GS1247 Improved Kitchen Regimes Multi-Country PoA
Gatsibo Borehole Projects
GS 3306, GS3430, GS3431, GS3432, GS3433, GS4202, GS4203

Monitoring Report

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Monitoring Report Information

Monitoring Period	**MP2 for GS3306** 08/08/2015 – 05/02/2017 **MP2 for GS3430, GS3431, GS3432, GS3433, GS4202, GS4203** 06/02/2016 - 05/02/2017
Reference number of the project activity	GS3306, GS3430, GS3431, GS3432, GS3433, GS4202, GS4203
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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 Gatsibo 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.

Gatsibo 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 Gatsibo 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 63 boreholes were rehabilitated as part of six VPAs between the 31st October 2014 and 1st September 2015. 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.

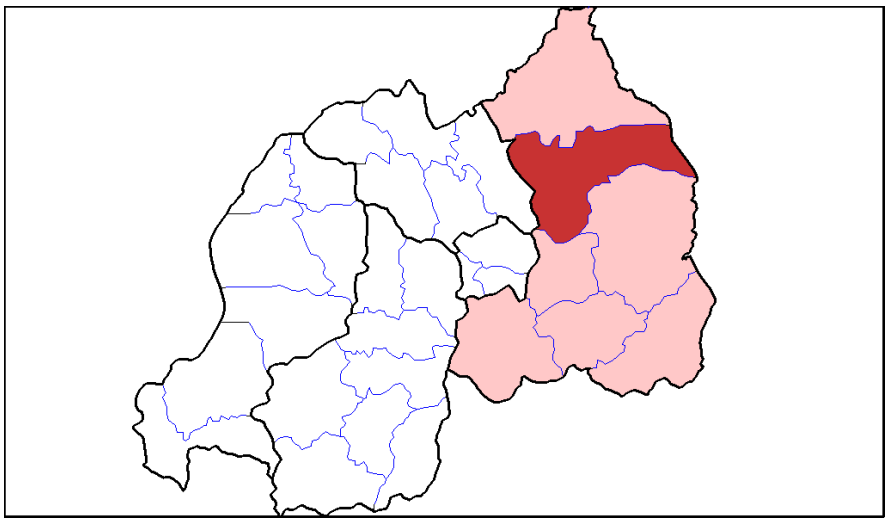
Borehole ID	Date of Rehabilitation	Lat	Long	Number of people using borehole	Mode of use
GS3306					
GAT 001	05/11/2014	-1.4846	30.2550	760	Domestic
GAT 002	05/11/2014	-1.67096	30.40233	768	Domestic
GAT 003	11/11/2014	-1.82734	30.36250	668	Domestic
GAT 004	10/11/2014	-1.65755	30.40486	510	Domestic
GAT 005	10/11/2014	-1.69779	30.38204	494	Domestic
GAT 006	31/10/2014	-1.79396	30.39394	265	Domestic
GAT 007	11/11/2014	-1.4653	30.2257	520	Domestic
GAT 008	11/11/2014	-1.82347	30.42489	451	Domestic
GAT 009	12/11/2014	-1.80910	30.3587	405	Domestic
GS3430					
GAT010	05/11/2014	-1.79623	30.38889	726	Domestic
GAT011	04/11/2014	-1.81366	30.37515	583	Domestic
GAT012	10/11/2014	-1.66539	30.41101	503	Domestic
GAT013	04/06/2015	-1.68831	30.43399	325	Domestic
GAT014	04/06/2015	1.6457	30.4235	692	Domestic
GAT015	01/06/2015	1.80356	30.40954	824	Domestic
GAT016	05/06/2015	1.7552	30.3639	583	Domestic
GAT017	05/06/2015	1.70231	30.41547	627	Domestic
GAT018	06/06/2015	1.61215	30.38777	521	Domestic
GS3431					
GAT019	06/06/2015	1.62592	30.4311	600	Domestic
GAT020	08/06/2015	1.73264	30.39679	605	Domestic
GAT021	08/06/2015	1.59851	30.46499	479	Domestic
GAT022	09/06/2015	-1.6129	30.46591	500	Domestic
GAT023	03/06/2015	-1.79045	30.37594	519	Domestic
GAT024	01/06/2015	-1.79594	30.37632	427	Domestic
GAT025	09/06/2015	-1.643	30.4351	882	Domestic
GAT026	03/06/2015	-1.77015	30.34641	623	Domestic
GAT027	02/06/2015	-1.77091	30.35111	514	Domestic
GS3432					
GAT028	02/06/2015	-1.77097	30.35395	526	Domestic
GAT029	10/06/2015	-1.6406	30.39029	626	Domestic
GAT030	10/06/2015	-1.60261	30.42379	438	Domestic
GAT031	11/06/2015	-1.58999	30.39139	545	Domestic
GAT032	11/06/2015	-1.58672	30.3437	857	Domestic
GAT033	12/06/2015	-1.81343	30.44441	1058	Domestic
GAT034	12/06/2015	-1.701261	30.446767	507	Domestic
GAT035	13/06/2015	-1.6312	30.4297	725	Domestic
GAT036	13/06/2015	-1.62834	30.43798	519	Domestic
GS3433					
GAT037	15/06/2015	-1.7264	30.3922	589	Domestic

GAT038	16/06/2015	-1.6637	30.4354	506	Domestic
GAT039	17/06/2015	-1.656	30.4256	556	Domestic
GAT040	17/06/2015	-1.60402	30.33127	444	Domestic
GAT041	18/06/2015	-1.65979	30.43514	524	Domestic
GAT042	19/06/2015	-1.54559	30.35735	921	Domestic
GAT043	26/08/2015	-1.7418	30.38926	655	Domestic
GAT044	21/08/2015	-1.79851	30.36953	239	Domestic
GAT045	21/08/2015	-1.79506	30.36255	252	Domestic
GS4202					
GAT046	24/08/2015	-1.79391	30.3562	185	Domestic
GAT047	27/08/2015	-1.79285	30.35239	188	Domestic
GAT048	26/08/2015	-1.62962	30.37743	1013	Domestic
GAT049	19/08/2015	-1.64673	30.45684	468	Domestic
GAT050	25/08/2015	-1.66785	30.41568	529	Domestic
GAT051	20/08/2015	-1.80712	30.31485	463	Domestic
GAT052	20/08/2015	-1.80419	30.31039	595	Domestic
GAT053	01/09/2015	-1.85073	30.46383	519	Domestic
GAT054	21/08/2015	-1.80172	30.42948	485	Domestic
GS4203					
GAT055	19/08/2015	-1.59373	30.51485	823	Domestic
GAT056	26/08/2015	-1.67042	30.45224	488	Domestic
GAT057	28/08/2015	-1.67283	30.39238	434	Domestic
GAT058	28/08/2015	-1.67588	30.38931	388	Domestic
GAT059	18/08/2015	-1.66049	30.40731	445	Domestic
GAT060	24/08/2015	-1.78246	30.40674	533	Domestic
GAT061	18/08/2015	-1.66005	30.46137	820	Domestic
GAT062	31/08/2015	-1.67711	30.40872	431	Domestic
GAT063	27/08/2015	-1.67564	30.46383	436	Domestic

Project Location

This project is located in Gatsibo District, Eastern Province of Rwanda. Below is the geographic reference to allow unique identification of the project boundary. The target area and the fuel collection area are defined as being contained within project boundary, with the outer limits of the project boundary being clearly defined below. As the majority of beneficiaries collect their wood fuel locally in close proximity to their homesteads, the woodfuel collection area and target area are considered the same.

Map 1 Country map of Rwanda



Map 2 Eastern Province and Gatsibo district within (dark red)

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 NGOs' Kigali office then sent to the CO2balance UK project manager.

Continent	Country	Region	District	Sector	Sub-Location	Geographical Reference	
Africa	Rwanda	Eastern Province	Gatsibo	N/A	N/A	-1.62	30.20

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.

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 nth 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 Qp,y and Qp,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 the districts of the Eastern Province including Gatsibo. The samples for the survey listed 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. Cross sampling were applied to the following surveys;

- Project surveys
- Usage Surveys
- Water Consumption Field Tests

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:	9.6%
Justification of the choice of data or description of measurement methods and procedures actually applied:	The portion of safe water users is determined though 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_2/TJ
Description:	Non-co_2 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_2/TJ
Description:	co_2 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_2/TJ
Description:	Non-co_2 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_b
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_p
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:	$W_{b,y}$
Data unit:	T/litre
Description:	Quantity of fuel that is used to treat 1 litre of water in the baseline scenario b during year y
Source of data to be used:	Baseline Water Boiling Test
Value of data applied for the purpose of calculating expected emission reductions	0.0007363
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: *Technologies and*

methods and procedures to be applied:	*Practices to Displace Decentralized Thermal Energy Consumption* Version 1*, Draft General Guidelines On Sampling And Surveys*; EB37 Annex 27; and *Standard For Sampling And Surveys For CDM Project Activities and Programme of Activities* (Version 02); EB65 Annex 2
Any comment:	

Data / Parameter:	$W_{p,y}$
Data unit:	T/litre
Description:	Quantity of fuel that is used to treat 1 litre of water in the project scenario p during year y
Source of data to be used:	Baseline Water Boiling Test
Value of data applied for the purpose of calculating expected emission reductions	0.0007363
Description of measurement methods and procedures to be applied:	The baseline water boiling test is used to determine the amount of wood used to purify 1 litre of water by boiling. This data is gathered according to: *Technologies and Practices to Displace Decentralized Thermal Energy Consumption* Version 1*, Draft General Guidelines On Sampling And Surveys*; EB37 Annex 27; and *Standard For Sampling And Surveys For CDM Project Activities and Programme of Activities* (Version 02); EB65 Annex 2
Any comment:	

Data / Parameter:	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	2,652,868 – GS3306 1,970,544 – GS3430 1,884,534 – GS3431 2,123,166 – GS3432 1,715,076 – GS3433 1,626,870 – GS4202 1,756,068 – GS4203
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 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 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	13.49
Description of measurement	Method used similar to Kitchen Performance Test in which the volume of water consumed in each household is averaged over 3 days. The WCFT was carried out by

methods and procedures to be applied:	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:	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 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).

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

Where:

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

The tests were conducted over the course of 4 days in November, 2015 (1 day preparation and 3 days measurement) in people's homes following a similar method as the Kitchen Performance Test. The total litres of water consumed each day was measured and divided by the number of people consuming water in that day – this measurement was repeated over 3 consecutive week days (weekdays) and an overall average per household was calculated.

Usage Survey

A usage survey was conducted 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%.

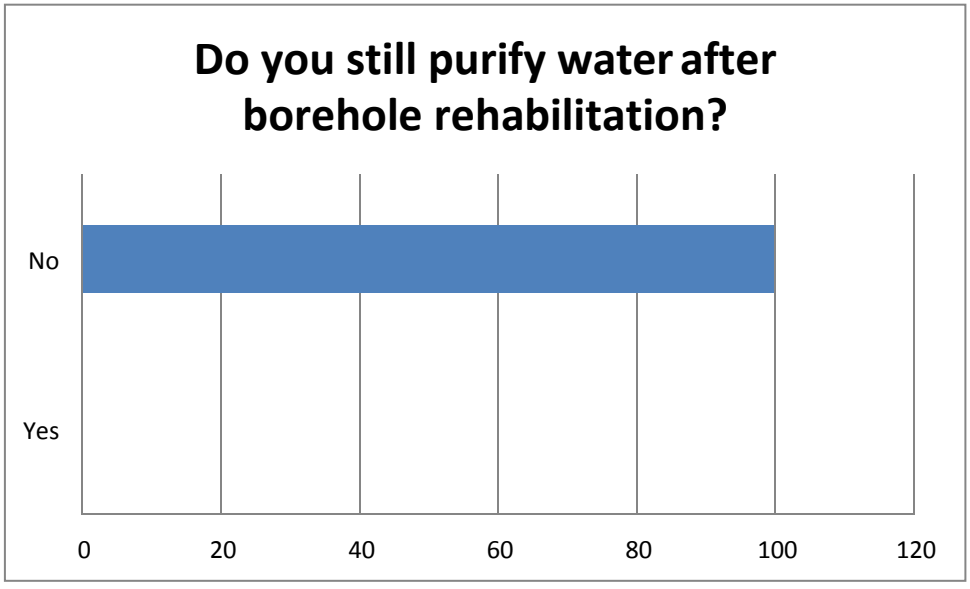
Project Survey Analysis

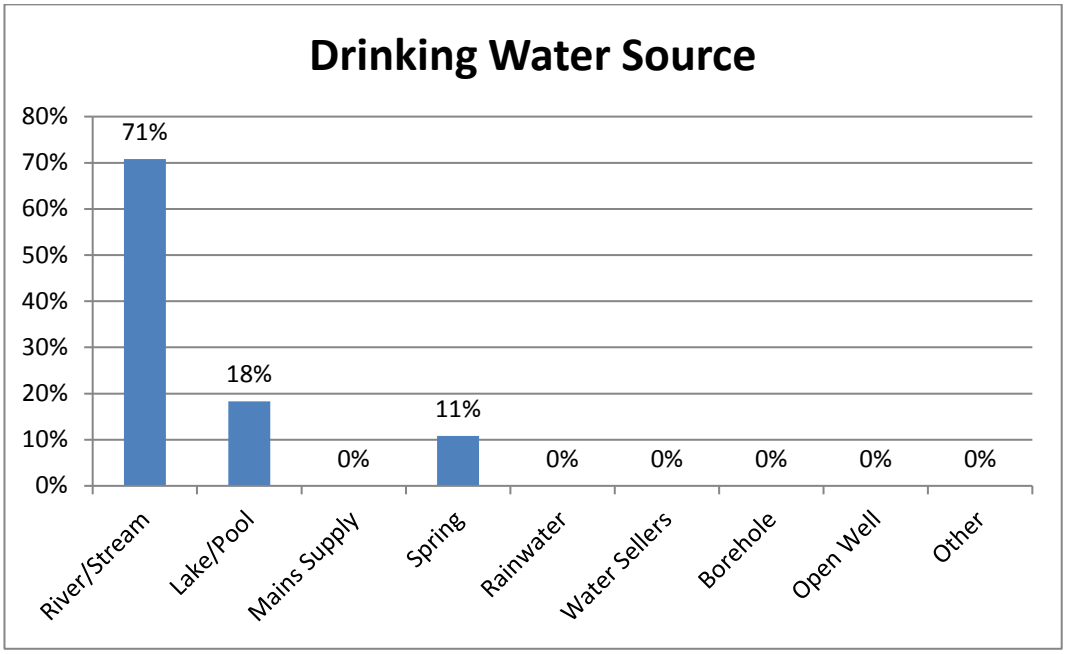
Project surveys were conducted on a sample of at least 100 randomly selected households to explore changes in the project scenario (demographics, water use and purification practices etc) over time.

Data collected during the project surveys includes the following:

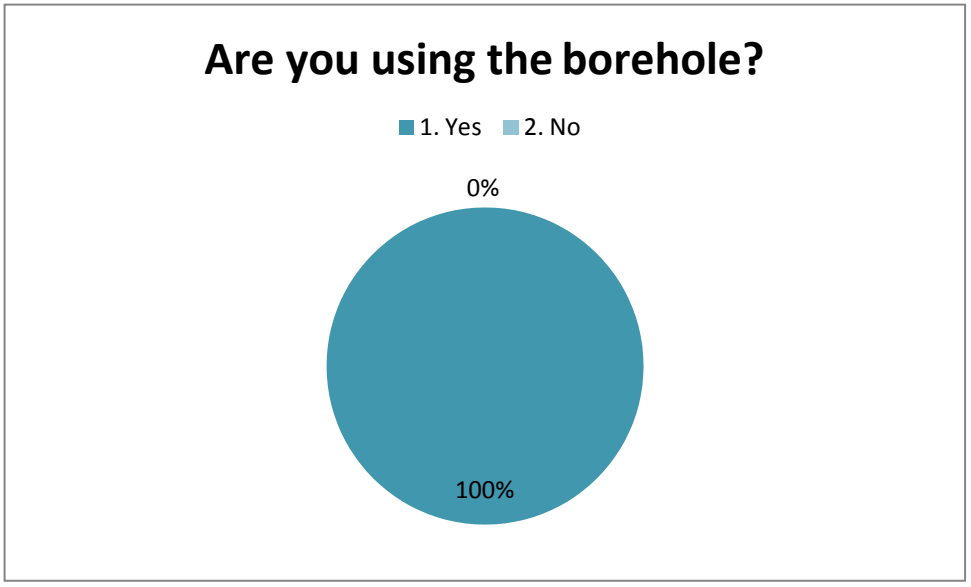
- General information - Name, address, telephone number etc.
- Household socio-demographic information.
- Water use and purification characteristics.
- Sources and availability of fuel.

The respondents obtained their water from one the boreholes which were rehabilitated as part of the projects.



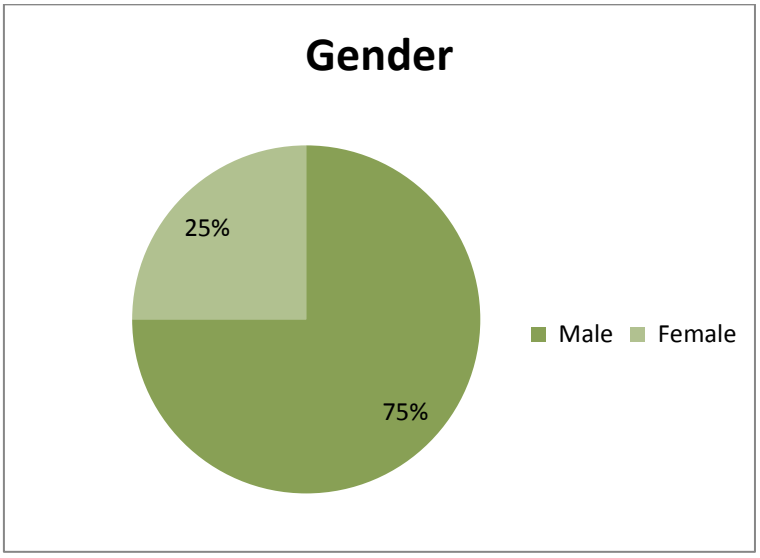


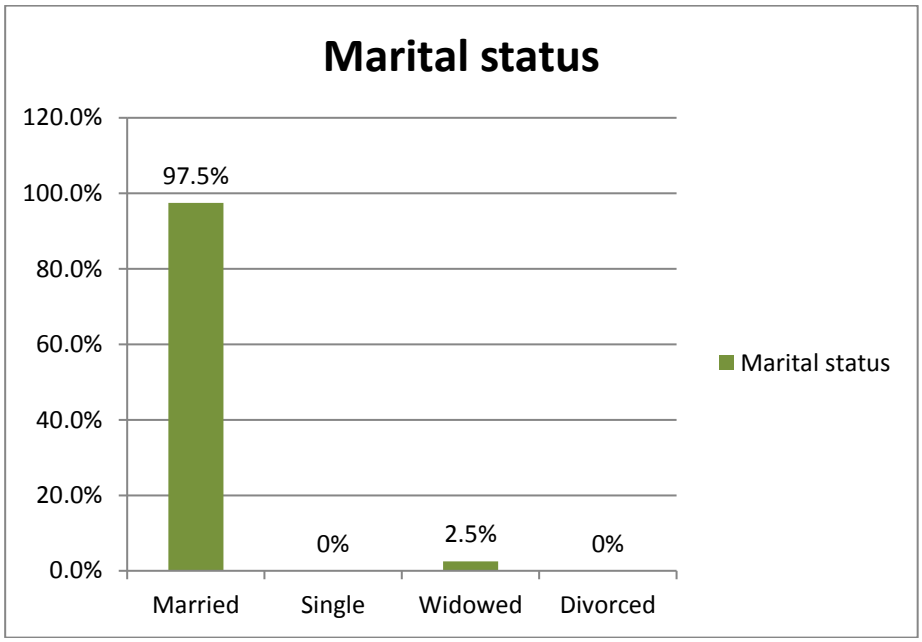
The results of the project survey confirm the outcome of the baseline surveys that none of the current borehole users had previously access to clean water. The results from the usage survey conducted on the same households showed that 100% of the respondents now collect their water from boreholes, which indicates a major improvement over the baseline. On average 5 people drinks the borehole water in the family and 100% of that is for personal use.

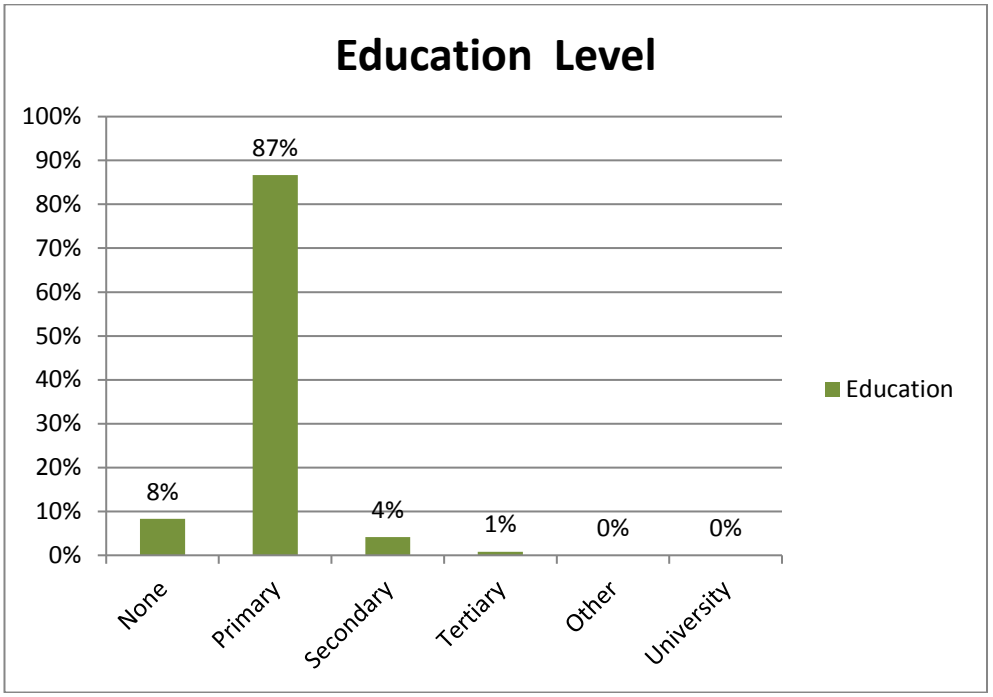


Socio-Demographic Characteristics

Analysis of the Project Survey results confirms that the socio-demographic characteristics such as gender, marital status, education and employment among the borehole users are the same, as shown in the following graphs.


Gender
25%
75%
Male
Female


Marital status
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
97.5%
0%
2.5%
0%
Married
Single
Widowed
Divorced
Marital status



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 indictors 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)

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 34), 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 WASH sensitization programme on a borehole level right after the rehabilitation. Such trainings were not widely available for the rural population and at remote places where the rehabilitated boreholes could be found. The agenda of the meeting and the outcome has been confirmed and signed by the in-country partner and is uploaded as supporting document to the Markit registry.

Summary of Emissions Reductions Total

The total ERs for the monitoring period for the 7 VPAs in this monitoring report gives the result of 75,000 as detailed below:

GS ID	ER total
GS3306	15014
GS3430	10027
GS3431	10027
GS3432	10027
GS3433	10027
GS4202	10027
GS4203	10027
SUM	75178

Summary of Emissions Reductions by Vintage and VPA

A breakdown of the emission reductions by vintage has been provided below:

GS3306

Total Emission Reductions for Monitoring Period 2

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		2652868
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	13244

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		2652868
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	24,474
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	**Ery**	**tCO2/y**	**24474**
	Deduction from MP1 (-659)		23,815
	Capped		**15,014**

In line with requirements, PP has deducted 659 ERs to meet the micro-scale annual threshold of 10,000 tCo2e emission reductions. Revised emission reductions calculations for monitoring period 1 have been uploaded to the registry.

Emission Reductions Vintage 2015

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		706786
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	3529

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		706786
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	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	6,520
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	**Ery**	**tCO2/y**	**6520**
	Capped		**4000**

Emission Reductions Vintage 2016

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1771806
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	8846

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1771806
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	16,345
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	**Ery**	**tCO2/y**	**16345**
	Capped		**10027**

Emission Reductions Vintage 2017

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		174276
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	870

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		174276
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	1,608
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	**Ery**	**tCO2/y**	**1608**
	Capped		**986**

GS3430

Total Emission Reductions for Monitoring Period 2

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1970544
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	9838

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1970544
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	18,179
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	**Ery**	**tCO2/y**	**18179**
	Capped		**10,027**

Emission Reductions Vintage 2016

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1776720
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	8870

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1776720
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	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	16,391
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	16391
	Capped		**9041**

Emission Reductions Vintage 2017

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		193824
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	968

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		193824
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	1,788
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	1788
	Capped		**986**

GS3431

Total Emission Reductions for Monitoring Period 2

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1884534
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	9408

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1884534
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	17,385
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	**Ery**	**tCO2/y**	**17385**
	Capped		**10,027**

Emission Reductions Vintage 2016

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1699170
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	8483

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1699170
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	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	15,675
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	15675
	Capped		**9041**

Emission Reductions Vintage 2017

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		185364
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	925

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		185364
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	1,710
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	1710
	Capped		**986**

GS3432

Total Emission Reductions for Monitoring Period 2

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		2123166
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	10600

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		2123166
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	19,587
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	**Ery**	**tCO2/y**	**19587**
	Capped		**10,027**

Emission Reductions Vintage 2016

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1914330
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	9557

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1914330
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	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	17,660
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	17660
	Capped		**9041**

Emission Reductions Vintage 2017

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		208836
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	1043

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		208836
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	1,927
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	1927
	Capped		**986**

GS3433

Total Emission Reductions for Monitoring Period 1

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1715076
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	8562

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1715076
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	15,822
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	**Ery**	**tCO2/y**	**15822**
	Capped		**10,027**

Emission Reductions Vintage 2016

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1546380
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	7720

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1546380
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	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	14,266
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	14266
	Capped		**9041**

Emission Reductions Vintage 2017

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		168696
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	842

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		168696
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	1,556
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	1556
	Capped		**986**

GS 4202

Total Emission Reductions for Monitoring Period 2

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1626870
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	8122

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1626870
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	15,008
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	**Ery**	**tCO2/y**	**15008**
	Capped		**10,027**

Emission Reductions Vintage 2016

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1466850
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	7323

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1466850
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	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	13,532
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	13532
	Capped		**9041**

Emission Reductions Vintage 2017

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		160020
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	799

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		160020
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	1,476
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	1476
	Capped		**986**

GS4203

Total Emission Reductions for Monitoring Period 2

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1756068
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	8767

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1756068
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	16,200
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	**Ery**	**tCO2/y**	**16200**
	Capped		**10,027**

Emission Reductions Vintage 2016

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		1583340
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	7905

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		1583340
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	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	14,607
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	14607
	Capped		**9041**

Emission Reductions Vintage 2017

Baseline Fuel Use (Bby)			
Portion using safe water	Cj	fraction	9.6%
Person Days	Njy		172728
Fuel to treat 1 litre of water using baseline tech	Wb,y	T/L	0.0007363
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	862

Project Fuel Use (Pby)			
Portion of safe users	Cj	fraction	9.60%
Person Days	Njy		172728
Fossil fuel required to treat 1 litre for water in project scenario	Wp,y	T/L	0.0007363
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	1,593
Project emissions per year	PEp,y	tCO2/y	0
Usage rate	Up,y	fraction	1
Leakage	LEp,y	tCO2/y	0
Emission Reductions	Ery	tCO2/y	1593
	Capped		**986**