

# Monitoring Report

**GS1247 Improved Kitchen Regimes Multi-Country PoA  
Kayonza District Borehole Project**

**GS4897, GS4898, GS4899, GS4900, GS4901, GS5033,  
GS5034, GS5035, GS5036, GS5392, GS5393, GS5395,  
GS5396**



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## Monitoring Report Information

Monitoring Period	<b>MP1 for all</b> <b>GS4897:</b> 14/12/15 – 30/9/17 <b>GS4898:</b> 18/12/15 – 30/9/17 <b>GS4899:</b> 9/12/15 – 30/9/17 <b>GS4900:</b> 18/12/15 – 30/9/17 <b>GS4901:</b> 17/12/15 – 30/9/17 <b>GS5033:</b> 17/8/16 – 30/9/17 <b>GS5034:</b> 24/8/16 – 30/9/17 <b>GS5035:</b> 18/8/16 – 30/9/17 <b>GS5036:</b> 15/8/16 – 30/9/17 <b>GS5392:</b> 9/12/15 – 30/9/17 <b>GS5393:</b> 11/12/15 – 30/9/17 <b>GS5395:</b> 19/8/16 – 30/9/17 <b>GS5396:</b> 16/8/16 – 30/9/17
Reference number of the project activity	GS4897, GS4898, GS4899, GS4900, GS4901, GS5033, GS5034, GS5035, GS5036, GS5392, GS5393, GS5395, GS5396
Version number of the monitoring report	1
Completion date of the monitoring report	19/10/17
Prepared By	Tom Urry

## Project Summary

In partnership with Likano Project Development GmbH and Open Circle Investments Pty Ltd, CO2balance UK Ltd is implementing a number of Micro-Scale Voluntary Project Activities under PoA 1247 in the districts of Kayonza which are eligible under the Gold Standard methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption. Local people typically use wood fuel on inefficient three stone fires for cooking and water purification, which results in the release of greenhouse gas emissions from the combustion of wood. This can be avoided if a technology that does not require fuel (wood or fossil) supplies clean water desired by households.

Kayonza is a largely rural district in which local people typically use wood fuel on inefficient three-stone fires to purify their drinking, cleaning and washing water. This process results in the release of greenhouse gas emissions from the combustion of wood. This can be avoided if a technology that does not require fuel (wood or fossil), supplies the clean water desired by households. Many existing boreholes are owned by community groups and have fallen into disrepair because maintenance programmes have been poorly managed, or proven too expensive. In this project co2balance UK Ltd., Likano Project Development GmbH and Open Circle Investments Pty Ltd work with community groups and a local NGO partner, Rwandans4Water in Kayonza district, to identify broken down boreholes and renovate them so that they deliver clean, safe water and breakdowns are fixed rapidly.

The date of rehabilitation was confirmed by a Repair Confirmation Form, which was signed by the mechanic employed by the local NGO partner, 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 totaled to give the total number of project technology days for this monitoring period. In total 76 boreholes were rehabilitated as part of 13 VPAs between the 9<sup>th</sup> December 2015 and 22<sup>nd</sup> September 2016. The date of rehabilitation, the project ID, location and number of people served by each borehole is given in the table below, which forms the project database.

Borehole ID	Date of Rehabilitation	Village	Pump Model	Lat	Long	Number of people using borehole	Mode of use
<b>GS4897</b>							
KAY001	14/12/2015	GACACA	AFRIDEV	-1.96262	30.58928	722	Domestic
KAY002	25/01/2016	AKARAMBO	AFRIDEV	-1.97520	30.47720	733	Domestic
KAY003	12/01/2016	SABASENGO	AFRIDEV	-1.83532	30.64530	510	Domestic
KAY004	23/01/2016	KAYONGO	AFRIDEV	-1.72615	30.50116	704	Domestic
KAY005	18/01/2016	KARAGARI1	AFRIDEV	-1.76691	30.45985	710	Domestic
KAY006	28/12/2015	MURENGE	AFRIDEV	-1.99200	30.56910	609	Domestic
<b>Total</b>						<b>3988</b>	
<b>GS4898</b>							
KAY007	18/12/2015	KAZENEZA	AFRIDEV	-1.96016	30.63001	690	Domestic
KAY008	23/12/2015	KAYEBE	AFRIDEV	-1.93774	30.60389	524	Domestic
KAY009	20/01/2016	AKABARE1	AFRIDEV	-1.76761	30.46153	747	Domestic
KAY010	14/01/2016	GAKOMA1	AFRIDEV	-1.71212	30.59665	618	Domestic
KAY011	04/02/2016	KIGARAMA	AFRIDEV	-1.96282	30.6123	799	Domestic
KAY012	05/01/2016	NYAMIRAMA	AFRIDEV	-1.72193	30.49350	583	Domestic
<b>Total</b>						<b>3961</b>	
<b>GS4899</b>							
KAY013	09/12/2015	MBARARA1	AFRIDEV	-1.98270	30.57946	562	Domestic
KAY014	10/12/2015	MBARARA2	AFRIDEV	-1.97353	30.57987	542	Domestic
KAY015	10/12/2015	MBARARA2	AFRIDEV	-1.97822	30.58029	559	Domestic
KAY016	16/12/2015	MUGANZA	AFRIDEV	-1.96916	30.60157	517	Domestic
KAY017	04/01/2016	RWAKABANDA	AFRIDEV	-1.73987	30.54110	595	Domestic
KAY018	16/01/2016	MIYAGA	AFRIDEV	-1.71638	30.57076	614	Domestic
KAY019	08/01/2016	NGUMERI	AFRIDEV	-1.68084	30.68084	610	Domestic
<b>Total</b>						<b>3999</b>	
<b>GS4900</b>							
KAY020	27/12/2015	RUBIRIZI	AFRIDEV	-1.93261	30.58630	629	Domestic
KAY021	07/01/2016	NYAGASHANGA	AFRIDEV	-1.70768	30.47002	537	Domestic
KAY022	28/01/2016	NYAKAGARAMA	AFRIDEV	-1.97504	30.54340	488	Domestic
KAY023	21/12/2015	AGASHIKIRI	AFRIDEV	-2.01766	30.57344	532	Domestic
KAY024	18/12/2015	TUBANIRE	AFRIDEV	-1.96301	30.62070	686	Domestic
KAY025	28/01/2016	KARAMA	AFRIDEV	-1.81952	30.46258	529	Domestic
KAY026	27/01/2016	NYAKAGARAMA	AFRIDEV	-1.98541	30.75410	573	Domestic
<b>Total</b>						<b>3974</b>	
<b>GS4901</b>							
KAY027	17/12/2015	SEKA	AFRIDEV	-1.95266	30.61045	502	Domestic
KAY028	29/01/2016	KIDOGO	AFRIDEV	-1.80158	30.45204	911	Domestic
KAY029	02/02/2016	MIYANGE	AFRIDEV	-1.88373	30.53494	873	Domestic
KAY030	13/01/2016	RUGEYO	AFRIDEV	-1.85373	30.64898	776	Domestic
KAY031	31/12/2015	RWAKABANDA	AFRIDEV	-1.73457	30.53058	430	Domestic
KAY032	11/01/2016	SABASENGO	AFRIDEV	-1.83712	30.64633	487	Domestic
<b>Total</b>						<b>3979</b>	
<b>GS5033</b>							
KAY046	17/08/2016	AKAMINA	AFRIDEV	-1.71311	30.47951	663	Domestic

KAY047	05/09/2016	KABUGA	AFRIDEV	-1.70845	30.46984	737	Domestic
KAY048	23/08/2016	BUGARURA	AFRIDEV	-1.6979	30.46526	613	Domestic
KAY049	16/09/2016	NYAMIRAMA	AFRIDEV	-1.87426	30.65248	979	Domestic
KAY050	20/09/2016	RUGUNGA	AFRIDEV	-1.70134	30.48431	990	Domestic
<b>Total</b>						<b>3982</b>	
<b>GS5034</b>							
KAY051	09/09/2016	MACUBA	AFRIDEV			903	Domestic
KAY052	24/08/2016	BUHABWA	AFRIDEV	-2.14628	30.98547	1009	Domestic
KAY053	13/09/2016	MIRAMBI3	AFRIDEV	-1.81254	30.46528	650	Domestic
KAY054	06/09/2016	KARAGARI2	AFRIDEV	-1.76785	30.45635	537	Domestic
KAY055	25/08/2016	BUTIMBA	AFRIDEV	-1.82782	30.45789	907	Domestic
<b>Total</b>						<b>4006</b>	
<b>GS5035</b>							
KAY056	18/08/2016	KARAMBO2	AFRIDEV	-1.89521	30.48826	593	Domestic
KAY057	30/08/2016	GACACA (II)	AFRIDEV	-1.97365	30.59142	1475	Domestic
KAY058	31/08/2016	GAHUSHYI	AFRIDEV	-1.97936	30.58942	559	Domestic
KAY059	21/09/2016	RUSERA	AFRIDEV	-1.93781	30.60385	646	Domestic
KAY060	14/09/2016	MIYAGA (II)	AFRIDEV	-2.12541	30.98562	742	Domestic
<b>Total</b>						<b>4015</b>	
<b>GS5036</b>							
KAY061	20/08/2016	BISHENYI	AFRIDEV	-1.92372	30.675194	508	Domestic
KAY062	01/09/2016	GISENGA	AFRIDEV	-1.81217	30.55215	647	Domestic
KAY063	15/09/2016	NYABOMBWE	AFRIDEV	1.833138	30.551366	536	Domestic
KAY064	20/09/2016	RUGUNGA	AFRIDEV	-1.70134	30.48431	596	Domestic
KAY065	22/09/2016	AGASHARU	AFRIDEV	2.018954	30.48953	975	Domestic
KAY066	15/08/2016	AKABARIMA	AFRIDEV	-2.02182	30.49527	762	Domestic
<b>Total</b>						<b>4024</b>	
<b>GS5392</b>							
KAY033	09/12/2015	MBARARA1	AFRIDEV	-1.98635	30.57831	681	Domestic
KAY034	15/12/2015	KINIHIRA	AFRIDEV	-1.95835	30.61025	427	Domestic
KAY035	15/01/2016	GAKOMA2	AFRIDEV	-1.65021	30.58778	574	Domestic
KAY036	16/01/2016	CYAMBURARA	AFRIDEV	-1.66442	30.53110	644	Domestic
KAY037	29/12/2015	RWAKABANDA	AFRIDEV	-1.73981	30.53758	659	Domestic
KAY038	26/01/2016	BUHORO	AFRIDEV	-2.01003	30.48498	492	Domestic
KAY039	11/12/2015	CYINGOGO	AFRIDEV	-1.96353	30.58492	509	Domestic
<b>Total</b>						<b>3986</b>	
<b>GS5393</b>							
KAY040	11/12/2015	MUTEMBO	AFRIDEV	-1.96710	30.58199	700	Domestic
KAY041	30/01/2016	MIRAMBI3	AFRIDEV	-1.8258	30.44800	456	Domestic
KAY042	19/01/2016	AKABARE1	AFRIDEV	-1.76925	30.46558	690	Domestic
KAY043	22/12/2015	AGASHIKIRI	AFRIDEV	-2.00408	30.57646	555	Domestic
KAY044	30/12/2015	RWAKABANDA	AFRIDEV	-1.75430	30.54070	427	Domestic
KAY045	06/01/2016	NYAMIRAMA	AFRIDEV	-1.72211	30.49184	609	Domestic
<b>Total</b>						<b>3437</b>	

**GS5395**

KAY067	22/09/2016	RYAKIBANDA	AFRIDEV	-1.89276	30.56093	932	Domestic
KAY068	19/08/2016	BICUMBI	AFRIDEV	-2.00542	30.57723	718	Domestic
KAY069	29/08/2016	BYIMANA	AFRIDEV	-2.01798	30.57953	715	Domestic
KAY070	02/09/2016	GISUNZU	AFRIDEV	-1.91127	30.68	561	Domestic
KAY071	07/09/2016	KARAGARI2 (II)	AFRIDEV	-1.76758	30.46654	471	Domestic
KAY072	08/09/2016	KAZENEZA(II)	AFRIDEV	-1.97851	30.78213	612	Domestic
						<b>Total</b>	<b>4009</b>

**GS5396**

KAY73	19/09/2016	NYANGA	AFRIDEV	-1.7403	30.48826	612	Domestic
KAY74	12/09/2016	MBURABUTURO	AFRIDEV	-1.54662	30.2826	734	Domestic
KAY75	16/08/2016	AKABEZA	AFRIDEV	-1.83816	30.47733	704	Domestic
KAY76	26/08/2016	BUTIMBA1	AFRIDEV	-1.83466	30.44705	924	Domestic
						<b>Total</b>	<b>2974</b>



## Hydrography of Rwanda

Rwanda is a country located in the Great Lakes Region of Africa. Its topography gradually rises from the East at an average altitude of 1,250 m to the North and West where it culminates in a mountain range called “Congo-Nile Ridge” varying from 2,200 m to 3,000 m and a volcano formation, the highest volcano being 4,507 m high (*Rwanda Natural Resources Authority, 2011*). This topography is characterized by a vast number of hills and mountains, a fact which results in high soil erosion and loss of water. Rwanda possesses a dense hydrographical network. Lakes occupy 128,190 ha; rivers cover an area of 7,260 ha and water in wetlands and valleys cover a total of 77,000 ha (*Ministry of Lands, Environment, Forests, Water and Mines (MINITERE), 2004*).

## Water Infrastructure of Rwanda

Where water is accessible from easily and freely available unprotected sources (unprotected springs, open wells, surface water bodies) an (unknown) part of the population tends to use these sources, at least for purposes other than human consumption (drinking and cooking). According to the Rwanda Ministry of Infrastructure (2010) the sustainable operation and management of rural water supply infrastructure is one of the key challenges of this sub-sector. Approximately one third of the existing infrastructure (about 850 rural water systems) needs rehabilitation.

## Organisational Structure

Likano Project Development GmbH and Open Circle Investments Pty Ltd are the project financier while CO2balance UK Ltd, is the managing entity and is responsible for communication with the Gold Standard. The two project implementers work together with a local NGO, Rwandans4Water and local project field staff from FAPDR who handle monitoring data collection and processing.

Two local project partners Rwandas4Water and FAPDR are responsible for the rehabilitation and maintenance of the boreholes, as well as the collection of the data to support this process. A permanent project officer is located at the project sites to oversee and coordinate the work completed by the contractors. The project officer is also responsible for coordinating the WASH programme, conducting monitoring exercises and identifying any maintenance works. All data that is collected in the field is processed at the NGO’s Kigali office then sent to the CO2balance UK project manager.

## Description of monitoring system

All surveys are administered by trained CO2balance staff and partner NGOs 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 then is sent to the UK head office for data analysis. The documentation procedure devised ensures a minimum chance of original data being lost – all original copies of our project documentation are retained in the Kigali office and are available scanned upon request of the UK team.



A woman uses part of an old plastic bottle to funnel water into a jerrycan at a borehole in Kayonza district

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. Each borehole user is assigned a unique random number which is then sorted in order from lowest to highest; the first  $n$  HHs are selected for the survey. The size of the RSG 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 RSG 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:

## 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 district officials. Rwandans4Water further conducts studies to screen and determine the exact number of people the rehabilitated boreholes. Using this method, the total number of people using each borehole has been fixed and hence a figure for person days can be calculated.

## 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  $Q_{p,y}$  and  $Q_{p,rawboil,y}$ ) – Completed prior to first verification and then biennially.
- **Quality of the treated water** - The quality of the treated water will be assessed to ensure that it is fit for human consumption. The parameters used to assess the water quality will be in line with Rwandan standards for potable water and all parameters will be shown to be within levels considered acceptable for domestic human consumption as per the WHO guidelines.
- **Usage Survey** - As all boreholes have been 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 will not be necessary. Therefore the annual usage survey will be conducted using a minimum sample size of 100.
- **Project Survey** – Conducted on 100 households, surveying end users currently using project technologies to explore changes in project scenario over time
- ☐ **Leakage assessment** - Sources of leakage detailed within the methodology relevant to this project have been reviewed.

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

## Cross Sampling

The project proponent has elected to cross-sample technologies across all its homogenous borehole VPAs located within Kayonza district. The samples for the surveys analysed below are randomly selected from the borehole information databases using the RSG procedure previously explained in line with the minimum sample size requirements as defined by the methodology. Following 90/30 precision, it was found that 5 sectors of the 8 sectors in Kayonza district which contain boreholes in the VPAs would need to be selected for inclusion in the surveys. 5 sectors were selected by generating a random list of numbers. An aggregate list was then generated of the borehole users in the 5 selected sectors, and these were ordered according to a random list of numbers. The first 120 users were selected for the Project Survey and Usage Survey, and the first 60 were selected for the WCFT.

The surveys have been conducted so as to ensure that they are within the end date of the respective monitoring periods for the VPAs.

## Fixed Parameters

The following data was fixed at validation.

Data / Parameter:	$C_j$
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. Credible literature, studies, survey, reports, relevant to the project target area
Value applied:	0.0%
Justification of the choice of data or description of measurement methods and procedures actually applied:	The portion of safe water users is determined through the baseline project survey and refers to the number of users that already use safe water from water sources such as boreholes.
Any comment:	-

Data / Parameter:	$EF_{b,co2}$
Data unit:	$tco_2/TJ$
Description:	$co_2$ emission factor arising from use of fuels in baseline scenario
Source of data used:	IPCC default value
Value applied:	112
Justification of the choice of data or description of measurement	Deemed valid by Methodology

methods and procedures actually applied:	
Any comment:	-

Data / Parameter:	$EF_{b,non\ co2}$
Data unit:	tco <sub>2</sub> /TJ
Description:	Non-co <sub>2</sub> emission factor arising from use of fuels in baseline scenario
Source of data used:	IPCC default value
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 <sub>2</sub> /TJ
Description:	co <sub>2</sub> emission factor arising from use of fuels in project scenario
Source of data used:	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
Any comment:	-

Data / Parameter:	$EF_{p,non\ co2}$
Data unit:	tco <sub>2</sub> /TJ
Description:	Non-co <sub>2</sub> emission factor arising from use of fuels in project scenario
Source of data used:	IPCC default value
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 <sub>b</sub>
Data unit:	TJ/ton
Description:	Net calorific value of the fuels used in the baseline

Source of data used:	IPCC default value
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 <sub>p</sub>
Data unit:	TJ/ton
Description:	Net calorific value of the fuels used in the project
Source of data used:	IPCC default value
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:	CDM Default National Figure
Value applied:	0.98
Justification of the choice of data or description of measurement methods and procedures actually applied:	
Any comment:	-

Data / Parameter:	W <sub>b,y</sub>
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	0.0006592
Description of measurement	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: <i>Technologies and</i>

methods and procedures to be applied:	<i>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</i>
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	0.0006592
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: <i>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</i>
Any comment:	

Data / Parameter:	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
Justification of the choice of data or description of measurement methods and procedures actually applied:	Suppressed demand will be determined through a set of questions in the 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 outline in annex 2. A fixed suppressed demand baseline has been opted for.
Any comment:	-

## 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	GS4897: 2,333,690 GS4898: 2,418,658 GS4899: 2,443,545 GS4900: 2,378,533 GS4901: 2,435,686 GS5033: 1,547,927 GS5034: 1,575,076 GS5035: 1,571,155 GS5036: 1,565,203 GS5392: 2,517,611 GS5393: 2,184,765 GS5395: 1,563,782 GS5396: 1,169,474
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 for each VPA in this 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 and local in-country partner Rwandans 4 Water 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 the project developers.
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. The WCFT is carried out by staff trained by CO2balance and local in- country partner Rwandans 4 Water 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 the project developers.
Any comment:	Value capped at 7.5

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 and local in-country partner FAPDR 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 project developers.
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:	
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 and local in-country partner FAPDR 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 project developers.
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 Kigali based recognised laboratory has certified each water supply in line with national standards which also adheres to the WHO guidelines.
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:	

## Survey Analysis

### Water Consumption Field Test

The Water Consumption Field Test was carried out between 3<sup>rd</sup> and 6<sup>th</sup> September 2017 on a randomly selected sample of households from the borehole user list. In line with the CDM Guidelines on Sampling, the following equations were used to estimate the sample size required to achieve the confidence/precision required by the methodology (90/10).

$$n \geq \frac{z^2 \times N \times V}{(N-1) \times \text{precision}^2 + z^2 \times V}$$

Where:

$$V = \left( \frac{SD}{\text{mean}} \right)^2$$

The tests were conducted over the course of 4 days (1 day of preparation and 3 days of measurement) in people's homes. The total volume of water consumed each day was measured and divided by the number of people consuming water in that day – this measurement was repeated over 3 consecutive days and an overall average per household was calculated.

### Usage Survey

A usage survey was conducted on 3<sup>rd</sup> September 2017 on a randomly selected sample of 100 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%.

### Project Survey Analysis

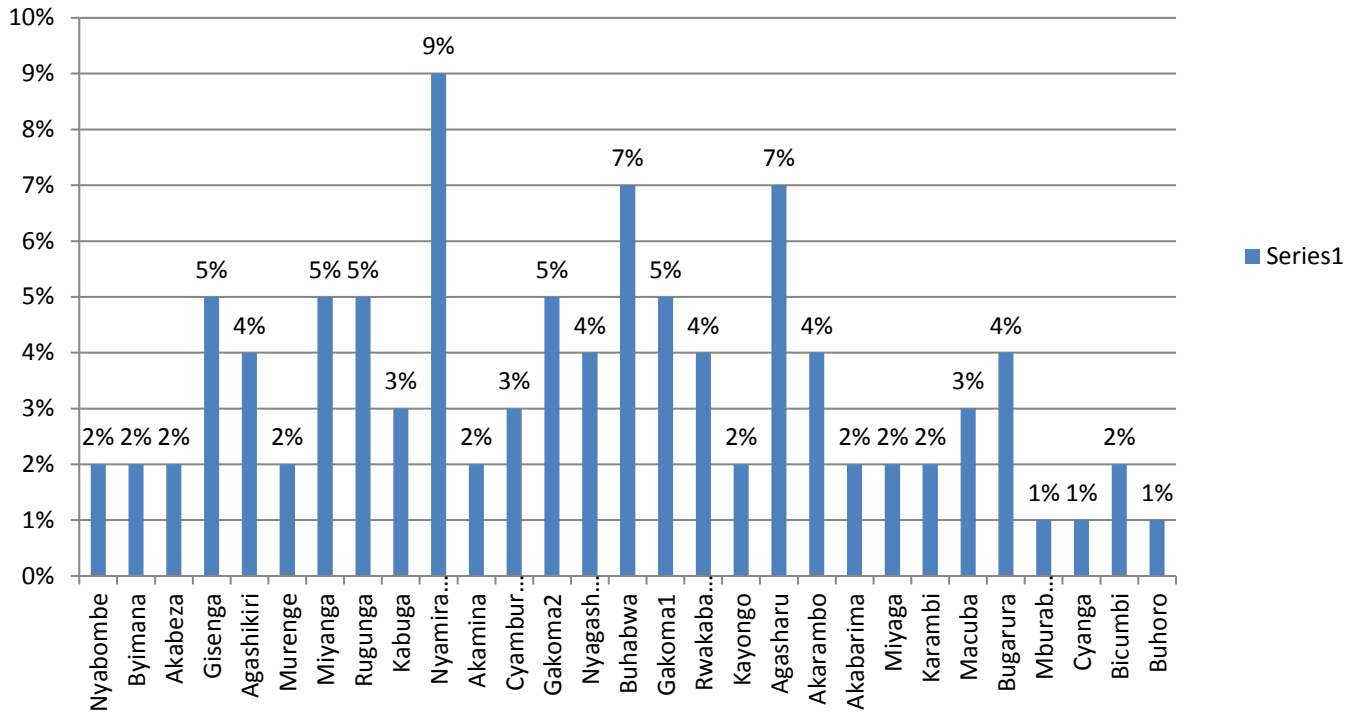
Project surveys were conducted between 3<sup>rd</sup> and 6<sup>th</sup> September 2017 on a sample of 100 randomly selected households to explore changes in the project scenario (demographics, water use and purification practices etc.) over time.

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.

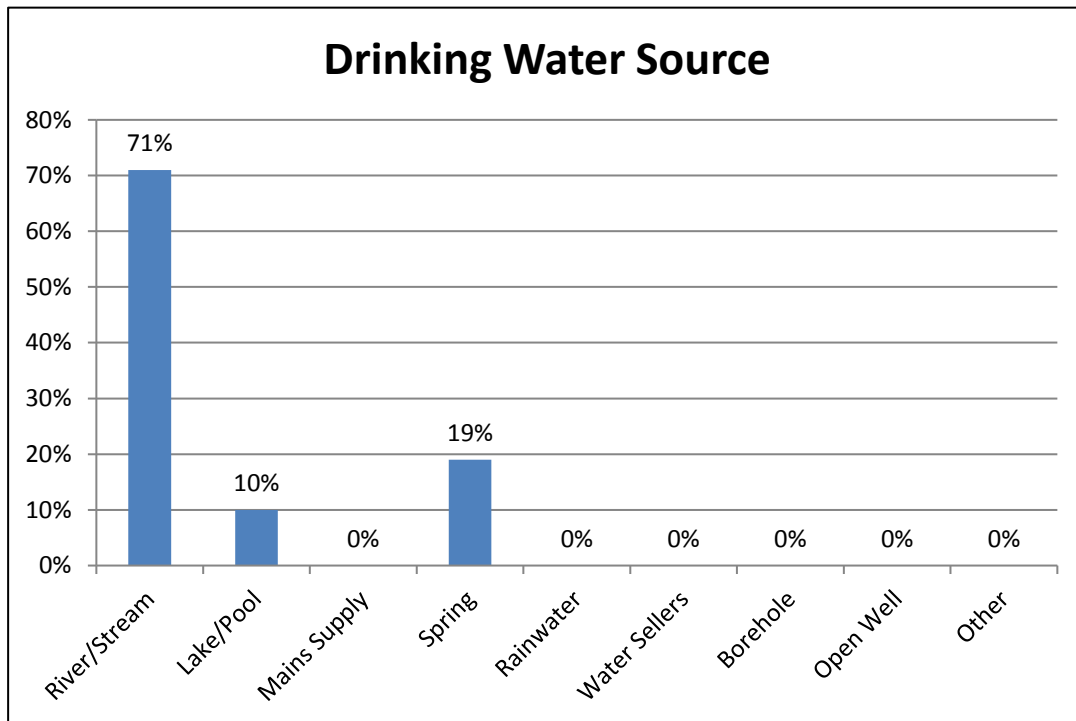
The respondents obtained their water from one the boreholes which were rehabilitated as part of the projects, as shown in the following graph:

## Borehole used?

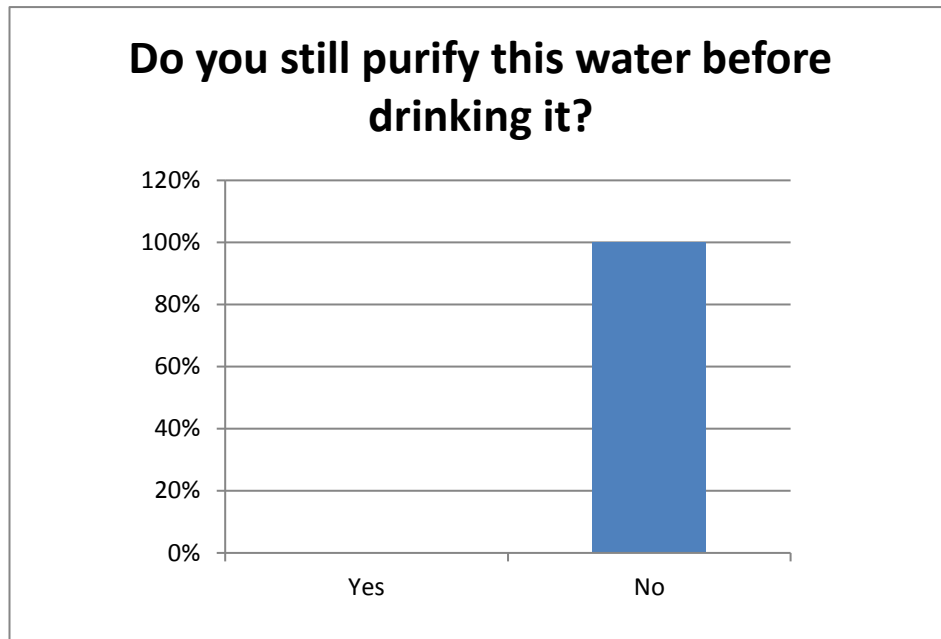


The survey confirmed that, prior to the project, none of the respondents obtained their drinking water from a safe source, with the majority (71%) obtaining water from a river or stream.

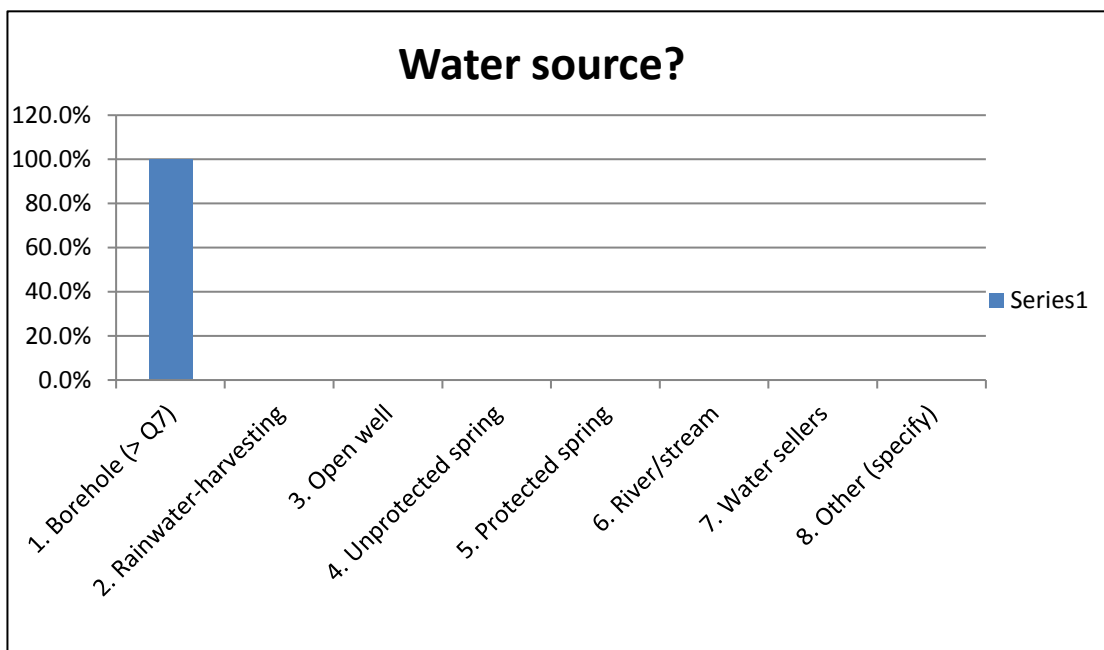
## Drinking Water Source

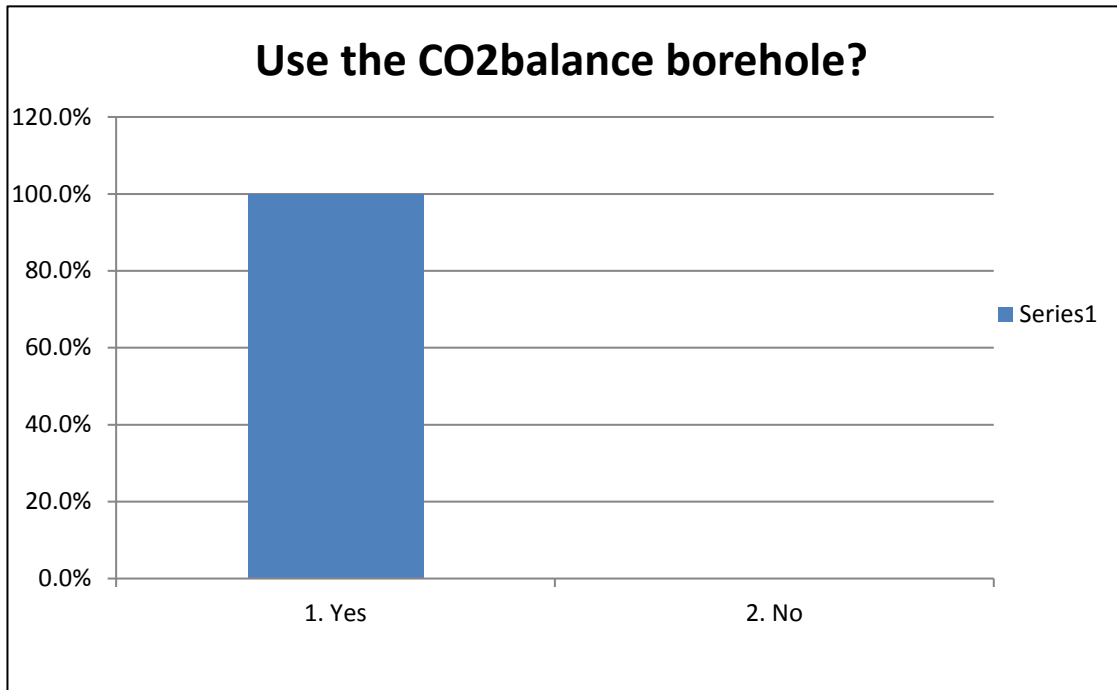


As shown in the following graph, none of the respondents deem it necessary to purify the borehole water that they now use before drinking it:



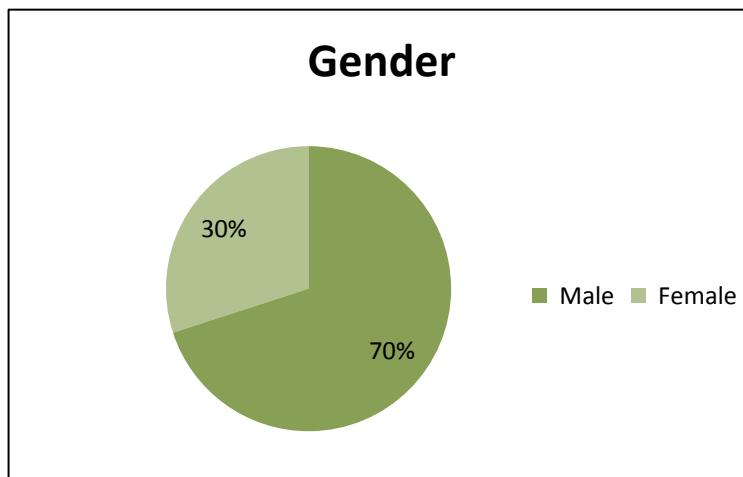
The results of the project survey confirm the outcome of the baseline surveys that none of the current borehole users had previously access to clean water. The results from the usage survey conducted on the same households showed that 100% of the respondents now collect their water from boreholes, which indicates a major improvement on the baseline situation. All respondents confirmed that the borehole they used is the one in their community rehabilitated through the CO2balance project. On average, each household makes 14.49 visits per week to the borehole.

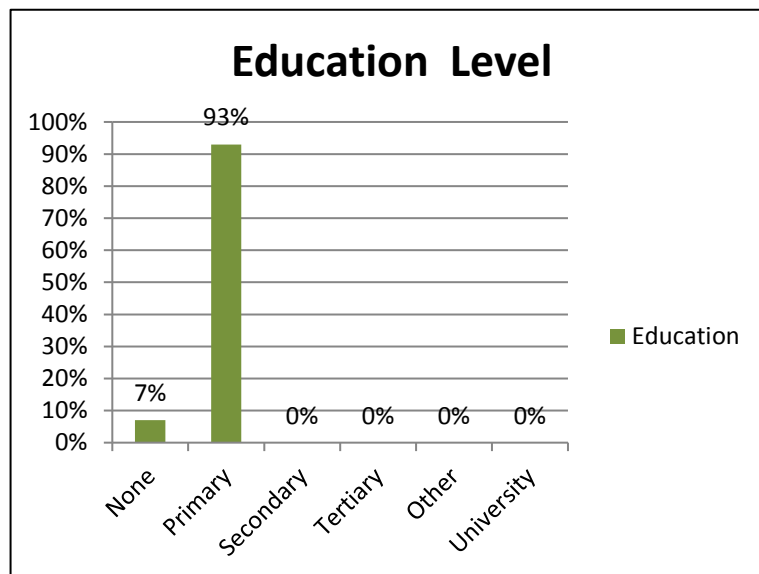
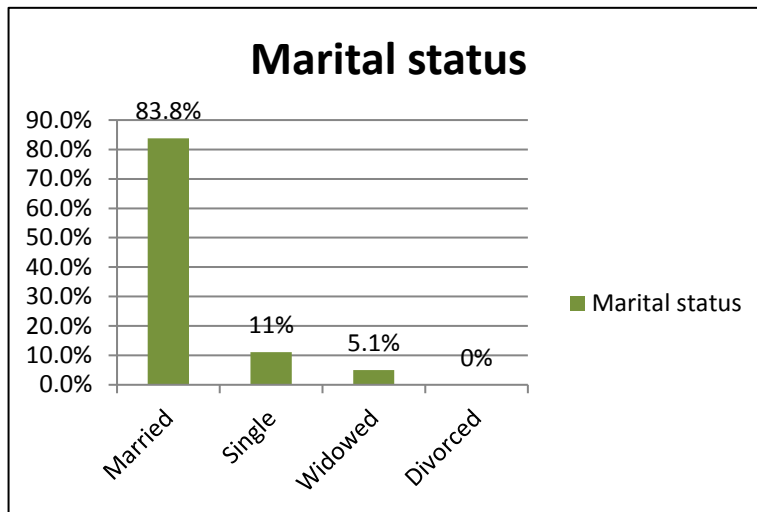




### Socio-Demographic Characteristics

Analysis of the Project Survey results confirms that the socio-demographic characteristics such as gender, marital status, education level are similar to those recorded in the baseline survey. There is some deviation in the marital status, with only 76% of people having reported themselves as married at baseline compared to 83.8% in this current survey. Moreover, a greater proportion of respondents reported themselves to have at least a primary education in the project survey (93%) compared to only 73% in the baseline survey. However, these deviations are not considered significant enough to represent anything other than coincidental deviations due to the random sampling.





## Leakage Assessment

In line with the monitoring requirements, a leakage assessment is conducted biennially and has therefore been included in this report.

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. 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.

## 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	
Chosen parameter	Total suspended 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	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
No	2	
Indicator	Human and institutional capacity	
Mitigation measure	Awareness raising programme is in place. WASH education is being conducted on a borehole level.	
Chosen parameter	Change in the number of WASH education programme held in the district	
Current situation of parameter	At the moment there are no trainings held for borehole users on the basic Water, Sanitation and Hygiene issues.	

Estimation of baseline situation of parameter	0	
Future target for parameter	1	
Way of monitoring	How	WASH training participant list or signed education agenda and programme by the education team, confirming that the training took place
	When	Once, at the beginning of the project
	By who	Rwandans4Water (in-country NGO partner)



Community members gather to collect water from a borehole in Kayonza district

## Air quality

According to FAO, the best single indicator of the health hazard of combustion smoke is thought to be small particles, which contain many chemicals (source: <http://www.fao.org/docrep/009/a0789e/a0789e09.htm>). Reduction in wood consumption, as determined through comparison of project data to the baseline, reduces emissions of carbon monoxide as well as total suspended particulate matter and respirable suspended particulate matter exposure. Air quality in homes were monitored in the Project Survey (question 36), in which 100% of the respondents answered that they do not boil water anymore to purify water as rehabilitated boreholes provide clean water. Therefore, we can conclude that there is an improvement of air quality in the households.

## Awareness Raising Programme and WASH education

The main purpose of the project is to rehabilitate boreholes which are broken for various reasons and therefore not used for several years. The people in the project area in the meantime had to use water sources such as rivers/lakes and drink water that was not fit for human consumption. Question 12 in the project survey confirms that no project beneficiaries had access to clean water before the project, but now 100% said they were using clean water from the boreholes. To encourage the continuous use of the borehole, the in-country project partners, Rwandas4Water and FAPDR jointly held a WASH sensitisation programme at the borehole level right after the rehabilitations. Such trainings were not widely available for the rural communities using the boreholes prior to this project. We can therefore conclude that there was an improvement in human and institutional capacity in relation to WASH knowledge due to the project.

## Summary of Emissions Reductions Total

The total ERs for the 13 VPAs in the period under review amount to 176,593 tCO<sub>2</sub>e:

GS ID	PTD Total	ER Total	Capped ERs Total
GS4897	2,329,702	21,284	17,596
GS4898	2,414,697	22,060	17,589
GS4899	2,439,546	22,287	17,855
GS4900	2,374,559	21,693	17,616
GS4901	2,431,707	22,216	17,535
GS5033	1,543,945	14,105	11,205
GS5034	1,571,070	14,353	11,205
GS5035	1,567,140	14,317	11,178
GS5036	1,561,179	14,263	11,260
GS5392	2,513,625	22,964	17,763
GS5393	2,181,328	19,928	17,642
GS5395	1,559,773	14,250	11,151
GS5396	1,166,500	10,657	10,657
<b>TOTAL</b>	<b>25,654,771</b>	<b>234,376</b>	<b>190,251</b>

## Summary of Emissions Reductions by Vintage and VPA

A breakdown of the emission reductions by VPA and vintage is provided in the following sections.

## GS4897

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.00%
Person Days	Njy		2329702
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	11518
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		2329702
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	21,284
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>21284</b>
	<b>ERs claimed</b>		<b>17,596</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 (Njv). This resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA. Please note that the boreholes KAY001 and KAY004 experienced temporary breakdowns during 2017. The dates of the breakdowns have been deducted from crediting, as can be seen in the 'Total PTDs' sheet in the Emission Reduction Calculations. Certificates showing the date of breakdown and date of repair have also been uploaded. The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2015			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		12770
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	63
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		12770
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TJ/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	117
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>117</b>
			<b>ERs claimed 117</b>

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1403534
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	6939
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1403534
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TJ/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	12,822
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>12822</b>
			<b>ERs claimed 10000</b>

Cap applied to prevent 12 month ERs exceeding 10,000

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		913398
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	4516
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		913398
Fossil fuel required to treat 1 litre for water in project scena	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project tech wat	Qp, raw , y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil,	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non	TCD2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	8,345
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>8345</b>
	<b>ERs claimed</b>		<b>7479</b>

Cap applied to prevent 12 month ERs exceeding 10,000

## GS4898

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		2414637
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	11938
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		2414637
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	22,060
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>22060</b>
	<b>ERs claimed</b>		<b>17,589</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 (Njv). This resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA. Please note that the borehole KAY011 experienced a temporary breakdown during 2017. The dates of the breakdown have been deducted from crediting, as can be seen in the 'Total PTDS' sheet in the Emission Reduction Calculations. Certificates showing the date of breakdown and date of repair have also been uploaded.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2015			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		11948
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	59
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		11948
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology	Qp, raw , y	L/pd	0
Quantity of safe water boiled	Qp, cleanb	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TCCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	109
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>109</b>
<b>ERs claimed</b>			<b>109</b>

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1392507
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	6885
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1392507
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology	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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co2	TCCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	12,722
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>12722</b>
<b>ERs claimed</b>			<b>10000</b>

Cap applied to prevent 12 month ERs exceeding 10,000

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1010242
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	4995
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1010242
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil,	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non	TCCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	9,229
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>9229</b>
	<b>ERs claimed</b>		<b>7479</b>

Cap applied to prevent 12 month ERs exceeding 10,000

## GS4899

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.00%
Person Days	Njy		2439546
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006532
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	12061
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		2439546
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006532
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co	TCO2/TJ	8.632
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	22,287
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>22287</b>
	<b>ERs claimed</b>		<b>17,855</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA. Please note that the boreholes KAY013-5 and KAY017 experienced temporary breakdowns during 2017. The dates of the breakdowns have been deducted from crediting, as can be seen in the 'Total PTDS' sheet in the Emission Reduction Calculations. Certificates showing the date of breakdown and date of repair have also been uploaded.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2015			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		41060
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	203
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		41060
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co2	T/CO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	375
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>375</b>
<b>ERs claimed</b>			<b>375</b>

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1444731
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	7143
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1444731
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co2	T/CO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	13,199
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>13199</b>
<b>ERs claimed</b>			<b>10000</b>

Cap applied to prevent 12 month ERs exceeding 10,000

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		953755
Fuel to treat 1 litre of water using baseline tech	wb,y	T/L	0.0006592
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	4715
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		953755
Fossil fuel required to treat 1 litre for water in project scenario	wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project tech water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil,	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non	TCCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	8,713
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>8713</b>
	<b>ERs claimed</b>		<b>7479</b>

Cap applied to prevent 12 month ERs exceeding 10,000

## GS4900

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.00%
Person Days	Njy		2374559
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	11740
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		2374559
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	21,693
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>21693</b>
	<b>ERs claimed</b>		<b>17,616</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 (Njv). This resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA. Please note that the boreholes KAY022 and KAY026 experienced temporary breakdowns during 2017. The dates of the breakdowns have been deducted from crediting, as can be seen in the 'Total PTDs' sheet in the Emission Reduction Calculations. Certificates showing the date of breakdown and date of repair have also been uploaded.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2015			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		14907
Fuel to treat 1 litre of water using baseline tech	w <sub>b,y</sub>	T/L	0.0006592
Quantity safe water litres consumed in project scenario supplied by project technology	Q <sub>p,y</sub>	L/pd	7.5
Quantity of raw water boiled in addition to project technology water	Q <sub>p,raw,y</sub>	L/pd	0
Quantity fuel consumed in baseline scenario	B <sub>b,y</sub>	T	74
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		14907
Fossil fuel required to treat 1 litre for water in project scenario	w <sub>p,y</sub>	T/L	0.0006592
Quantity of raw water boiled in addition to project technology water	Q <sub>p,raw,y</sub>	L/pd	0
Quantity of safe water boiled	Q <sub>p,cleanboil,y</sub>	L/pd	0
Quantity of fuel consumed in project scenario per HH	B <sub>p,y</sub>	T	0
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EF <sub>b,fuel,co2</sub>	tCO2/TJ	112
Emissions factor fuel (non-co2)	EF <sub>b,fuel,non-co2</sub>	TJ/TJ	8.692
Net calorific value of fuel	NCV <sub>b,fuel</sub>	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BE <sub>b,y</sub>	tCO2/y	136
Project emissions per year	PE <sub>p,y</sub>	tCO2/y	0
Usage rate	U <sub>p,y</sub>	fraction	1
Leakage	LE <sub>p,y</sub>	tCO2/y	0
<b>Emission Reductions</b>	<b>E<sub>ry</sub></b>	<b>tCO2/y</b>	<b>136</b>
<b>ERs claimed</b>			<b>136</b>

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1404651
Fuel to treat 1 litre of water using baseline tech	w <sub>b,y</sub>	T/L	0.0006592
Quantity safe water litres consumed in project scenario supplied by project technology	Q <sub>p,y</sub>	L/pd	7.5
Quantity of raw water boiled in addition to project technology water	Q <sub>p,raw,y</sub>	L/pd	0
Quantity fuel consumed in baseline scenario	B <sub>b,y</sub>	T	6945
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1404651
Fossil fuel required to treat 1 litre for water in project scenario	w <sub>p,y</sub>	T/L	0.0006592
Quantity of raw water boiled in addition to project technology water	Q <sub>p,raw,y</sub>	L/pd	0
Quantity of safe water boiled	Q <sub>p,cleanboil,y</sub>	L/pd	0
Quantity of fuel consumed in project scenario per HH	B <sub>p,y</sub>	T	0
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EF <sub>b,fuel,co2</sub>	tCO2/TJ	112
Emissions factor fuel (non-co2)	EF <sub>b,fuel,non-co2</sub>	TJ/TJ	8.692
Net calorific value of fuel	NCV <sub>b,fuel</sub>	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BE <sub>b,y</sub>	tCO2/y	12,833
Project emissions per year	PE <sub>p,y</sub>	tCO2/y	0
Usage rate	U <sub>p,y</sub>	fraction	1
Leakage	LE <sub>p,y</sub>	tCO2/y	0
<b>Emission Reductions</b>	<b>E<sub>ry</sub></b>	<b>tCO2/y</b>	<b>12833</b>
<b>ERs claimed</b>			<b>10000</b>

Cap applied to prevent 12 month ERs exceeding 10,000

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		955001
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	4722
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		955001
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil,	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non	TCCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	8,725
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>8725</b>
	<b>ERs claimed</b>		<b>7479</b>

Cap applied to prevent 12 month ERs exceeding 10,000

## GS4901

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		2431707
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	12022
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		2431707
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	22,216
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>22216</b>
<b>ERs claimed</b>			<b>17,535</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 (Njv). This resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA. Please note that the boreholes KAY027, KAY030 and KAY031 experienced temporary breakdowns during 2017. The dates of the breakdowns have been deducted from crediting, as can be seen in the 'Total PTDs' sheet in the Emission Reduction Calculations. Certificates showing the date of breakdown and date of repair have also been uploaded.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2015			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.00%
Person Days	Njy		6096
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	30
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		6096
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co2	TCD2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEB,y	tCO2/y	56
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>56</b>
			<b>ERs claimed 56</b>

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.00%
Person Days	Njy		1382594
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	6836
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1382594
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co2	TCD2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEB,y	tCO2/y	12,631
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>12631</b>
			<b>ERs claimed 10000</b>

Cap applied to prevent 12 month ERs exceeding 10,000

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.00%
Person Days	Njy		1043017
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	5157

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1043017
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil,	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0

Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non	TCD2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	9,529
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>9529</b>
	<b>ERs claimed</b>		<b>7479</b>

Cap applied to prevent 12 month ERs exceeding 10,000

## GS5033

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1543945
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	7633
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1543945
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co	TCCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	14,105
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>14105</b>
		<b>ERs claimed</b>	<b>11,205</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 (Njv). This resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		456859
Fuel to treat 1 litre of water using baseline tech	wb,y	T/L	0.0006592
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	2259

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		456859
Fossil fuel required to treat 1 litre for water in project scenario	wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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

Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-c	TCCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	4,174
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>4174</b>
	<b>ERs claimed</b>		<b>3726</b>

Cap applied to prevent 12 month ERs exceeding 10,000

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1087086
Fuel to treat 1 litre of water using baseline tech	wb,y	T/L	0.0006592
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	5375

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1087086
Fossil fuel required to treat 1 litre for water in project scenario	wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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

Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-c	TCCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	9,931
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>9931</b>
	<b>ERs claimed</b>		<b>7479</b>

Cap applied to prevent 12 month ERs exceeding 10,000

## GS5034

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1571070
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	7767
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1571070
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	14,353
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>14353</b>
	<b>ERs claimed</b>		<b>11,205</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.00%
Person Days	Njy		477432
Fuel to treat 1 litre of water using baseline tech	wb,y	T/L	0.0006592
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	2360

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		477432
Fossil fuel required to treat 1 litre for water in project scenario	wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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

Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-c	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	4,362
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>4362</b>
	<b>ERs claimed</b>		<b>3726</b>

Cap applied to prevent 12 month ERs exceeding 10,000

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.00%
Person Days	Njy		1093638
Fuel to treat 1 litre of water using baseline tech	wb,y	T/L	0.0006592
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	5407

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1093638
Fossil fuel required to treat 1 litre for water in project scenario	wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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

Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-c	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156

Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	9,991
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>9991</b>
	<b>ERs claimed</b>		<b>7479</b>

Cap applied to prevent 12 month ERs exceeding 10,000

## GS5035

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1567140
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006532
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	7748
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1567140
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006532
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co	TCO2/TJ	8.632
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	14,317
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>14317</b>
		<b>ERs claimed</b>	<b>11,178</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 (Njv). This resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		471045
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	2329
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		471045
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
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
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	4,303
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>4303</b>
	<b>ERs claimed</b>		<b>3699</b>
	Cap applied to prevent 12 month ERs exceeding 10,000		

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1096095
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	5419
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1096095
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
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
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	10,014
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>10014</b>
	<b>ERs claimed</b>		<b>7479</b>
	Cap applied to prevent 12 month ERs exceeding 10,000		

## GS5036

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1561179
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006532
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	7718
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1561179
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006532
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co	TCO2/TJ	8.632
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	14,263
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>14263</b>
		<b>ERs claimed</b>	<b>11,260</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		462627
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	2287
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		462627
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-c	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	4,226
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>4226</b>
		<b>ERs claimed</b>	<b>3781</b>
	Cap applied to prevent 12 month ERs exceeding 10,000		

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1098552
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	5431
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1098552
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-c	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	10,036
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>10036</b>
		<b>ERs claimed</b>	<b>7479</b>
	Cap applied to prevent 12 month ERs exceeding 10,000		

## GS5392

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		2513625
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006532
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	12427
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		2513625
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006532
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co	TCO2/TJ	8.632
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	22,964
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>22964</b>
	<b>ERs claimed</b>		<b>17,763</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 (Njv). This resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA. Please note that the borehole KAY039 experienced a temporary breakdown during 2017. The dates of the breakdown have been deducted from crediting, as can be seen in the 'Total PTDS' sheet in the Emission Reduction Calculations. Certificates showing the date of breakdown and date of repair have also been uploaded.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2015			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		31036
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	153
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		31036
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
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
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	284
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>284</b>
		<b>ERs claimed</b>	<b>284</b>

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1425460
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	7047
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1425460
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
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
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	13,023
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>13023</b>
		<b>ERs claimed</b>	<b>10000</b>
	Cap applied to prevent 12 month ERs exceeding 10,000		

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1057129
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	5226
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1057129
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project tech water	Qp, raw, y	L/pd	0
Quantity of safe water boiled	Qp, cleanboil,	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non	TCCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	9,658
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>9658</b>
	<b>ERs claimed</b>		<b>7479</b>
	Cap applied to prevent 12 month ERs exceeding 10,000		

## GS5393

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		2181328
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006532
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	10784
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		2181328
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006532
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non-co	TCO2/TJ	8.632
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	19,928
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>19928</b>
		<b>ERs claimed</b>	<b>17,642</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA. Please note that the borehole KAY041 experienced a temporary breakdown during 2017. The dates of the breakdown have been deducted from crediting, as can be seen in the 'Total PTDs' sheet in the Emission Reduction Calculations. Certificates showing the date of breakdown and date of repair have also been uploaded.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2015			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		17740
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	88
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		17740
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
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
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	162
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>162</b>
			<b>ERs claimed 162</b>

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1225743
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	6060
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1225743
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project technology 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
Constants			
NRB	NRB	Fraction	0.98
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
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	11,198
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>11198</b>
			<b>ERs claimed 10000</b>
Cap applied to prevent 12 month ERs exceeding 10,000			

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.00%
Person Days	Njy		937845
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	4637
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		937845
Fossil fuel required to treat 1 litre for water in project scena	Wp,y	T/L	0.0006592
Quantity of raw water boiled in addition to project tech wat	Qp,raw,y	L/pd	0
Quantity of safe water boiled	Qp,cleanboil	L/pd	0
Quantity of fuel consumed in project scenario per HH	Bp,y	T	0
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb,fuel,non	TCD2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	TJ/T	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	8,568
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>8568</b>
		<b>ERs claimed</b>	<b>7479</b>
	Cap applied to prevent 12 month ERs exceeding 10,000		

## GS5395

Total Emission Reductions for Monitoring Period 1			
<b>Baseline Fuel Use (Bby)</b>			
Portion using safe water	Cj	fraction	0.00%
Person Days	Njy		1559773
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006592
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	7712
<b>Project Fuel Use (Pby)</b>			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1559773
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006592
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
<b>Constants</b>			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
<b>Emissions Reductions</b>			
Baseline emissions per year	BEb,y	tCO2/y	14,250
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>14250</b>
	<b>ERs claimed</b>		<b>11,151</b>

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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		465316
Fuel to treat 1 litre of water using baseline tech	wb,y	T/L	0.0006592
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	2301
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		465316
Fossil fuel required to treat 1 litre for water in project scenario	wp,y	T/L	0.0006592
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	4,251
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>4251</b>
	<b>ERs claimed</b>		<b>3671</b>
	Cap applied to prevent 12 month ERs exceeding 10,000		

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1094457
Fuel to treat 1 litre of water using baseline tech	wb,y	T/L	0.0006592
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	5411
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1094457
Fossil fuel required to treat 1 litre for water in project scenario	wp,y	T/L	0.0006592
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co	TCO2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	9,999
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>9999</b>
	<b>ERs claimed</b>		<b>7479</b>
	Cap applied to prevent 12 month ERs exceeding 10,000		

## GS5396

Total Emission Reductions for Monitoring Period 1			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		1166500
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0006532
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	5767
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		1166500
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0006532
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
Constants			
NRB	NRB	Fraction	0.98
Emissions factor fuel (co2)	EFb,fuel,co2	tCO2/TJ	112
Emissions factor fuel (non-co2)	EFb, fuel, non-co	TCD2/TJ	8.692
Net calorific value of fuel	NCV,b,fuel	T/JT	0.0156
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	10,657
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>10657</b>
	<b>ERs claimed</b>		<b>10,657</b>

The portion of safe water fuel 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 resulted in the stated tonnes of wood used in the **baseline scenario** (Bb,y).

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 (Njv). This resulted in the stated figure of wood used in the **project scenario** (Bp,y).

The baseline and project emissions were calculated by multiplying the amount of wood used in these scenarios by the emissions factors for CO<sub>2</sub> (corrected by the fNRB value), non CO<sub>2</sub> and the net calorific value of biomass. The difference in baseline and project emissions were then adjusted using the usage rate observed in the project (Up,y) and any leakage (LEp,y) subtracted from the total. The resulting figure tells us the Emission Reductions (Ery) for the VPA.

The breakdown of ERs by vintage for the VPA is as follows:

Emission Reductions Vintage 2016			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		354598
Fuel to treat 1 litre of water using baseline tech	wb,y	T/L	0.0006592
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	1753
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		354598
Fossil fuel required to treat 1 litre for water in project scenario	wp,y	T/L	0.0006592
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
Constants			
NRB	NRB	Fraction	0.98
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
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	3,240
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>3240</b>
<b>ERs claimed</b>			<b>3240</b>

Emission Reductions Vintage 2017			
Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	0.0%
Person Days	Njy		811902
Fuel to treat 1 litre of water using baseline tech	wb,y	T/L	0.0006592
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	4014
Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	0.00%
Person Days	Njy		811902
Fossil fuel required to treat 1 litre for water in project scenario	wp,y	T/L	0.0006592
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
Constants			
NRB	NRB	Fraction	0.98
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
Emissions Reductions			
Baseline emissions per year	BEb,y	tCO2/y	7,417
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
<b>Emission Reductions</b>	<b>Ery</b>	<b>tCO2/y</b>	<b>7417</b>
<b>ERs claimed</b>			<b>7417</b>