GS1247 Improved Kitchen Regimes - Kasungu Boreholes, Malawi

Monitoring Report

GS 5339, GS 5340, GS 5341, GS 5342,

GS 5343, GS 5344

co2balance.com

CO2balance UK Ltd.
1 Discovery House,
Cook way,Taunton,
Somerset TA2 6BJ
01823 332233

Contents

1. Monitoring Report Information

Monitoring Period	MP 1 GS5339: 10/02/2016-31/12/2017 GS5340: 11/02/2016-31/12/2017 GS5341: 09/07/2016-31/12/2017 GS5342: 02/09/2016-31/12/2017 GS5343: 20/09/2016-31/12/2017 GS5344: 26/09/2016-31/12/2017
Reference number of the project activity	GS 5339, GS 5340, GS 5341, GS 5342, GS 5343, GS 5344
Version number of the monitoring report	2.0
Completion date of the monitoring report	29/01/2018
Prepared by	Pierre Badiuzzaman, Ilona Coulson-Ashworth

2. Project Summary

In Malawi, approximately half the population is without access to clean water and therefore relies on unprotected water sources such as hand dug open wells and rivers for drinking water, which are often contaminated by bacteria and pollutants. One of the key factors influencing water scarcity is the absence of borehole maintenance programs and the high costs of implementation. According to the Rural Water Supply Network over 40% of Malawi's boreholes are non-functioning, thus there is a clear need for improved intervention.

As part of our GS1247 Improved Kitchen Regimes Multi-Country PoA, CO2balance UK Ltd and United Purpose (formerly known as Concern Universal) have developed pure water supply projects in the Republic of Malawi. This project has been registered under the Gold Standard Foundation Programme of Activities (thereafter GS PoA) using the methodology "Technologies and Practices to Displace Decentralized Thermal Energy Consumption. v1.0" (TPDDTEC).

In this project co2balance and United Purpose have provided safe drinking water to communities and reduced the need to boil water as a means of purification through the repair of damaged boreholes and the drilling of additional new boreholes. By providing safe water, the project ensures that households consume less firewood during the process of water purification and as a result there has been a reduction of greenhouse gas emissions from the combustion process. The carbon credits earned through the reduction of emissions have been used, in part, to fund and create a self-sustaining maintenance program.

In total 76 boreholes were drilled or rehabilitated across VPAs in Kasungu between the 10th February 2016 and 2nd October 2016. The date, location and number of people served by each borehole in each VPA in Kasungu are given in the table below, which forms the project database:

GS ID	Borehole	TA	Start of MP1	Pump Model	Latitude	Longitude	Number of borehole users
GS5339	Chankhawuta	Kawamba	10/02/2016	Afridev	-13.25487585	33.1398508	433
GS5339	Mphembedzu	Kawamba	10/02/2016	Afridev	-13.28811212	33.14689561	484
GS5339	Chisuku II	Kawamba	12/02/2016	Afridev	-13.32358686	33.1865201	153
GS5339	Kalemba-Jasi	Kawamba	12/02/2016	Afridev	-13.30706936	33.1394375	286
GS5339	kambala	Kawamba	12/02/2016	Afridev	-13.24158697	33.33176396	132
GS5339	Sanikonda	Kawamba	13/02/2016	Afridev	-13.2910865	33.33063092	309
GS5339	Kamphako	Santhe	18/02/2016	Afridev	-13.40705267	33.2629356	453
GS5339	Kaomba	Santhe	19/02/2016	Afridev	-13.39670025	33.28688349	273
GS5339	Gwawa	Santhe	19/02/2016	Afridev	-13.3085217	33.30027803	298

GS5339	Mtelezi	Santhe	21/02/2016	Afridev	-13.53040041	33.31616269	176
GS5339	Dyuku	Santhe	22/02/2016	Afridev	-13.34247987	33.47985131	275
GS5339	Kwamdera	Santhe	23/02/2016	Afridev	-13.56301019	33.3274172	191
GS5340	Jozeki	Kawamba	11/02/2016	Afridev	-13.31938024	33.05996249	159
GS5340	Sungani	Kawamba	13/02/2016	Afridev	-13.31440691	33.36361577	228
GS5340	Kapsyala	Santhe	19/02/2016	Afridev	-13.43209757	33.31252318	132
GS5340	Mataya	Santhe	19/02/2016	Afridev	-13.4137368	33.42156001	248
GS5340	shemu	Santhe	19/02/2016	Afridev	-13.4745387	33.32230721	383
GS5340	Mkakatanji	Santhe	20/02/2016	Afridev	-13.46565348	33.37226879	143
GS5340	Ngoma/ Ntchentche	Santhe	20/02/2016	Afridev	-13.47644013	33.3847401	221
GS5340	Mikule	Santhe	21/02/2016	Afridev	-13.48712676	33.36123279	239
GS5340	Mnjemu / Kawata	Santhe	21/02/2016	Afridev	-13.52837918	33.33380182	676
GS5340	Chilembwe	Santhe	23/02/2016	Afridev	-13.59081783	33.31815607	239
GS5340	Bimphi	Santhe	24/02/2016	Afridev	-13.54554504	33.2445381	198
GS5340	Mpalata	Santhe	24/02/2016	Afridev	-13.49890297	33.32585117	107
GS5340	Lumbani	Santhe	25/02/2016	Afridev	-13.46275988	33.33368295	125
GS5340	Sikelo	Santhe	26/02/2016	Afridev	-13.42280382	33.24560494	350
GS5341	Chambwe	Kawamba	09/07/2016	Afridev	-12.90698912	33.38879133	176
GS5341	Mgwedeza	Kawamba	09/07/2016	Afridev	-13.26519947	33.23091553	169
GS5341	Msamba	Kawamba	26/08/2016	Afridev	-13.33856643	33.00139437	302
GS5341	Thawale	Kawamba	26/08/2016	Afridev	-13.357221	33.00532857	222
GS5341	Chambalekani	Kawamba	27/08/2016	Afridev	-13.32128099	33.05164349	233
GS5341	Nkhoma Katete	Kawamba	27/08/2016	Afridev	-13.28125061	33.12683946	178
GS5341	Kalundi	Kawamba	28/08/2016	Afridev	-13.33664159	33.09253566	454
GS5341	Chiwambe	Kawamba	29/08/2016	Afridev	-13.31031446	33.34137654	260
GS5341	Kambwera	Kawamba	29/08/2016	Afridev	-13.44057447	33.25226518	330
GS5341	Vinthenga	Kawamba	30/08/2016	Afridev	-13.32315523	33.12329706	251
GS5341	Msulu	Kawamba	31/08/2016	Afridev	-13.28080323	33.20323426	296
GS5341	Chimtengo	Kawamba	01/09/2016	Afridev	-13.57165261	33.34231034	347
GS5341	Kalima	Kawamba	01/09/2016	Afridev	-13.20388667	33.35383495	225
GS5342	Mcheleka	Kawamba	02/09/2016	Afridev	-13.3133587	33.22171862	753
GS5342	Mikodo	Kawamba	07/09/2016	Afridev	-13.3248186	33.38544096	213
GS5342	Zifo	Kawamba	09/09/2016	Afridev	-13.16531947	33.33452158	182
GS5342	Chinkhande	Kawamba	12/09/2016	Afridev	-13.31609858	33.35021163	286
GS5342	Kabibi 2	Kawamba	13/09/2016	Afridev	-13.29038887	33.11564529	351
GS5342	Kawinga	Kawamba	14/09/2016	Afridev	-13.282663	33.34131016	240
GS5342	Pundu Kabibi	Kawamba	14/09/2016	Afridev	-13.31031446	33.34137654	195
GS5342	Lembanyanja	Kawamba	18/09/2016	Afridev	-13.26757757	33.35652092	181
GS5342	Chikukula	Kawamba	20/09/2016	Afridev	-13.24614525	33.32401642	250
GS5342	Chipaza	Kawamba	20/09/2016	Afridev	-13.29825741	33.17598469	248
GS5342	Chinyengo	Kawamba	21/09/2016	Afridev	-13.26508826	33.32466923	172
GS5342	Sendeza	Kawamba	23/09/2016	Afridev	-13.27482387	33.26478671	202
GS5343	Kasichi	Kawamba	20/09/2016	Afridev	-13.27861962	33.12608107	390
GS5336	Kapiri	Kawamba	21/09/2016	Afridev	-13.29024179	33.15426434	350
GS5343	Gideon	Kawamba	21/09/2016	Afridev	-13.30449256	33.15455957	315
GS5343	Kaputwa	Kawamba	22/09/2016	Afridev	-13.32765125	33.09819258	159
GS5343	Kapwata 2	Kawamba	22/09/2016	Afridev	-13.2914724	33.37817783	323
GS5343	Munye Madzi	Kawamba	22/09/2016	Afridev	-13.22108082	33.31586118	475
GS5343	Mwenda	Kawamba	23/09/2016	Afridev	-13.24646986	33.28701117	116
GS5343	Chiphaliwali	Santhe	24/09/2016	Afridev	-13.45223561	33.28910202	88

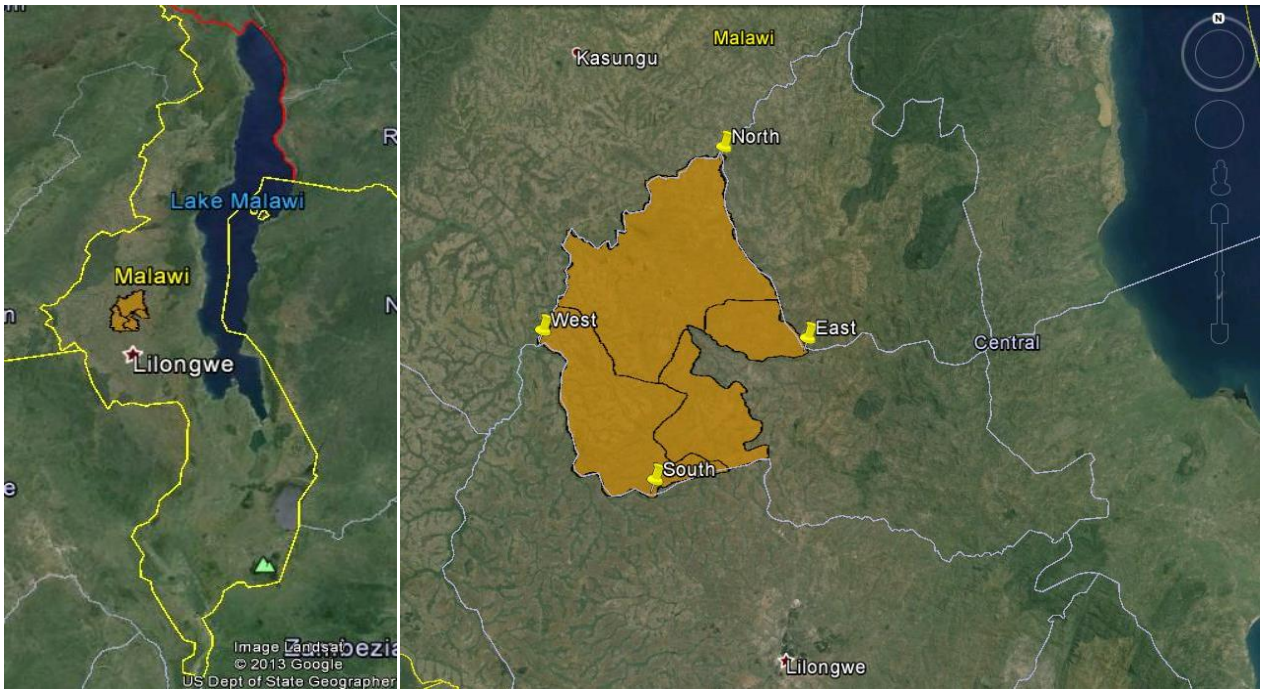
GS5343	Kateme/Yonamu	Kawamba	24/09/2016	Afridev	-13.2837002	33.32255212	207
GS5343	Simoni	Kawamba	24/09/2016	Afridev	-13.29739234	33.33501569	315
GS5343	Chilaka	Santhe	25/09/2016	Afridev	-13.45987805	33.29542127	162
GS5343	Jeputala	Santhe	25/09/2016	Afridev	-13.40524371	33.2049178	220
GS5343	Lufeyo	Santhe	25/09/2016	Afridev	-13.45786236	33.34458702	206
GS5344	Masinjang`ombe	Santhe	26/09/2016	Afridev	-13.43055312	33.1685519	208
GS5344	Misika	Santhe	26/09/2016	Afridev	-13.41059133	33.40423557	296
GS5344	Kantchele / Katchere	Santhe	27/09/2016	Afridev	-13.38399913	33.29183735	352
GS5344	Kunkhulire	Santhe	27/09/2016	Afridev	-13.43903022	33.4201261	210
GS5344	Matatiyo	Kawamba	27/09/2016	Afridev	-13.27373068	33.36624157	244
GS5344	Chimwendo	Santhe	28/09/2016	Afridev	-13.38707271	33.17530087	324
GS5344	Chiunguza	Santhe	30/09/2016	Afridev	-13.53625294	33.29202185	626
GS5344	Lodzeni/Lozani	Santhe	30/09/2016	Afridev	-13.28742018	33.24657594	183
GS5344	Mndawirako	Santhe	30/09/2016	Afridev	-13.46747206	33.82948532	275
GS5344	Dunda	Santhe	01/10/2016	Afridev	-13.519579	33.36138326	263
GS5344	Chikoti	Santhe	02/10/2016	Afridev	-13.27373068	33.36624157	258

The date of rehabilitation was confirmed by a Repair Confirmation Form which was signed by the mechanic carrying out the repair along with an elected representative of the community group owners of the borehole. The date of rehabilitation was used as the start date of operation and crediting for each borehole; we have conservatively assumed that the first day of crediting is not counted.

The number of days each borehole credited for in this monitoring period was multiplied by the number of people using the borehole to give the total number of project technology days for that borehole. The individual project technology days for each borehole were totalled to give the total number of project technology days for this monitoring period.

3. Project Location

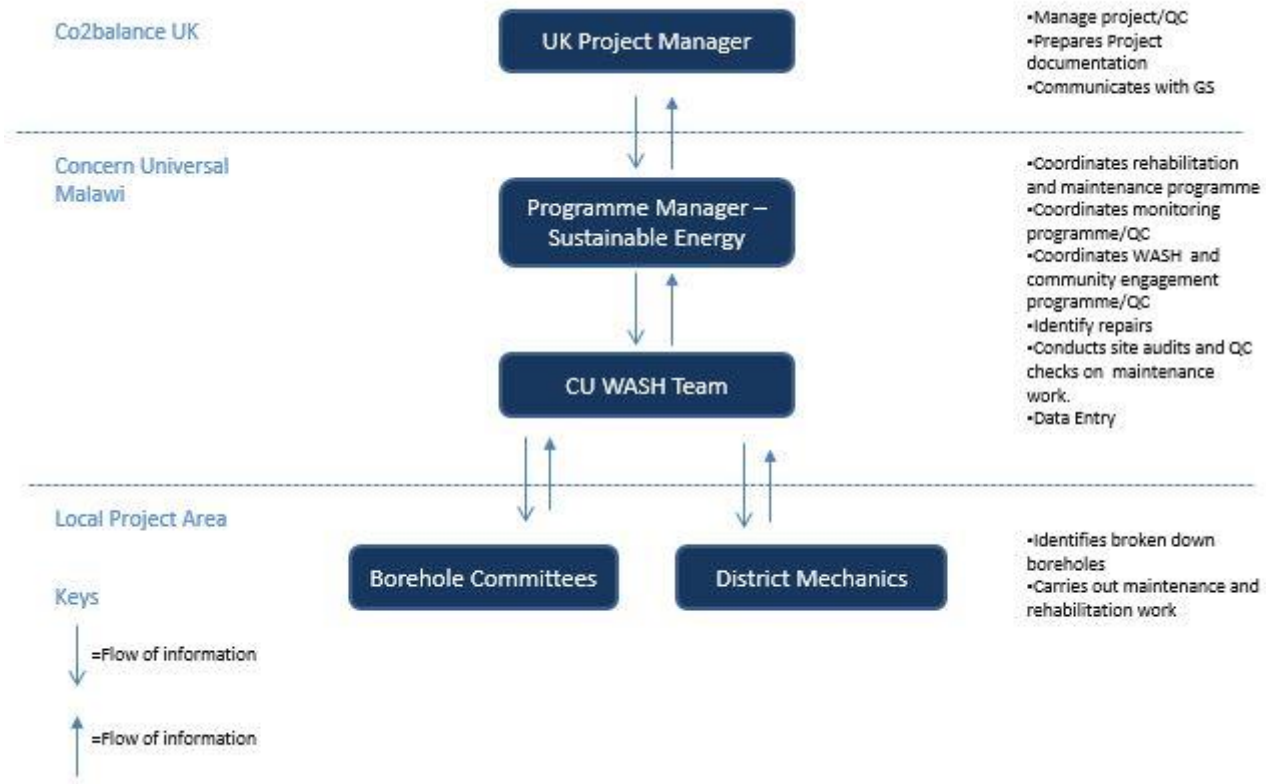
The location of the project activity is within the administrative boundary of Kasungu District in the central region of Malawi. Below is the geographic reference to allow unique identification of the VPA Improved Kitchen Regimes, Kasungu.



Project Area Extremities		
	Latitude	Longitude
North	-13.206318°	33.702993°
South	-13.716648°	33.578534°
East	-13.505547°	33.825191°
West	-13.480841°	33.409259°

4. Organisational Structure

In this project CO2balance UK ltd is the managing entity and is responsible for communication with the Gold Standard. United Purpose Malawi works with local project field staff who handle all monitoring data collection and processing.



CO2balance and United Purpose work together with local district mechanics that are responsible for the rehabilitation and maintenance of the boreholes, as well as the collection of the data to support this process. The WASH team are responsible for conducting the sensitization meeting, monitoring exercises and identifying any maintenance works. All data that is collected in the field is processed at the local office and sent to the United Purpose Programme Manager for a quality control check prior to sending the documents to the CO2balance UK projects team.

5. Description of monitoring system

All surveys are administered by trained CO2balance staff and partner United Purpose that are local to the area and conversant in the local dialects to ensure that the responses are consistent and not biased by any regional language barriers. Each participant is provided with a briefing on the purpose of the survey and is assured that no individual names are used in the analysis.

The results of the surveys are collated in excel spreadsheets and stored on a central server in an electronic format which is sent to the UK head office for data analysis. The documentation procedure that co2balance has devised ensures a minimum chance of original data being lost – all original copies of our project documentation are retained in the United Purpose Malawi office and are available scanned upon request of the UK team.

In accordance with the Gold Standard methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption, the survey samples are randomly selected from the borehole user record. Using an online research randomizer, each borehole user, selected from the total user list for all VPAs, is assigned a unique random number which is then sorted in order from lowest to highest. The first *n* number of HHs are selected for the survey. The size of the random sample is dependent on the methodological requirements and variance of the parameter being monitored to ensure the parameters measured satisfy 90/10 precision (90% confidence interval and 10% margin of error). The random sample is reselected for every monitoring period to ensure the selection remains random.

Below is a summary of the key information that has been collected and monitored as part of this project;

5.1 Borehole database

The borehole installation/rehabilitation record includes the following information:

- Date of installation/rehabilitation
- GPS location of the borehole
- Model of the borehole
- Quantity of boreholes installed
- The total number of people obtaining their water from each borehole
- Mode of use: commercial/domestic

The total number of households using each borehole has been determined through the lists supplied by the community group and or district water officer responsible for that borehole. Using this method, the total number of people using each borehole has been determined and hence a figure for person days can be calculated.

5.2 Ongoing Monitoring Studies

The following ongoing monitoring studies were conducted; the results are given in the parameter boxes tables in Section 6.

- **Water Consumption Field Test** (Equation parameters Qp,y and Qp,rawboil,y) – Completed prior to first verification and then biennially. It was conducted on 79 households.

- **Quality of the treated water** - The quality of the treated water is assessed to ensure that it is fit for human consumption. The parameters used to assess the water quality are in line with Malawian standards for potable water and all parameters are shown to be within levels considered acceptable for domestic human consumption.

- **Usage Survey** - As all boreholes were installed within 1 year of the start of the crediting period and are expected to last the lifetime of the project, minimum samples of 30 for different aged technologies are not necessary. Therefore, the annual usage survey was conducted using a minimum sample size of 100.

- **Project Survey** – Conducted on 108 households, surveying end users currently using project technologies to explore changes in project scenario over time.

- **Leakage -** The PDD has described which sources of leakage detailed within the methodology are relevant to this project and which have been discounted. A leakage assessment is provided below.

Individual participants were selected from the borehole user data base using the random sampling process outlined above and in the monitoring plan. Sample sizes are in line with the Gold Standard requirements.

5.3 Cross Sampling

The project proponent has elected to cross-sample technologies across all its homogenous borehole VPAs located within the districts of Dowa and Kasungu. In this monitoring period, cross-sampling was conducted across VPAs 91-104 and 112-116. The sample number of boreholes randomly monitored from the borehole list is in accordance with a 90/30 confidence/precision. The number of households randomly sampled from the user lists of the selected boreholes, is in accordance with the minimum sample size requirements in the Gold Standard methodology for each individual survey and test. Water Quality tests are conducted for each verification as supporting documentation to confirm that each borehole is functioning. Cross sampling is applied to the following surveys;

- Project surveys – Completed annually
- Usage Surveys – Completed annually
- Water Consumption Field Tests – Completed annually

The surveys have been conducted to ensure that they are within the end date of the respective monitoring periods for each VPA and they satisfy the sampling requirements in the methodology. As required for the WCFT, sampling complies with 90/10 precision (90% confidence interval and 10% margin of error), and the sample group is reselected for every monitoring period using an online research randomizer to ensure random selection.

6. Fixed Parameters

The following data was fixed at validation.

Data / Parameter:	$EF_{b,co2}$
Data unit:	tco_2/TJ
Description:	co_2 emission factor arising from use of wood fuel in baseline scenario
Source of data used:	TTPDTEC/IPCC default value:
Value applied:	112
Justification of the choice of data or description of measurement methods and procedures actually applied:	Deemed valid by Methodology: "112 tCO2/TJ for Wood/Wood Waste, or the IPCC default value of other relevant fuel" (p.15)
Any comment:	-

Data / Parameter:	$EF_{b,non\ co2}$
Data unit:	tco_2/TJ
Description:	Non-co_2 emission factor arising from use of fuels in baseline scenario
Source of data used:	IPCC default value: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14 Global Warming Potential: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14
Value applied:	8.692
Justification of the choice of data or description of measurement methods and procedures actually applied:	Deemed valid by Methodology

Any comment:	-

Data / Parameter:	$EF_{p,co2}$
Data unit:	tco_2/TJ
Description:	co_2 emission factor arising from use of fuels in project scenario
Source of data used:	TTPDTEC/IPCC default value
Value applied:	112
Justification of the choice of data or description of measurement methods and procedures actually applied:	Deemed valid by Methodology: "112 tCO2/TJ for Wood/Wood Waste, or the IPCC default value of other relevant fuel" (p.15)
Any comment:	-

Data / Parameter:	$EF_{p,non\ co2}$
Data unit:	tco_2/TJ
Description:	Non-co_2 emission factor arising from use of fuels in project scenario
Source of data used:	IPCC default value: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14 Global Warming Potential: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14
Value applied:	8.692
Justification of the choice of data or description of measurement methods and procedures actually applied:	Deemed valid by Methodology
Any comment:	-

Data / Parameter:	NCV_b
Data unit:	TJ/ton
Description:	Net calorific value of the fuels used in the baseline
Source of data used:	IPCC default value: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf_Table 1.2
Value applied:	0.0156
Justification of the choice of data or description of measurement methods and procedures actually applied:	Deemed valid by Methodology
Any comment:	-

Data / Parameter:	NCV_p
Data unit:	TJ/ton
Description:	Net calorific value of the fuels used in the project
Source of data used:	IPCC default value:

	http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf_Table 1.2
Value applied:	0.0156
Justification of the choice of data or description of measurement methods and procedures actually applied:	Deemed valid by Methodology
Any comment:	-

Data / Parameter:	$f_{NRB,i,y}$
Data unit:	Fractional non-renewability
Description:	Non-renewability status of woody biomass fuel in scenario i during year y
Source of data used:	Applicable NRB assessment conducted by C4Eco
Value applied:	0.92
Justification of the choice of data or description of measurement methods and procedures actually applied:	The NRB assessment has been carried out in accordance with the methodology. The report has been attached in the accompanying 'NRB Report' document.
Any comment:	-

Data / Parameter:	$W_{b,y}$
Data unit:	T/litre
Description:	Quantity of fuel that is used to treat 1 litre of water in the baseline scenario b during year y
Source of data to be used:	Baseline Water Boiling Test
Value of data applied for the purpose of calculating expected emission reductions	0.000900352
Description of measurement methods and procedures to be applied:	The baseline water boiling test is used to determine the amount of wood used to purify 1 litre of water by boiling. This data is gathered according to: *Technologies and Practices to Displace Decentralized Thermal Energy Consumption* Version 1*, Draft General Guidelines On Sampling And Surveys*; EB37 Annex 27; and *Standard For Sampling And Surveys For CDM Project Activities and Programme of Activities* (Version 02); EB65 Annex 2
Any comment:	

Data / Parameter:	$W_{p,y}$
Data unit:	T/litre
Description:	Quantity of fuel that is used to treat 1 litre of water in the project scenario p during year y
Source of data to be used:	Baseline Water Boiling Test
Value of data applied for the purpose of calculating expected emission reductions	0.000900352

Description of measurement methods and procedures to be applied:	The baseline water boiling test is used to determine the amount of wood used to purify 1 litre of water by boiling. This data is gathered according to: *Technologies and Practices to Displace Decentralized Thermal Energy Consumption* Version 1*, Draft General Guidelines On Sampling And Surveys*; EB37 Annex 27; and *Standard For Sampling And Surveys For CDM Project Activities and Programme of Activities* (Version 02); EB65 Annex 2
Any comment:	

Data / Parameter:	Cj
Data unit:	Percentage
Description:	Portion of users of project safe water supply who were already in baseline using a non-boiling safe water supply
Source of data used:	Baseline Study
Value applied:	0.09091
Justification of the choice of data or description of measurement methods and procedures actually applied:	Deemed valid by Methodology
Any comment:	-

Data / Parameter:	Xboil Non Suppressed Demand
Data unit:	Percentage
Description:	Percentage of premises that in the absence of the project activity would have used non-GHG emitting technologies like chlorine treatment techniques (if available) in the project boundary.
Source of data used:	Baseline study. Credible literature, studies, survey, reports, relevant to the project target area
Value applied:	0.0385
Justification of the choice of data or description of measurement methods and procedures actually applied:	Suppressed demand was determined through a set of questions in the baseline project survey that establish the method households use to purify their water, if any, and how they would choose to purify if they were not subject to monetary and access barriers. This is in line with the Gold Standard principles of suppressed demand outlined in annex 2. A fixed suppressed demand baseline has been opted for, however, in the event the project surveys show a substantial change in fuel use characteristics, a new baseline shall be conducted.
Any comment:	-

7. Monitored Parameters

As outlined in section 5.2 the following parameters are monitored in line with the methodological requirements and monitoring plan. The results are given in the parameter boxes below followed by an analysis of the surveys in section 8.

Data / Parameter:	N p,y
Data unit:	Project Technology Days
Description:	Number of persons consuming water supplied by project scenario p through year y
Source of data to be used:	Borehole Project Database

Value of data applied for the purpose of calculating expected emission reductions	GS5339: 2,367,456 GS5340: 2,339,405 GS5341: 1,701,511 GS5342: 1,553,755 GS5343: 1,520,261 GS5344: 1,484,526
Description of measurement methods and procedures to be applied:	Sum of the total number of people using each borehole in the project multiplied by the number of days crediting each borehole earns in a given monitoring period.
Any comment:	

Data / Parameter:	U p,y
Data unit:	Percentage
Description:	Usage rate in project scenario p through year y
Source of data to be used:	Annual Usage Survey
Value of data applied for the purpose of calculating expected emission reductions	100%
Description of measurement methods and procedures to be applied:	The usage survey has been carried out by staff trained by CO2balance to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by co2balance UK Ltd
Any comment:	

Data / Parameter:	Qp,y
Data unit:	Litres per person per day
Description:	Quantity of safe water supplied in the project scenario p during the year y using the zero or low emissions clean water supply technology
Source of data to be used:	Water Consumption Field Test (WCFT)
Value of data applied for the purpose of calculating expected emission reductions	7.5
Description of measurement methods and procedures to be applied:	Method used similar to Kitchen Performance Test in which the volume of water consumed in each household is averaged over 3 days. Volume capped at 7.5 litres per person per day as per the methodology The WCFT will be carried out by staff trained by CO2balance to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by CO2balance UK Ltd
Any comment:	

Data / Parameter:	Qp,cleanboil,y
Data unit:	Litres per person per day
Description:	Quantity of safe water boiled in the project scenario p during the year y using the zero or low emissions clean water supply technology
Source of data to be used:	Water Consumption Field Test (WCFT)
Value of data applied for the purpose of calculating expected emission reductions	0
Description of measurement methods and procedures to be applied:	Method used similar to Kitchen Performance Test in which the volume of water consumed in each household is averaged over 3 days. The WCFT has been carried out by staff trained by CO2balance to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by CO2balance UK Ltd
Any comment:	

Data / Parameter:	Qp,rawboil, y
Data unit:	Litres per person per day
Description:	The raw of unsafe water that is still boiled after installation of the water treatment technology
Source of data to be used:	Water Consumption Field Test (WCFT)
Value of data applied for the purpose of calculating expected emission reductions	0
Description of measurement methods and procedures to be applied:	Method used similar to Kitchen Performance Test in which the volume of water consumed in each household is averaged over 3 days. The WCFT has been carried out by staff trained by CO2balance to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by CO2balance UK Ltd
Any comment:	

Data / Parameter:	Quality of Treated Water
Data unit:	Parameters as per national standards
Description:	Performance of the treatment technology
Source of data to be used:	Laboratory Tests

Value of data applied for the purpose of calculating expected emission reductions	Pass
Description of measurement methods and procedures to be applied:	The National Water Quality Reference Laboratory has certified each water supply in line with national standards.
Any comment:	

Data / Parameter:	LEp,y
Data unit:	tCO2e per year
Description:	Leakage in project scenario p during year y
Source of data to be used:	Baseline and monitoring surveys
Value of data applied for the purpose of calculating expected emission reductions	0
Description of measurement methods and procedures to be applied:	Assessed every two years using baseline and monitoring surveys
Any comment:	

8. Survey Analysis

8.1 Water Consumption Field Test

The Water Consumption Field Test was carried out on a randomly selected sample of households from the borehole user list in line with the Gold Standard requirements. As Dowa and Kasungu Districts are monitored together, a cross sample was taken from a combined user list from both areas.

The tests were conducted between the 02/10/2017 and 17/10/2017 on a sample of 79 households. All tests were completed over the course of 4 days in October 2017 (1-day preparation and 3 days' measurement), in people's homes following a similar method as the Kitchen Performance Test. The total litres of water consumed each day was measured and divided by the number of people consuming water on that day – this measurement was repeated over 3 consecutive week days (weekdays) and an overall average per household was calculated. The results showed that on average 10.91 litres were used per person per day (capped at 7.5l).

8.2 Usage Survey

Usage surveys following the cross sampling method were conducted in October 2017 (between the 02/10/2017 and 17/10/2017). In total 100 usage surveys were conducted on a randomly selected sample of households drawn from the borehole user records. The results of the usage survey confirmed that usage of boreholes for both respondents and their family was 100%.

8.3 Project Survey Analysis

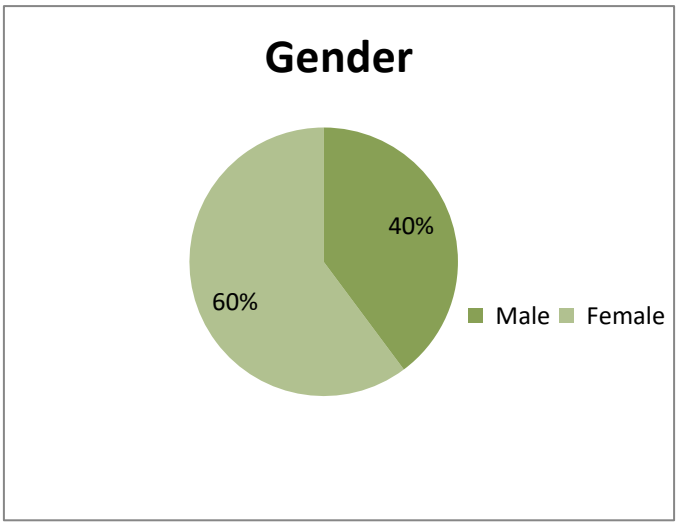
Project surveys were conducted on a sample of 108 randomly selected households from across the homogenous VPAs in Dowa and Kasungu to explore changes in the project scenario (demographics, water use and purification practices etc.) over time. Project surveys were conducted between 20/08/2017 and 30/08/2017.

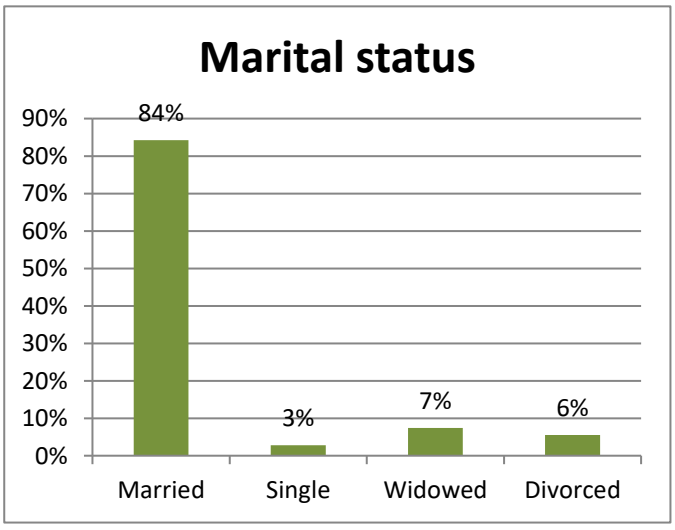
Data collected during the project surveys includes the following:

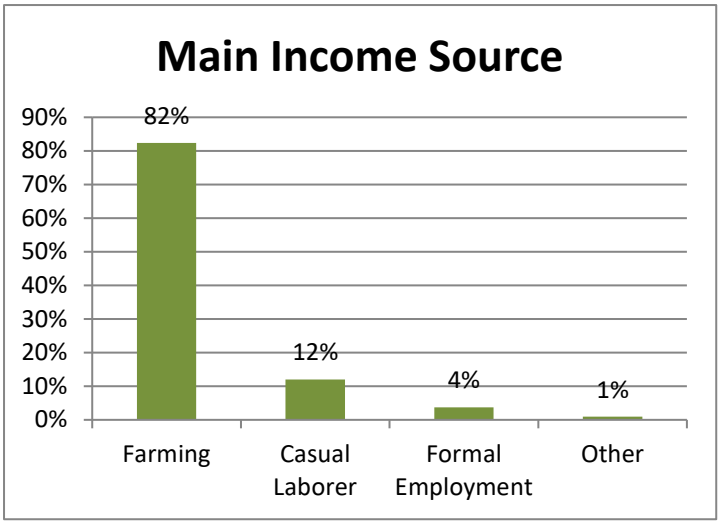
- General information - Name, address, telephone number etc.
- Household socio-demographic information.
- Water use and purification characteristics.
- Sources and availability of fuel.

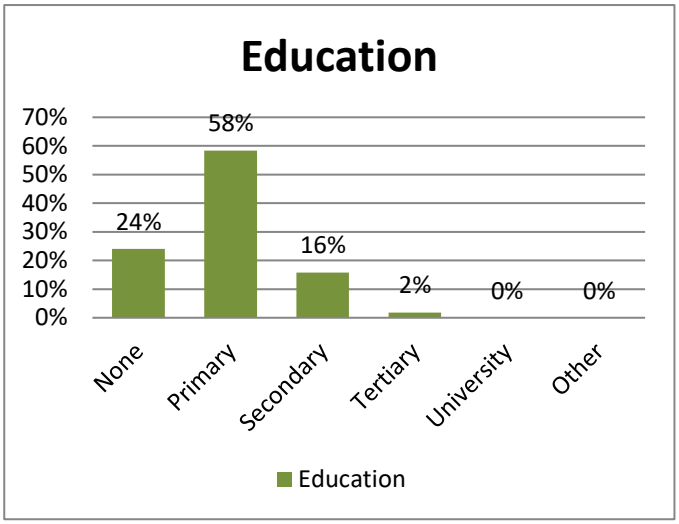
Socio-Demographic Characteristics

Analysis of the Project Survey results shows that socio-demographic characteristics such as gender is divided 40% males and 60% females in the Project Survey. 84% of respondents are married and 82% list their main source of income as farming. This is followed by casual labour at 12% and formal employment at 4%. 58% of respondents have primary level education and 16% have secondary level education. 2% of the sample have tertiary education though 24% list having no education.



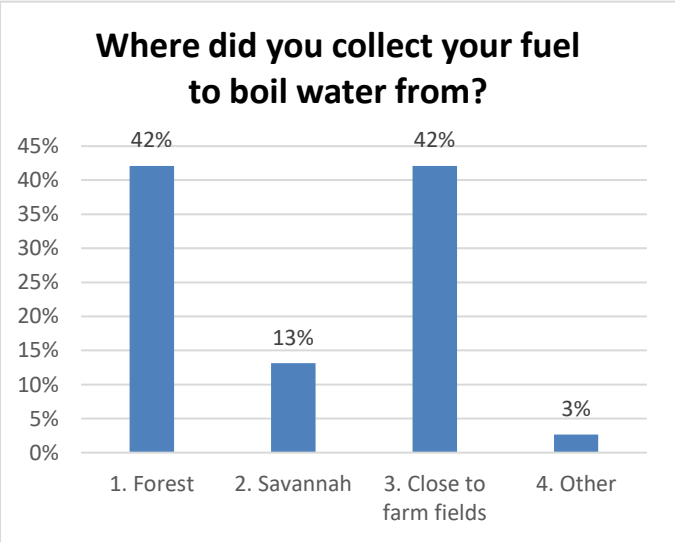


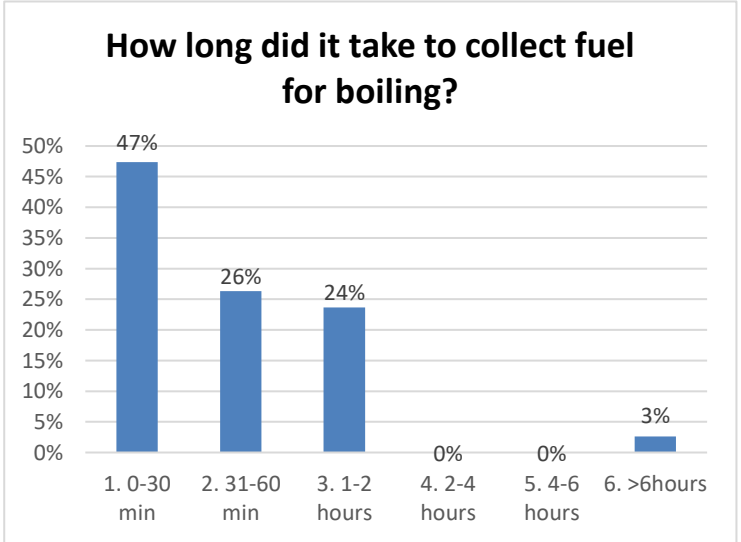




In the Baseline Survey, 93% of participants said their water is not safe to drink. The results from the Usage Survey showed that 100% of the respondents now collect their water from boreholes, which indicates a major improvement over the baseline and highlights that there is no longer a need for people to purify their water.

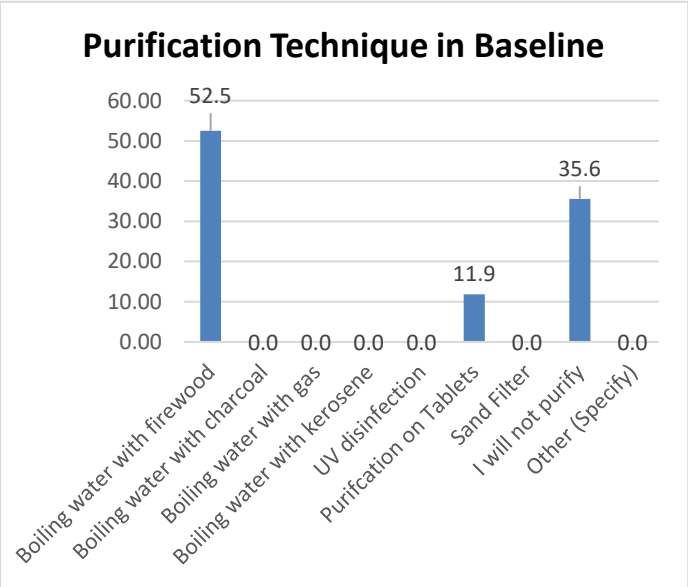
Furthermore, this creates less of a need for project participants to collect fuel in order to boil water to purify. Previous to the project, households collected fuel from the forest or close to farm fields (42%). 13% of participants collected fuel from the Savannah and 3% from other locations. This took 47% of people 0-30 minutes. A further 50% of participants could spend up to 1 or 2 hours collecting fuel. Since the introduction of the project, households don't collect fuel for water purification and save time, enabling them to pursue other economic and domestic activities.

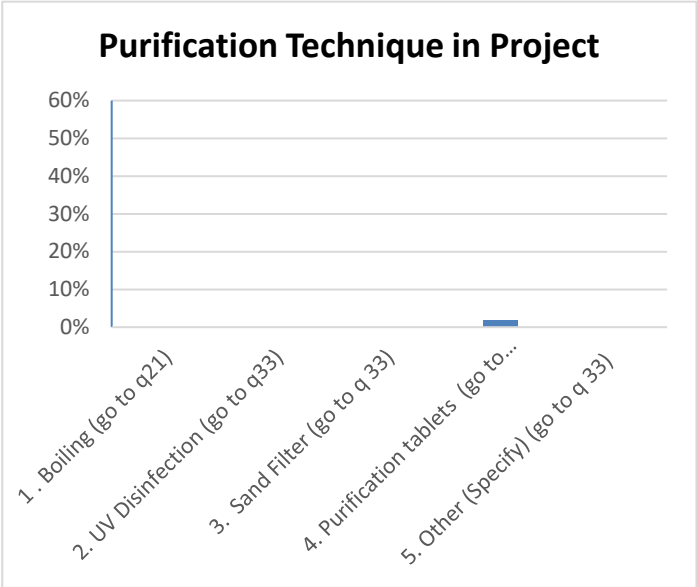




When asked what approach households use to make their water safe to drink, the Baseline study found that 52% of households boil their water as a means of purification, 12% use purification tablets and the remaining 36% do not practice any form of purification due to energy poverty.

In the project scenario, the survey shows that 98% of households no longer purify their water. 2% use purification tablets and 0% state that they continue to boil their water. This represents a reduction in pollution from burning wood to boil water and corresponds to the results of the Water Consumption Field Test.





Before the project, most households obtained their water from unsafe water sources. 19% of households collected water from a river or stream and 59% of households collected water from an open well. The results of the Usage Survey show that 100% of respondents now collect water from the borehole which is safe to drink.

8.4 Water Quality Tests

Water quality tests were conducted for all boreholes under the VPA between 01/05/2016 and 01/01/2017. The results show that all boreholes provide water at satisfactory biological, chemical and physical levels which comply with national standards on potable drinking water. This was confirmed by the respective District Water officer and the Lab Technician of the Ministry of Health.

8.5 Leakage Assessment

The potential sources of leakage listed in the methodology have been investigated, and addressed below:

a) The displaced baseline technologies are reused outside the project boundary in place of lower emitting technology or in a manner suggesting more usage than would have occurred in the absence of the project.

In all cases the baseline technologies displaced are three stones; these have no market value and are not a product as such. There is nothing limiting the use of three stone cooking across the country (the technology is lowest rung on the energy ladder and the price is zero), which is why this cooking method is so widespread. In any case the primary purpose of these three rocks is for cooking so they will not be replaced/displaced in their entirety as a result of this project - which means they will not be reused outside the project boundary. This leakage source can therefore be discounted.

b) The non-renewable biomass or fossil fuels saved under the project activity are used by non-project users who previously used lower emitting energy sources.

There is no evidence to suggest significant (if any) use of renewable energy for purifying water in the project region as found in the Baseline Water Surveys. As solar purification devices are not used, renewable energy used for purifying water would likely be animal dung or crop residues which will be used due to ease of availability/proximity to the home rather than due to a shortage of wood fuel, therefore it is an independent factor. This leakage source can therefore be discounted.

c) The project significantly impacts the NRB fraction within an area where other CDM or VER project activities account for NRB fraction in their baseline scenario.

As the majority of participants collect wood from within the project boundary, it is not expected that the NRB in other areas will be affected. There are currently no other CDM or VER projects in the project area.
d) The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of heating or by retaining some use of inefficient technology.

The space heating effect of boiling water for purification purposes will be minimal, as the predominant use of baseline technology is for cooking. Therefore it is highly unlikely that another technology will be used for heating when users no longer boil water.

e) By virtue of promotion and marketing of new technology with high efficiency, the project stimulates substitution within households who commonly used a technology with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline.

This project is not marketing efficient technology; it is eliminating the need for a fuel based technology to deliver pure water. Lower emission technology substitution within households is therefore not possible and this leakage source can therefore be discounted.

Therefore, a value of 0 is applied for leakage.

Data / Parameter:	$LE_{p,y}$
Data unit:	tCO2e per year
Description:	Leakage
Source of data to be used:	Baseline and monitoring surveys
Value of data applied for the purpose of calculating expected emission reductions	0
Description of measurement methods and procedures to be applied:	Leakage will be assessed after the first verification
Any comment:	

9. Sustainable Development Indicators

The following indicators were considered of most importance to this project and were accordingly monitored:

No		1
Indicator		Air quality
Mitigation measure		None
Repeat for each parameter		
Chosen parameter		Total suspended matter (TSPM)- measured indirectly by wood consumption
Current situation of parameter		As determine by research and field staff, traditional methods used for boiling water with biomass fuel produce large amounts of TSPM. It is not justifiable to measure this quantitatively but it will measured qualitatively as described below
Estimation of baseline situation of parameter		Quantitatively, the baseline situation is one which smoke is emitted by fires used to boil water.
Future target for parameter		The project aims to reduce wood consumption and hence make a reduction in the defined parameter. This will be indicated by any reported reduction in wood fuel use in the project scenario as determined by surveys of the target population
Way of monitoring	How	Project surveys, Usage surveys
	When	Annually
	By who	Expert surveying team

Given that 100% of participants use the boreholes, there is no need to boil water for purification. As reported by the project survey, average fuel use per household for boiling water was reduced from 0.69 to 0.00 bundles of wood per week in the dry season and from 0.73 to 0.00 bundles in the wet season. Consequently, TPSM has been reduced as a result of this project and so we score this indicator positively.

10. Calculations

Baseline Emissions

$$BE_{b,y} = B_{b,y} * \left(\left(fNRB_y * EF_{b,fuel,co2} \right) + EF_{b,fuel,nonco2} \right) * NCV_{b,fuel}$$

Where:

$$B_{b,y} = \left(1 - C_j\right) * N_{j,y} * W_{i,y} * \left(Q_{p,y} + Q_{p,rawboil,y}\right) \quad (11)$$

Where:

$N_{j,y}$	Number of person.days consuming water supplied by project scenario p through year y[47]
C_j	Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it
$B_{b,y}$	Quantity of fuel consumed in baseline scenario b during the year y in tons
$Q_{p,y}$	Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day
$Q_{p,rawboil,y}$	Quantity of raw water boiled in the project scenario p per person per day
$W_{b,y}$	Quantity of fuel in tons required to treat 1 litre of water using technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test.

Project Emissions

$$PE_{p,y} = B_{p,y} * \left(\left(fNRB_y * EF_{p,fuel,co2} \right) + EF_{p,fuel,nonco2} \right) * NCV_{p,fuel}$$

Where:

$$B_{p,y} = \left(1 - C_j\right) * N_{p,y} * W_{p,y} * \left(Q_{p,rawboil,y} + Q_{p,cleanboil,y}\right)$$

Where:

$N_{p,y}$	Number of person.days consuming water supplied by project scenario p through year y
C_j	Expressed as a percentage, this is the portion of users of the project technology j or who in the baseline were already consuming safe water without boiling it
$B_{p,y}$	Quantity of fuel consumed in project scenario p during the year y in tons
$Q_{p,rawboil,y}$	Quantity of raw water boiled in the project scenario p per person per day
$Q_{p,cleanboil,y}$	Quantity of safe water boiled in the project scenario p per person per day
$W_{p,y}$	Quantity of wood fuel or fossil fuel in tons required to treat 1 litre of water using technologies representative of the project scenario p during project year y

Overall Emission Reductions

$$ER_y = \left(\left(\Sigma BE_{b,y} - \Sigma PE_{p,y} \right) * U_{p,y} - \Sigma LE_{p,y} \right) * (1 - Xboil)$$

Where:

$U_{p,y}$	Cumulative usage rate for technologies in project scenario p during year y, based on cumulative installation rate and drop off rate.

The results also consider the discounted fraction of non-suppressed demand users (xboil). For full calculations please see accompanying 'ER Calculations Spreadsheet.'

Baseline Fuel Use

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	
Person Days	Njy		
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	
Quantity safe water litres consumed in project scenario supplied by project technology	Qp,y	L/pd	
Quantity of raw water boiled in addition to project technology water	Qp, raw, y	L/pd	
Quantity fuel consumed in baseline scenario	Bb,y	T	

The portion of safe water users prior to the start of the project was removed from the baseline (Cj) before the amount of wood used to boil 1 litre of water (Wb,y) was multiplied by the number of litres of safe and raw water consumed per person per day (Qp,y) by the total number of project technology days (Njy). This gives the total tonnes of wood used in the baseline (Bb,y).

Project Fuel Use

Project Fuel Use (Pby)			
Portion users	Cj	fraction	
Person Days	Njy		
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	
Quantity of raw water boiled in addition to project tech water	Qp, raw, y	L/pd	
Quantity of safe water boiled	Qp, cleanboil, y	L/pd	
Quantity of fuel consumed in project scenario per HH	Bp,y	T	

The portion of safe water uses was removed from the project scenario (Cj) before the amount of wood used to boil 1 litre of water (Wp,y) was multiplied by the number of litres of raw and safe water boiled per person per day (Qp) by the total number of project technology days (Njy). This gives the total tonnes of wood used in the project (Bp,y).

Constants			
NRB	NRB	Fraction	
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TCO2/TJ	
Net calorific value of fuel	NCV,b,fuel	TJ/T	

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	
Project emissions per year	PEp,y	tCO2/y	
Usage rate	Up,y	fraction	
Leakage	LEp,y	tCO2/y	
Emission Reductions	Ery	tCO2/y	

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors (EFb) for CO_2 (corrected by the fNRB value), non CO_2 and the net calorific value of biomass (NCV,b). The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y)) and any leakage subtracted from the total (LEp,y).

Suppressed Demand Assessment			
Percentage of suppressed demand users			
Percentage of **non**-suppressed demand users	Xboil	Percentage	
Emission Reductions	Ery	tCO2/y	

The emissions reductions were then corrected for the levels of suppressed demand observed in the project by multiplying by (1-Xboil) to give the a total of emission reductions (ERy) for this monitoring period.

Emission Reduction Cap			
Emission Reduction Cap	Ery	tCO2/y	10,000

The maximum number of emissions reductions claimable for this VPA is limited to 10,000 for each year (detailed below). An average allowance rate of 27.40 ERs/crediting day, which corresponds to 10,000ERs/year, has been applied to ensure each VPA complies with this requirement.

11. Summary of Emissions Reductions per VPA

GS 5339

Constants			
NRB	NRB	Fraction	0.92000
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.09091
Person Days	Njy		2367456
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.000900352
Quantity safe water litres consumed in project scenario supplied by project technology	Qp,y	L/pd	7.5
Quantity of raw water boiled in addition to project technology water	Qp, raw, y	L/pd	0
Quantity fuel consumed in baseline scenario	Bb,y	T	14533.25041

Project Fuel Use (Pby)			
Portion users	Cj	fraction	0.09091
Person Days	Njy		2367456
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.000900352
Quantity of raw water boiled in addition to project tech water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil, y	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	25,332
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	25332
Suppressed Demand Assessment			
Percentage of suppressed demand users			96.15%
Percentage of **non**-suppressed demand users	Xboil	Percentage	3.85%
Emission Reductions	Ery	tCO2/y	24357

Emission Reduction Cap			
Emission Reduction Cap	Ery	tCO2/y	18904

Emissions Reductions by Vintage

Emissions Reductions by Vintage		
Vintage	Total ERs	ERs MP1
10/02/2016 - 31/12/2016	8,904	8,904
01/12/2017 - 31/12/2017	10,000	10,000
Total	18,904	18,904

Constants			
NRB	NRB	Fraction	0.92000
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.09091
Person Days	Njy		2339405
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.000900352
Quantity safe water litres consumed in project scenario supplied by project technology	Qp,y	L/pd	7.5
Quantity of raw water boiled in addition to project technology water	Qp, raw, y	L/pd	0
Quantity fuel consumed in baseline scenario	Bb,y	T	14361.05198

Project Fuel Use (Pby)			
Portion users	Cj	fraction	0.09091
Person Days	Njy		2339405
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.000900352
Quantity of raw water boiled in addition to project tech water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil, y	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	25,032
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	25032
Suppressed Demand Assessment			
Percentage of suppressed demand users			96.15%
Percentage of **non**-suppressed demand users	Xboil	Percentage	3.85%
Emission Reductions	Ery	tCO2/y	24069

Emission Reduction Cap			
Emission Reduction Cap	Ery	tCO2/y	18877

Emissions Reductions by Vintage

Emissions Reductions by Vintage		
Vintage	Total ERs	ERs MP1
11/02/2016 - 31/12/2016	8,877	8,877
01/12/2017 - 31/12/2017	10,000	10,000
Total	18,877	18,877

Constants			
NRB	NRB	Fraction	0.92000
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.09091
Person Days	Njy		1701511
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.000900352
Quantity safe water litres consumed in project scenario supplied by project technology	Qp,y	L/pd	7.5
Quantity of raw water boiled in addition to project technology water	Qp, raw, y	L/pd	0
Quantity fuel consumed in baseline scenario	Bb,y	T	10445.17213

Project Fuel Use (Pby)			
Portion users	Cj	fraction	0.09091
Person Days	Njy		1701511
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.000900352
Quantity of raw water boiled in addition to project tech water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil, y	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	18,206
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	18206
Suppressed Demand Assessment			
Percentage of suppressed demand users			96.15%
Percentage of **non**-suppressed demand users	Xboil	Percentage	3.85%
Emission Reductions	Ery	tCO2/y	17506

Emission Reduction Cap			
Emission Reduction Cap	Ery	tCO2/y	14822

Emissions Reductions by Vintage

Emissions Reductions by Vintage		
Vintage	Total ERs	ERs MP1
09/07/2016 - 31/12/2016	4,822	4,822
01/12/2017 - 31/12/2017	10,000	10,000
Total	14,822	14,822

Constants			
NRB	NRB	Fraction	0.92000
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.09091
Person Days	Njy		1553755
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.000900352
Quantity safe water litres consumed in project scenario supplied by project technology	Qp,y	L/pd	7.5
Quantity of raw water boiled in addition to project technology water	Qp, raw, y	L/pd	0
Quantity fuel consumed in baseline scenario	Bb,y	T	9538.133124

Project Fuel Use (Pby)			
Portion users	Cj	fraction	0.09091
Person Days	Njy		1553755
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.000900352
Quantity of raw water boiled in addition to project tech water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil, y	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	16,625
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	16625
Suppressed Demand Assessment			
Percentage of suppressed demand users			96.15%
Percentage of **non**-suppressed demand users	Xboil	Percentage	3.85%
Emission Reductions	Ery	tCO2/y	15986

Emission Reduction Cap			
Emission Reduction Cap	Ery	tCO2/y	13315

Emissions Reductions by Vintage

Emissions Reductions by Vintage		
Vintage	Total ERs	ERs MP1
02/09/2016 - 31/12/2016	3,315	3,315
01/12/2017 - 31/12/2017	10,000	10,000
Total	13,315	13,315

Constants			
NRB	NRB	Fraction	0.92000
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.09091
Person Days	Njy		1544935
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.000900352
Quantity safe water litres consumed in project scenario supplied by project technology	Qp,y	L/pd	7.5
Quantity of raw water boiled in addition to project technology water	Qp, raw, y	L/pd	0
Quantity fuel consumed in baseline scenario	Bb,y	T	9483.989238

Project Fuel Use (Pby)			
Portion users	Cj	fraction	0.09091
Person Days	Njy		1544935
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.000900352
Quantity of raw water boiled in addition to project tech water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil, y	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	16,531
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	16531
Suppressed Demand Assessment			
Percentage of suppressed demand users			96.15%
Percentage of **non**-suppressed demand users	Xboil	Percentage	3.85%
Emission Reductions	Ery	tCO2/y	15895

Emission Reduction Cap			
Emission Reduction Cap	Ery	tCO2/y	12795

Emissions Reductions by Vintage

Emissions Reductions by Vintage		
Vintage	Total ERs	ERs MP1
20/09/2016 - 31/12/2016	2,795	2,795
01/12/2017 - 31/12/2017	10,000	10,000
Total	12,795	12,795

Constants			
NRB	NRB	Fraction	0.92000
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.09091
Person Days	Njy		1484526
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.000900352
Quantity safe water litres consumed in project scenario supplied by project technology	Qp,y	L/pd	7.5
Quantity of raw water boiled in addition to project technology water	Qp, raw, y	L/pd	0
Quantity fuel consumed in baseline scenario	Bb,y	T	9113.152727

Project Fuel Use (Pby)			
Portion users	Cj	fraction	0.09091
Person Days	Njy		1484526
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.000900352
Quantity of raw water boiled in addition to project tech water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil, y	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	15,884
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	15884
Suppressed Demand Assessment			
Percentage of suppressed demand users			96.15%
Percentage of **non**-suppressed demand users	Xboil	Percentage	3.85%
Emission Reductions	Ery	tCO2/y	15273

Emission Reduction Cap			
Emission Reduction Cap	Ery	tCO2/y	12658

Emissions Reductions by Vintage

Emissions Reductions by Vintage		
Vintage	Total ERs	ERs MP1
26/09/2016 - 31/12/2016	2,658	2,658
01/01/2017 - 31/12/2017	10,000	10,000
Total	12,658	12,658