0	0	0	0

Comparison of Fuel use data between Baseline KS and MKS

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. Although the number of male respondents has increased slightly, the majority of respondents are still women; there is therefore no need for the identification of any futher clusters.

Gender			
MKS	**n**	**Male**	**Female**
KS	100	9	91
MKS 9	45	10	35
MKS 10	45	13	32
MKS 11	45	12	33

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 remained consistent in the last monitoring period.

Education							
MKS	**n**	**None**	**Primary**	**Secondary**	**Tertiary**	**University**	**Other**
KS	100	8	67	22	3	0	0
MKS 9	45	4	19	22	0	0	0
MKS 10	45	3	19	23	0	0	0
MKS 11	45	3	25	16	0	0	1

An assessment of the number of people cooked for shows little change since the Baseline KS was conducted, with the average staying at around 5 people. This is also consistent with the national average household size of 5.1 (FAO)2

Number of People Cooked For				
MKS	**n**	**Mean**	**Median**	**Mode**
KS	100	6	5	5
MKS 9	45	5	5	5
MKS 10	45	5	5	6
MKS11	45	4	4	4

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					
MKS	n	Trade	Employment	Farming	Labour
KS	100	9	2	85	4
MKS 9	45	4	2	33	6
MKS 10	45	5	2	33	5
MKS 11	45	4	3	36	2

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 2

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

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

checks on the collected data. This shall be applied to the next verification period.

In response to FAR1 raised during the last verification, co2balance UK Ltd introduced a new standard operating procedure (SOP) for the distribution of stoves in order to improve data management, reduce and to minimize the risk of losing stoves. The SOP consists of three main phases are; forward tracking, installation and stove tracking.

During the forward tracking phase field staff are instructed to visit households in the project area with a short questionnaire to establish which families are interested in receiving a stove. The households that request a stove are asked to fill in their details on a forward tracking sheet. Once complete, a camera phone is used to take a GPS tagged picture of the beneficiary's house so that they can be located again for installation. At the end of the day, the pictures are uploaded onto the co2balance UK Ltd FED computer system which automatically converts the GPS data and household names into an excel spreadsheet and plots the coordinates of each household on a map. This data can then be used to locate the same households for installation.

The last stage of the distribution procedure involves tracking the installed stoves to ensure their location corresponds with the forward tracked stoves. After the stoves have been installed, the beneficiaries are asked to sign a carbon rights form and a GPS tagged photo is taken of the copy. After the photo of the CTF is uploaded to the FED, its GPS coordinates and contact details are compared against the corresponding forward tracking photos. Any stove inaccuracies or mistakes in data recording determined by the system must be repeated.

The standard operating procedure described above will be applied to future stove roll-outs in Aberdares.

Forward Action Request (FAR) # 2: 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.

The next KPT due in June 2014 will assess the difference in efficiency between damaged and non-damaged stoves as noted in FAR 2.

Forward Action Request (FAR) # 3: The PP shall ensure that the Usage Survey planned for June 2014 uses the updated questionnaire and shall further clarify the usage status of 'Damaged' stoves: This shall be checked by the DOE.

The PP has used the updated questionnaire for the usage survey which will be submitted during the next monitoring period and assessed accordingly. As noted in the previous issuance review, based on feedback from project area staff, the stoves reported as damaged only have minor chips and/or cracking which does not effect the efficiency of the stove, and this has again been confirmed by the DOE.

Forward Action Request (FAR) # 4: PP has described that the data was lost and could not submit all the documents related to the conducted trainings. However, the verification team is able to confirm that all the personnel working on the project are competent enough to conduct the efficient surveys and ensure the qualify of the data. The necessary measures to avoid such data loss were not provided in the monitoring report. Hence, PP is required to demonstrate the data handling procedures and its implementation by the next verification. Thus, FAR 2 is raised.

The PP has provided the updated monitoring protocol which was developed in response to FAR 2 in order to improve the data collection procedure. Please see 'Monitoring Protocol'.

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 quarterly 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:

ERy = Emissions reductions in total project population in year y (tCO_2/yr)
BEi,y = Baseline emissions of cluster i in year y (tCO_2/yr)
PEi,y = Project emissions of cluster i in year y (tCO_2/yr)
LEi,y = Leakage of cluster i in year y (tCO_2/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:

Ni,y = the number of Units in cluster i

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

>> Baseline emissions in tCO_2/stove/year are calculated as follows:

$$BE_y = X_{nrb,bl,y} \times B_{bl,y} \times EF_{bl,bio,CO2} + \sum (AF_{bl,i,y} \times EF_{af,CO2,i})$$

+∑(Non-CO2 emissions during cooking)

+∑(GHG emissions during production of the fuels) ……Eqn B.1a

Where:

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

Xnrb,bl,y = the non-renewable fraction of the woody biomass harvested in the project collection area in year y in the baseline scenario

Bbl,y = the mass of woody biomass consumed during cooking in the baseline in year y (tonnes/year)

EFbl,bio,co2 = the CO2 emission factor for use of the biomass fuel in the baseline scenario in tonnes CO2 per tonne fuel

AFbl,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).

EFaf,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:

EFbl,bio,non-co2,i = Emission factor for GHG gas i in the baseline scenario in units of tonnes gas per tonne wood-fuel

EFaf,non-co2 gas i = Non-CO2 emission factor during cooking for alternative fuel i for GHG gas i in tonnes gas per tonnes fuel

EFbio,prod,co2 = CO2 emission factor for wood-fuel during production in tonnes gas per tonnes fuel

EFaf,prod,co2,i = CO2 emission factor for fuel I during production in tonnes gas per tonnes fuel

EFbio,prod,non-co2 gas i = Non-CO2 emission factor for wood-fuel during production in tonnes gas per tonne fuel

EFaf,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

Baseline Emissions		
BEy		**7.14**
Xnrb,bl,y	(fraction)	0.95
Bbl,y	(t/HH/year)	3.97
EFbl,bio,CO2	(tCO_2/t_wood)	1.7472

AFbl,i,y	(t/HH/year)	0
EFaf,CO2	(tCO_2/t _fuel)	0

Non-CO2 Emissions		0.538916139
EFbl,bio,non-co2	(tCO_2/t_wood)	0.1355952
EFbio,CH4	(tCO_2/t_wood)	0.117
EFbio,N2O	(tCO_2/t_wood)	0.0185952
EFaf,i,non-co2 gas	(tCO_2/t_fuel)	0

GHG Emissions During Production		0
EFbio,prod,co2	(tCO_2/t_wood)	0
EFaf,prod,co2	(tCO_2/t_fuel)	0
EFbio,prod,non-co2 gas	(tCO_2/t_wood)	0
EFaf,prod,non-co2 gas	(tCO_2/t_fuel)	0

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

>> Project emissions in tCO_2/stove/year are calculated as follows:

$$PE_y = X_{nrb,pj,y} \times B_{pj,y} \times EF_{pj,bio,CO2} + \sum(AF_{pj,i,y} \times EF_{af,CO2,i})$$

+∑(Non-CO2 emissions during cooking)
+∑(GHG emissions during production of the fuels) ……Eqn P.1a

Where:

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

Xnrb,pj,y = the non-renewable fraction of the woody biomass harvested in the project collection area in year y in the project scenario

Bpj,y = the mass of woody biomass consumed during cooking in the project each year (tonnes/year)

AFpj,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

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

GHG emissions during production of the fuels

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

Project Emissions		
PEy		**3.90**
Xnrb,pj,y	(fraction)	0.95
Bpj,y	(t/HH/year)	2.17
EFpj,bio,CO2	(tCO_2/t_wood)	1.7472

AFpj,i,y	(t/HH/year)	0
EFaf,CO2	(tCO_2/t_fuel)	0
Non-CO2 Emissions		0.294379891
EFpj,bio,non-co2	(tCO_2/t_wood)	0.1355952
EFbio,CH4	(tCO_2/t_wood)	0.117
EFbio,N2O	(tCO_2/t_wood)	0.0185952
EFaf,i,non-co2 gas	(tCO_2/t_fuel)	0
GHG Emissions During Production		0
EFbio,prod,co2	(tCO_2/t_wood)	0
EFaf,prod,co2	(tco2/t_fuel)	0
EFbio,prod,non-co2 gas	(tCO_2/t_wood)	0
EFaf,prod,non-co2 gas	(tCO_2/t_fuel)	0

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

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
Total	56700	30972	0	24,441*

*After usage [0.95] has been accounted for

The table below shows the ERs generated during each year of the monitoring period.

ERs by Vintage		
Year	**Date**	**ERs**
2013	01/04/2013 - 31/12/2013	18,331
2014	01/01/2014- 31/03/2014	6,110
	Total	24,441

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 (t CO_2e)	73,833	24,441

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 24,441 for this monitoring period.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	0	24,441

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Document information

Version	*Date*	*Description*
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

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