

Gold standard for the global goals Monitoring report



June 2017, version 1

Title of the project	GS1366 VPA 6 Kilifi Borehole Rehabilitation Project (GS7128) GS1366 VPA 7 Kilifi Borehole Rehabilitation Project (GS7129) GS1366 VPA 8 Kilifi Borehole Rehabilitation Project (GS7130) GS1366 VPA 9 Kilifi Borehole Rehabilitation Project (GS7131) GS1366 VPA 10 Kilifi Borehole Rehabilitation Project (GS7367) GS1366 VPA 11 Kilifi Borehole Rehabilitation Project (GS7368) GS1366 VPA 12 Kilifi Borehole Rehabilitation Project (GS7369) GS1366 VPA 13 Kilifi Borehole Rehabilitation Project (GS7370) GS1366 VPA 14 Kilifi Borehole Rehabilitation Project (GS7371) GS1366 VPA 15 Kilifi Borehole Rehabilitation Project (GS7372)
Gold Standard project id	VPA 6 GS7128 VPA 7 - GS7129 VPA 8 - GS7130 VPA 9 - GS7131 VPA 10 - GS7367 VPA 11 - GS7368 VPA 12 - GS7369 VPA 13 - GS7370 VPA 14 - GS7371 VPA 15 - GS7372
Version number of the monitoring report	Version 4
Completion date of the monitoring report	12/03/2020
Date of project design certification	GS7128-31 - 17/10/2019 GS7367-72 - 02/12/2019
Start date of crediting period	GS7128 - 11/12/2018 GS7129 - 13/12/2018 GS7130 - 13/12/2018 GS7131 - 11/12/2018 GS7367 - 18/01/2019 GS7368 - 15/01/2019 GS7369 - 26/03/2019 GS7370 - 27/03/2019 GS7371 - 30/03/2019 GS7372 - 29/03/2019
Duration of this monitoring period	GS7128 - (11/12/2018) to (31/12/2019) GS7129 - (13/12/2018) to (31/12/2019) GS7130 - (13/12/2018) to (31/12/2019) GS7131 - (11/12/2018) to (31/12/2019) GS7367 - (18/01/2019) to (31/12/2019)

	GS7368 - (15/01/2019) to (31/12/2019) GS7369 - (26/03/2019) to (31/12/2019) GS7370 - (27/03/2019) to (31/12/2019) GS7371 - (30/03/2019) to (31/12/2019) GS7372 - (29/03/2019) to (31/12/2019)
Duration of previous monitoring period	N/A
Project representative(s)	Ilona Coulson-Ashworth; Thomas Devesa (CO2balance)
Host Country	Kenya
Certification pathway (activity certification/impact certification)	Impact Certification
SDG Contributions targeted (as per approved PDD)	1 – SDG 3 Good Health and Well-being - Total reduction in household air pollution as a result of boiling 1 litre of water for purification 2 – SDG 5 Gender Equality - Time spent collecting firewood 3 – SDG 6 Clean Water and Sanitation - Proportion of population using safe water 4 - SDG 13 Climate Action - Total project emissions reductions
Gold Standard statement/product certification sought (GSVER/ADALYs/RECs etc.)	GSVER
Selected methodology(ies)	TPDDTEC v.1
Estimated amount of annual average certified SDG impact (as per approved PDD)	1 – SDG 3: 50% decrease in household smoke 2 - SDG 5: 0.5 hours per household per day saved on firewood collection time 3 - SDG 6: 3,876 additional people gain access to safe water 4 – SDG 13: estimated emissions reductions per VPA per monitoring period GS7128: 10,548 tCO ₂ e/y GS7129: 10,493 tCO ₂ e/y GS7130: 10,493 tCO ₂ e/y GS7131: 10,548 tCO ₂ e/y GS7367: 9,507 tCO ₂ e/y GS7368: 9,589 tCO ₂ e/y GS7369: 7,671 tCO ₂ e/y GS7370: 7,644 tCO ₂ e/y GS7371: 7,562 tCO ₂ e/y GS7372: 7,589 tCO ₂ e/y
Total amount of certified SDG impact (as per approved methodology) achieved in this monitoring period	1 – SDG 3: 100% decrease in household smoke (All VPAs) 2 – SDG 5: 0.53 hours per household per week saved on firewood collection time (All VPAs) 3 – SDG 6: additional people gain access to safe water GS7128: 4,195 GS7129: 4,368

	GS7130: 3,941
	GS7131: 3,933
	GS7367: 4,169
	GS7368: 3,456
	GS7369: 3,394
	GS7370: 3,387
	GS7371: 3,329
	GS7372: 3,512
	4 – SDG 13: Emissions reductions (tCO ₂ e) per VPA
	GS7128: 10,535
	GS7129: 11,055
	GS7130: 10,623
	GS7131: 10,395
	GS7367: 9,534
	GS7368: 9,616
	GS7369: 7,699
	GS7370: 7,671
	GS7371: 7,589
	GS7372: 7,616

SECTION A. Description of project

A.1. Purpose and general description of project

With a population of 52.5 million, 41% of Kenyans still rely on unimproved water sources with no access to safe water. Open water sources are highly susceptible to contamination. The rural population especially rely on boiling water to ensure a potable supply.

Kilifi County is a largely rural province on the coast of Kenya in which many local people typically use wood fuel on inefficient three stone fires to purify their drinking water, as well as water for cleaning and washing food for cooking preparation. This process results in the release of greenhouse gas emissions from the combustion of wood which can be avoided if a technology that does not require fuel (wood or fossil) supplies clean water desired by households. By providing safe water this project ensures that households consume less firewood during the process of water purification and therefore reduce greenhouse gas emissions from the combustion process.

Many existing boreholes in Kenya, including Kilifi County, have fallen into disrepair because maintenance programmes have been poorly managed, or proven too expensive leaving people without access to clean water. CO2balance has worked to identify broken down boreholes, renovate them and supply a maintenance programme to ensure that clean, safe water is delivered as a result of this project. The boreholes included under the project are entirely human operated and fitted with hand pump models that are commonly used in the area such as Afridev, U3 Modified and India Mark II pumps. The depth of the boreholes are all limited to 100m or less. The capacity of communities to maintain their boreholes will also be supported through the project to ensure that the water keeps flowing.

In total 63 boreholes were rehabilitated as part of this project between 10th December 2018 and 8th April 2019. The boreholes will continue to be maintained throughout their crediting period, dates of which can be found in Section A.4. The projects are in their first 5-year crediting period which is twice renewable. The date, location and number of people served by each borehole are given in the table below, which forms the project database:

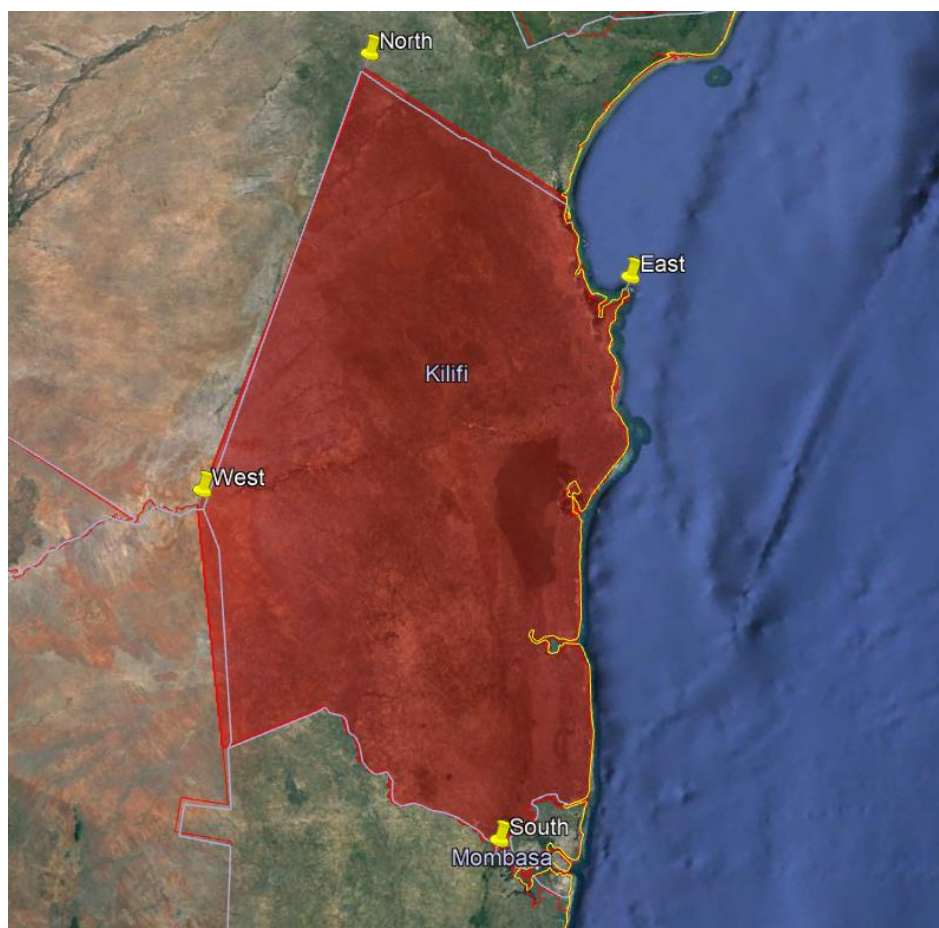
VPA ID	GS ID	Borehole ID	Village Name	Date of Rehab	Latitude (South)	Longitude (East)	Number of People
6	7128	KIB002	Mzambarauni	10/12/2018	3.965093	39.723223	639
6	7128	KIB001	Mtomondoni	11/12/2018	3.944138	39.738042	682
6	7128	KIB012	Makadara/ Barani	11/12/2018	3.92717	39.771258	642
6	7128	KIB031	Ushindi	16/01/2019	3.904932	39.777924	1071
6	7128	KIB025	Bureni/ Vipingo	18/01/2019	3.829723	39.831423	682
6	7128	KIB028	Vipingo	19/01/2019	3.809803	39.815403	700
7	7129	KIB014	Mtwapa/ Coral	12/12/2018	3.924976	39.770245	719
7	7129	KIB015	Kijijini/ Mtaani	13/12/2018	3.942769	39.757281	713
7	7129	KIB005	Fofarm/Majewao	14/12/2018	3.917314	39.759298	686
7	7129	KIB006	Maweni	14/12/2018	3.924035	39.777972	697
7	7129	KIB007	Kididima	14/12/2018	3.921837	39.769106	885
7	7129	KIB009	Maweni / Mwamunga	16/12/2018	3.932764	39.767245	898
8	7130	KIB008	Barani	12/12/2018	3.932764	39.766945	637
8	7130	KIB011	Mtwapa/ Mwavitwa	13/12/2018	3.939687	39.759552	683
8	7130	KIB004	Mtepeni	14/12/2018	3.939464	39.745129	658
8	7130	KIB013	Barani / Kididima	15/12/2018	3.938362	39.768356	679
8	7130	KIB018	Shariani/ Kuruvitu B	14/01/2019	3.786695	39.825354	721

8	7130	KIB019	Shariani/ Kurumtu B	15/01/2019	3.804966	39.814657	770
9	7131	KIB003	Makio/ Kanamai	10/12/2018	3.939464	39.746883	903
9	7131	KIB010	Barani / Timboni	10/12/2018	3.927183	39.771269	501
9	7131	KIB020	Timboni/Kurumi	15/01/2019	3.789966	39.825391	704
9	7131	KIB021	Lutsangani/Shariani	15/01/2019	3.742443	39.854688	662
9	7131	KIB022	Vipingo	16/01/2019	3.797943	39.810474	665
9	7131	KIB023	Vipingo/ Bomani	17/01/2019	3.817296	39.817381	705
10	7367	KIB024	Majengo Mapya	17/01/2019	3.813792	39.817381	674
10	7367	KIB026	Shariani	18/01/2019	3.787273	39.826406	669
10	7367	KIB029	Timboni	20/01/2019	3.776585	39.82581	715
10	7367	KIB030	Vipingo	20/01/2019	3.813518	39.810438	681
10	7367	KIB041	Shangani	22/03/2019	3.816916	39.818024	661
10	7367	KIB045	Ziwani	22/03/2019	3.934715	39.765124	667
10	7367	KIB039	Kizingitini	23/03/2019	3.80432	39.811891	321
11	7368	KIB016	Buguluni	14/01/2019	3.826349	39.797747	705
11	7368	KIB017	Shariani / Kuruwitu	14/01/2019	3.790682	39.832482	766
11	7368	KIB027	Takaungu / Timboni	18/01/2019	3.931772	39.768243	627
11	7368	KIB037	Mwakamsha	23/03/2019	3.812478	39.814886	325
11	7368	KIB040	Bodoi	24/03/2019	3.812756	39.812956	306
11	7368	KIB049	Bureni A	25/03/2019	3.829708	39.810146	601
11	7368	KIB036	Ndaraweni	26/03/2019	3.878954	39.794868	308
12	7369	KIB048	Shauri Moyo	25/03/2019	3.784698	39.823938	616
12	7369	KIB061	Bureni	25/03/2019	3.83327	39.807087	664
12	7369	KIB047	Mabatini	26/03/2019	3.916538	39.78129	310
12	7369	KIB057	Mapendeni	26/03/2019	3.832297	39.829547	609
12	7369	KIB058	Kireme	26/03/2019	3.869675	39.765656	660
12	7369	KIB059	Chodari	26/03/2019	3.88009	39.74872	714
13	7370	KIB032	Maweni/Kikambala	26/03/2019	3.938856	39.795513	780
13	7370	KIB038	Mtepeni	27/03/2019	3.80635	39.806227	313
13	7370	KIB046	Matandale	27/03/2019	3.942536	39.768303	656
13	7370	KIB035	Rea Vipingo	28/03/2019	3.804626	39.811762	694
13	7370	KIB042	Kwa Pop	29/03/2019	3.784347	39.823696	669
13	7370	KIB051	Bureni B	01/04/2019	3.805561	39.813459	453
14	7371	KIB043	Bomani	29/03/2019	3.917184	39.767245	309
14	7371	KIB056	Kolewa	29/03/2019	3.905327	39.796874	677
14	7371	KIB044	Vipingo Centre	31/03/2019	3.812102	39.813369	675
14	7371	KIB050	Bembo	31/03/2019	3.857664	39.815609	608
14	7371	KIB054	Mwakamsha	01/04/2019	3.812216	39.815865	627
14	7371	KIB055	Takaungu	01/04/2019	3.837795	39.816887	608

15	7372	KIB034	Timboni	28/03/2019	3.92179	39.791345	882
15	7372	KIB060	Maweni	30/03/2019	3.906568	39.775883	298
15	7372	KIB053	Buguluni	01/04/2019	3.945873	39.765835	311
15	7372	KIB033	Mwakamsha	02/04/2019	3.92179	39.778453	675
15	7372	KIB052	Shauri moyo Ziwani	02/04/2019	3.825195	39.817736	489
15	7372	KIB062	Maekani	08/04/2019	3.931288	39.797439	337
15	7372	KIB063	Galoleni	08/04/2019	3.964517	39.779424	705

A.2. Location of project

The Project Area is within Kilifi County, Kenya, as shown in the figure below. 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 wood fuel collection area and target area are considered the same.



Project Area Coordinates		
	Latitude	Longitude
North	2°18'35.89"S	39°53'32.73"E
South	3°59'26.35"S	39°32'30.39"E
East	2°58'43.63"S	40°14'21.47"E
West	3° 4'10.02"S	39°13'7.74"E

A.3. Reference of applied methodology

This project utilises the Gold Standard Methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption V.01'.

A.4. Crediting period of project

The date of rehabilitation was used as the start date of operation. It was conservatively assumed that the first day of crediting is not counted and the crediting period begins the following day after the borehole is rehabilitated. The length of the crediting period is to be 5 years, twice renewable totaling 15 years as per the approved PDD.

Please find the start dates for the projects below (crediting period and Monitoring Period begins the following day):

Project ID	Start Date	Crediting Period Start Date	Crediting Period End Date
GS7128	10/12/2018	11/12/2018	10/12/2023
GS7129	12/12/2018	13/12/2018	12/12/2023
GS7130	12/12/2018	13/12/2018	12/12/2023
GS7131	10/12/2018	11/12/2018	10/12/2023
GS7367	17/01/2019	18/01/2019	17/01/2024
GS7368	14/01/2019	15/01/2019	14/01/2024
GS7369	25/03/2019	26/03/2019	25/03/2024
GS7370	26/03/2019	27/03/2019	26/03/2024
GS7371	29/03/2019	30/03/2019	29/03/2024
GS7372	28/03/2019	29/03/2019	28/03/2024

SECTION B. Implementation of project

B.1. Description of implemented project

CO2balance has rehabilitated 63 boreholes as part of these projects and all water points under the VPAs are in good working order and have been crediting since the beginning of their crediting period. All of the boreholes rehabilitated in these projects are Afridev handpumps. The Afridev is a public domain pump that is reliable and popular with local communities, as well as being emissions free in its use. Below is an example of the Afridev model.



Technical Specification:

	Afridev
Cylinder Diameter (mm)	63.5
Maximum Stroke (mm)	125
Approx. discharge at about 75 watt input (m3/h)	At 10m head 1.4
	At 15 m head 1.1
	At 20m head 0.9
	At 30m head 0.7
Pumping Lift (m)	10-50
Water Consumption (litres per capita)	15-20

Water Quality Standard

All boreholes are chlorinated following rehabilitation and then every 6 months thereafter to ensure a safe water supply. All boreholes undergo annual water quality testing to ensure the water is safe for human consumption as per national water standards¹. The national standards set parameters with upper limits which must be adhered to for drinking water to qualify as potable. Microbiological limits require that potable water has zero counts of Coliforms and *E.coli*. Chemical limits state that Total Dissolved Solids are limited to 1500 mg/L for natural potable water. The national water standards are applicable to the project area. The water quality is approved by Polucon²; an accredited laboratory based in Mombasa, Kenya. In addition, WASH training was conducted with communities at the beginning of the project to ensure safe use of the boreholes and safe transfer of clean water from the point of distribution to consumption.

Project Feedback

¹ http://www.puntofocal.gov.ar/notific_otros_miembros/ken470_t.pdf

² <https://polucon.com/>

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Grievance expression process books placed at government county offices have not received any feedback and CO2balance field staff have not received any feedback during this monitoring period from the borehole users on damage or breaking of boreholes therefore it can be assumed that the project is running as planned. The feedback/grievance mechanisms were discussed during the LSC so that all relevant stakeholders are aware of the processes in place for reporting any issues.

B.2. Post-registration changes

B.2.1. Temporary deviations from Certified Key Project Information, Project Design Document, Monitoring & Reporting Plan, applied methodology or applied standardized baseline

N/A

B.2.2. Corrections

N/A

B.2.3. Changes to start date of crediting period

N/A

B.2.4. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

N/A

B.2.5. Changes to project design of approved project

N/A

SECTION C. Description of monitoring system applied by the project

All surveys are administered by trained staff 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. Training is conducted before monitoring takes place and ensures the following objectives are met:

- Orientation for data collectors on borehole monitoring surveys
- Ensure all team members have the knowledge and skills to carry out the required work with confidence and to a high standard
- Ensure data collectors understand the guidelines and survey tools for usage, project and WCFT surveys as well as data collection and management processes and protocols
- Familiarise data collectors with carbon finance and Gold Standard principles and requirements during surveying

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 by a minimum of two Kenyan CO2balance staff involved in typing up the monitoring data into excel and cross-checking the data. The excel data is then stored on a central server in an electronic format and sent to the UK head office for data analysis. The documentation procedure ensures a minimum chance of original data being lost – all original copies of our project documentation are retained in the Kenyan office and are available scanned upon request of the UK team. UK staff use scanned copies to check data input and quality control before submitting for verification.

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 and are determined in accordance with the required confidence/precision. The size of the sample is dependent on the methodological requirements and variance of the parameter being monitored to ensure the parameters measured satisfy 90/30 precision (90% confidence interval and 30% margin of error). The sample is reselected for every monitoring period to ensure the selection remains random.

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

Borehole database

The borehole installation/rehabilitation record includes the following information:

- Date of installation/rehabilitation
- Quantity of boreholes installed
- The total number of people obtaining their water from each borehole

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

Borehole Operationality

Following rehabilitation of the boreholes, checks are conducted to ensure that boreholes remain fully operational during the monitoring period. There are two active approaches utilised. Communities and Water Point Committees for each of the boreholes are provided with contact details for local CO2balance field staff. Any problems with the boreholes can be reported and the issues can quickly be resolved through this direct line of communication. During the monitoring period, no issues were raised. Secondly, CO2balance field staff perform a visit of each borehole, ensuring that each borehole is indeed operating as intended. If any issues are discovered and the appropriate repairs can be conducted. During the monitoring period, no issues were raised using this approach.

In the case of repairs being necessary, the total number of days the borehole is being repaired and not operational is recorded. This information is then used to adjust person days for emissions reductions calculations.

Carbon Rights Transfer

A Carbon Transfer Form (CTF) is signed by a village Water Officer/WASH committee for each borehole on behalf of all members of the community. This activity is agreed upon by stakeholders in the LSC and before signing so that all households are aware of the transfer of rights to CO2balance.

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 every two years. The survey is conducted over a 4 day period by field staff who are trained beforehand to conduct the survey in line with methodological requirements. The WCFT distinguishes between water use for project-related activities (i.e. drinking, food preparation, and basic personal hygiene) and non-project activities as well as borehole water which is boiled before use. Days 2-4 of the WCFT are used to measure water use. Surveyors assess the volumes, and empty weights, of all jerrycans used by households, distinguishing between those used for project-related activities and those not. Then, the total number of jerrycans emptied per day are observed along with the weight of any partially used jerrycans. This process is repeated each day until an average daily use figure is calculated, based on household size. As per the methodology, results are capped at 7.5l.

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- **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 Kenyan standards for potable water and all parameters will be shown to be within levels considered acceptable for domestic human consumption. Kenyan standards for potable water are provided by the Kenya Bureau of Standards (KEBS)³.
- **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. The results from the usage survey are used to determine the proportion of beneficiaries that use the borehole which is factored into the emission reduction calculations.
- **Project Survey** – Conducted on 100 households, surveying end users currently using project technologies to explore changes in project scenario over time. Data collected during the project surveys explores the following characteristics:
 - General information - Name, address, telephone number etc.
 - Household socio-demographic information.
 - Water use and purification characteristics.
 - Sources and availability of fuel.
- **Leakage** - The PDD has described which sources of leakage detailed within the methodology are relevant to this project and which have been discounted.

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

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

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

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

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

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

As the majority of participants collect wood from within the project boundary, it is not expected that the NRB in other areas will be affected. There are currently no other CDM or VER projects in the project area.

d) *The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of heating or by retaining some use of inefficient technology.*

³ Tables 8 within the document provides a the list of parameters required to be tested for potable drinking water (http://www.puntofocal.gov.ar/notific_otros_miembros/ken470_t.pdf)

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

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

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

Therefore, a value of 0 is applied for leakage last conducted in November 2019.

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 Kilifi County (GS 7128 – 7131; 7367 – 7372, 7513 – 7523, 7562). 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 will be applied to the following surveys;

- Project Surveys- Completed annually,
- Usage Surveys- Completed annually,
- Water Consumption Field Tests- Completed every two years.

SECTION D. Data and parameters

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

Relevant SDG Indicator	SDG 13.B.1 (Climate Action), SDG 6.1.1 (Clean Water and Sanitation)
Data/parameter:	C _j
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	Baseline study
Value(s) applied)	5%
Choice of data or measurement methods and procedures	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. Deemed valid by Methodology.
Purpose of data	Calculation of emission reductions
Additional comments	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)
Data/parameter:	EF _{b,co2}
Unit	tCO ₂ /TJ

Description	co ₂ emission factor arising from use of fuels in baseline scenario
Source of data	IPCC default value
Value(s) applied)	112
Choice of data or measurement methods and procedures	Deemed valid by Methodology.
Purpose of data	Calculation of baseline emissions.
Additional comments	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)			
Data/parameter:	EF _{b,non co2}			
Unit	tCO ₂ e/TJ			
Description	Non-CO ₂ (CH ₄ and N ₂ O) emission factor arising from use of wood fuel in baseline scenario			
Source of data	IPCC Default emissions factor			
Value(s) applied)	8.692			
Choice of data or measurement methods and procedures	Deemed valid by Methodology			
	Gas	Default Emissions factor (kg_gas/TJ _{NCV})	GWP of gas	Default Emissions factor (kg_CO ₂ e/TJ _{NCV})
	CH ₄	300	25	7,500
	N ₂ O	4	298	1,192
				Total
				8.692
Purpose of data	Calculation of emission reductions.			
Additional comments	-			

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)			
Data/parameter:	EF _{p,co2}			
Unit	tCO ₂ /TJ			
Description	CO ₂ emission factor arising from use of wood fuel in project scenario			
Source of data	Volume 2: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 2, Table 2.5			
Value(s) applied)	112			
Choice of data or measurement methods and procedures	Deemed valid by Methodology.			
Purpose of data	Calculation of emission reductions.			
Additional comments	-			

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)			
Data/parameter:	EF _{p,non co2}			

Unit	tCO ₂ e/TJ			
Description	Non-CO ₂ (CH ₄ and N ₂ O) emission factor arising from use of wood fuel in project scenario			
Source of data	IPCC Default emissions factor			
Value(s) applied)	8.692			
Choice of data or measurement methods and procedures	Deemed valid by Methodology			
	Gas	Default Emissions factor (kg_gas/TJ _{NCV})	GWP of gas	Default Emissions factor (kg_CO ₂ e/TJ _{NCV})
	CH ₄	300	25	7,500
	N ₂ O	4	298	1,192
				Total
				8.692
Purpose of data	Calculation of emission reductions.			
Additional comments	-			

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)
Data/parameter:	NCV _b
Unit	TJ/ton
Description	Net calorific value of the wood fuel used in the baseline
Source of data	IPCC Default emissions factor
Value(s) applied)	0.0156
Choice of data or measurement methods and procedures	Deemed valid by Methodology.
Purpose of data	Calculation of emission reductions.
Additional comments	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)
Data/parameter:	NCV _p
Unit	TJ/ton
Description	Net calorific value of the wood fuel used in the project
Source of data	IPCC Default emissions factor
Value(s) applied)	0.0156
Choice of data or measurement methods and procedures	Deemed valid by Methodology.
Purpose of data	Calculation of emission reductions.
Additional comments	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)
Data/parameter:	$fNRB_{i,y}$
Unit	Fractional non-renewability
Description	Non-renewability status of woody biomass fuel in scenario i during year y
Source of data	CDM Default stated in following document: https://cdm.unfccc.int/Panels/ssc_wg/meetings/035/ssc_035_an20.pdf
Value(s) applied)	0.92
Choice of data or measurement methods and procedures	Default values of fraction of non-renewable biomass as outlined by the UNFCCC CDM.
Purpose of data	Calculation of emission reductions.
Additional comments	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.

Relevant SDG Indicator	SDG 13.B.1 (Climate Action), SDG 6.1.1 (Clean Water and Sanitation)
Data/parameter:	$W_{b,y}$
Unit	T/litre
Description	Quantity of wood fuel that is used to treat 1 litre of water in the baseline scenario b during year y
Source of data	Baseline Water Boiling Test
Value(s) applied)	0.001156
Choice of data or measurement methods and procedures	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</i> , <i>Draft General Guidelines On Sampling And Surveys</i> ; EB37 Annex 27; and <i>Standard For Sampling And Surveys For CDM Project Activities and Programme of Activities (Version 02)</i> ; EB65 Annex 2
Purpose of data	Calculation of emission reductions.
Additional comments	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action), SDG 6.1.1 (Clean Water and Sanitation)
Data/parameter:	$W_{p,y}$
Unit	T/litre
Description	Quantity of wood fuel that is used to treat 1 litre of water in the project scenario p during year y
Source of data	Baseline Water Boiling Test
Value(s) applied)	0.001156
Choice of data or measurement methods and procedures	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</i> , <i>Draft General Guidelines On Sampling And Surveys</i> ; EB37 Annex 27; and <i>Standard For Sampling And Surveys For CDM Project Activities and Programme of Activities (Version 02)</i> ; EB65 Annex 2
Purpose of data	Calculation of emission reductions.
Additional comments	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)
Data/parameter:	Xboil Non Suppressed Demand
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	Baseline study. Credible literature, studies, survey, reports, relevant to the project target area
Value(s) applied)	6.3%
Choice of data or measurement methods and procedures	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, however, in the event the project surveys show a substantial change in fuel use characteristics, a new baseline shall be conducted.
Purpose of data	Calculation of emission reductions.
Additional comments	-

Relevant SDG Indicator	SDG 5.4.1 (Gender Equality)
Data/parameter:	$T_{b,y}$
Unit	Hours
Description	Time spent collecting firewood per household per week prior to project
Source of data	Baseline survey
Value(s) applied)	4.62
Choice of data or measurement methods and procedures	Measured by multiplying responses to questions 33 and 34 in the baseline survey.
Purpose of data	Calculating time saved collecting water by project.
Additional comments	-

Relevant SDG Indicator	SDG 3.9.1 (Good Health and Well-Being)
Data/parameter:	$P_{b,y}$
Unit	Kg/household
Description	Quantity of fuel that is consumed in the baseline scenario b during year y (kg/household-day)
Source of data	Baseline Survey
Value(s) applied)	8.67
Choice of data or measurement methods and procedures	Baseline Water Boiling Test Result.
Purpose of data	Calculating quantity of fuel used in the baseline scenario.
Additional comments	-

D.2. Data and parameters monitored

Relevant SDG Indicator	SDG 13.B.1 (Climate Action), SDG 6.1.1 (Clean Water and Sanitation)
Data/parameter:	$N_{p,y}$
Unit	Project Technology Days
Description	Number of persons consuming water supplied by project scenario p through year y
Measured/calculated/default	Calculated
Source of data	Borehole Project Database
Value(s) of monitored parameter	GS7128: 1,609,027 GS7129: 1,756,791 GS7130: 1,492,376 GS7131: 1,497,469 GS7367: 1,416,310 GS7368: 1,167,278 GS7369: 1,001,720 GS7370: 991,118 GS7371: 964,337 GS7372: 1,008,644
Monitoring equipment	Project Database
Measuring/reading/recording frequency:	Continuous
Calculation method (if applicable):	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.
QA/QC procedures:	N/A
Purpose of data:	Calculation of emission reductions.
Additional comments:	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action), SDG 6.1.1 (Clean Water and Sanitation), SDG 3.9.1 (Good Health and Well-Being)
Data/parameter:	$U_{p,y}$
Unit	Percentage
Description	Usage rate in project scenario p through year y
Measured/calculated/default	Measured
Source of data	Usage Survey
Value(s) of monitored parameter	100%
Monitoring equipment	Usage Survey
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	The usage survey has been carried out by trained local staff to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by CO2balance UK Ltd.
QA/QC procedures:	Field Sheet scans were checked against soft copy surveys.
Purpose of data:	Calculation of usage.

Additional comments:	-
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Relevant SDG Indicator	SDG 13.B.1 (Climate Action), SDG 6.1.1 (Clean Water and Sanitation)
Data/parameter:	$Q_{p,y}$
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
Measured/calculated/default	Default 7.5
Source of data	Water Consumption Field Test (WCFT)
Value(s) of monitored parameter	7.5
Monitoring equipment	WCFT Survey
Measuring/reading/recording frequency:	Completed every two years
Calculation method (if applicable):	Method used similar to Kitchen Performance Test in which the volume of water consumed in each household is averaged over 3 days. Volume is capped at 7.5 litres per person per day as per the methodology. The WCFT will be carried out by trained local staff to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by CO2balance UK Ltd.
QA/QC procedures:	Field Sheet scans were checked against soft copy surveys.
Purpose of data:	Calculation of emission reductions.
Additional comments:	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action), SDG 6.1.1 (Clean Water and Sanitation)
Data/parameter:	$Q_{p, \text{cleanboil}, y}$
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
Measured/calculated/default	Measured
Source of data	Water Consumption Field Test (WCFT)
Value(s) of monitored parameter	0
Monitoring equipment	WCFT Survey
Measuring/reading/recording frequency:	Completed every two years
Calculation method (if applicable):	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 trained local staff to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by CO2balance UK Ltd.
QA/QC procedures:	Field Sheet scans were checked against soft copy surveys.
Purpose of data:	Calculation of emission reductions.
Additional comments:	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)
Data/parameter:	$Q_{p,rawboil, y}$
Unit	Litres per person per day
Description	The raw of unsafe water that is still boiled after installation of the water treatment technology
Measured/calculated/default	Measured
Source of data	Water Consumption Field Test (WCFT)
Value(s) of monitored parameter	0
Monitoring equipment	WCFT Survey
Measuring/reading/recording frequency:	Completed every two years
Calculation method (if applicable):	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 trained local staff to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by CO2balance UK Ltd.
QA/QC procedures:	Field Sheet scans were checked against soft copy surveys.
Purpose of data:	Calculation of emission reductions.
Additional comments:	-

Relevant SDG Indicator	SDG 6.1.1 (Clean Water and Sanitation)
Data/parameter:	Quality of Treated Water
Unit	Parameters as per national standards
Description	Performance of the treatment technology
Measured/calculated/default	Measured
Source of data	Laboratory Tests
Value(s) of monitored parameter	Pass
Monitoring equipment	Laboratory equipment
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	An independent laboratory, Polucon, has certified each water supply as in line with national standards. Two samples are taken from each borehole for WQT. One for microbiological testing and one for chemical testing, with physiochemical testing being undertaken on both samples.
QA/QC procedures:	PP checks all tests before submitting.
Purpose of data:	To test water quality for safety of human consumption.
Additional comments:	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)
Data/parameter:	$LE_{p,y}$
Unit	tCO ₂ e per year

Description	Leakage in project scenario p during year y
Measured/calculated/default	Calculated
Source of data	Online research from secondary sources
Value(s) of monitored parameter	0
Monitoring equipment	Desk based research and field staff input
Measuring/reading/recording frequency:	Completed every two years
Calculation method (if applicable):	Assessed every two years using Desk based research and field staff input. Last conducted in November 2019.
QA/QC procedures:	N/A
Purpose of data:	Calculation of leakage.
Additional comments:	Leakage is assessed every two years using desk-based research by PD and feedback from field staff. Online secondary research as well as primary sources from field staff are used to inform the assessment.

Relevant SDG Indicator	SDG 5.4.1 (Gender Equality)
Data/parameter:	TP _y
Unit	hours
Description	Project time spent collecting firewood per household per week (hours)
Measured/calculated/default	Measured
Source of data	Project Survey
Value(s) of monitored parameter	4.09
Monitoring equipment	Project Survey
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Assessed every year using Project Survey, multiplying responses to questions 27 and 28.
QA/QC procedures:	Field Sheet scans were checked against soft copy surveys.
Purpose of data:	Calculation of SDG 5
Additional comments:	-

Relevant SDG Indicator	SDG 5.4.1 (Gender Equality)
Data/parameter:	TR _y
Unit	hours
Description	Total reduction in time spent collecting firewood per week for project activity in year y (hours)
Measured/calculated/default	Calculated
Source of data	Project Survey and baseline survey
Value(s) of monitored parameter	0.53
Monitoring equipment	Project Survey
Measuring/reading/recording frequency:	Annual

Calculation method (if applicable):	Assessed every year using Project Survey
QA/QC procedures:	Field Sheet scans were checked against soft copy surveys.
Purpose of data:	Calculation of SDG 5
Additional comments:	-

Relevant SDG Indicator	SDG 3.9.1 (Good Health and Well-Being)
Data/parameter:	HARP _y
Unit	percentage
Description	Total reduction in Household Air Pollution for project activity in year y (%)
Measured/calculated/default	Calculated
Source of data	Project Survey and baseline survey
Value(s) of monitored parameter	100%
Monitoring equipment	Project Survey
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Assessed every year using Project Survey
QA/QC procedures:	Field Sheet scans were checked against soft copy surveys.
Purpose of data:	Calculation of SDG 3
Additional comments:	-

Relevant SDG Indicator	SDG 3.9.1 (Good Health and Well-Being)
Data/parameter:	Pp _y
Unit	Kg/household
Description	Quantity of fuel that is consumed in the project scenario p during year y (kg/household-day)
Measured/calculated/default	Measured
Source of data	Baseline and Project Surveys
Value(s) of monitored parameter	0
Monitoring equipment	Baseline Water Boiling Test
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Assessed every year using usage survey determining the number of people boiling water in the project scenario.
QA/QC procedures:	N/A
Purpose of data:	Calculation of SDG 3
Additional comments:	-

Relevant SDG Indicator	SDG 6.1.1 (Clean Water and Sanitation)
Data/parameter:	P _{access}
Unit	Number of people
Description	Number of additional persons having access to safe water in the project activity compared to the baseline scenario
Measured/calculated/default	Calculated
Source of data	Project Survey and baseline survey
Value(s) of monitored parameter	GS7128: 4,195 GS7129: 4,368 GS7130: 3,941 GS7131: 3,933 GS7367: 4,169 GS7368: 3,456 GS7369: 3,394 GS7370: 3,387 GS7371: 3,329 GS7372: 3,512
Monitoring equipment	Project Survey, Usage Survey and Household list
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Assessed every year using Project Survey, Usage Survey and Household list
QA/QC procedures:	Field Sheet scans were checked against soft copy surveys.
Purpose of data:	Calculation of SDG 6
Additional comments:	-

Relevant SDG Indicator	SDG 6.1.1 (Clean Water and Sanitation)
Data/parameter:	P _y
Unit	Number of people
Description	Number of persons having access to safe water in the project activity
Measured/calculated/default	Measured
Source of data	Project Survey and Usage Survey
Value(s) of monitored parameter	GS7128: 4,416 GS7129: 4,598 GS7130: 4,148 GS7131: 4,140 GS7367: 4,388 GS7368: 3,638 GS7369: 3,573 GS7370: 3,565 GS7371: 3,504 GS7372: 3,697
Monitoring equipment	Project Survey, Usage Survey and Household list
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Assessed every year using Project Survey, Usage Survey and Household list
QA/QC procedures:	Field Sheet scans were checked against soft copy surveys.

Purpose of data:	Calculation of SDG 6
Additional comments:	-

D.3. Implementation of sampling plan

For the surveys, households were selected at random from the household lists. First, the hand pumps were randomly selected for monitoring; secondly, households served by those hand pumps were randomly selected for surveying. Sample sizes were chosen to meet the minimum requirements set in the methodology requirements. All VPAs are homogenous, meaning characteristics of the villages in the VPAs are very similar with regards to economic, social and environmental factors. Therefore, the random selection process can ensure full representativeness of the project area.

In line with the TPDDTEC v1 methodology, monitoring surveys were conducted within the monitoring period and ensured that any possible deviations as a result of seasonal variation were taken into account. The surveys were designed to account for any possible changes due to the differing seasons with the respondents.

Water Consumption Field Test

The Water Consumption Field Test was carried out on a randomly selected sample of 45 households from the borehole user list. This complies with the recommended minimum sample size of 30 in the Gold Standard requirements. Furthermore, the sample confidence interval is within 10% of the mean. Between 2-3 staff carried out the test over a period of four days (1 day preparation and 3 days measurement) following a similar method as the Kitchen Performance Test, and all tests were conducted between 27/11/19 – 29/11/19. These dates fall in Kilifi County's, and Kenya's, short rains season. 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 days and an overall average per household was calculated.

The results showed that on average 9.30 litres of non-boiled clean water used only for drinking, hand washing and food preparation (capped at 7.5l) and 0 litres of boiled clean water is consumed per person per day. The total amount of water credited for in this monitoring period is equal to the average amount of clean non-boiled water consumed per person per day (7.5l), minus the average amount of boiled clean water consumed per person per day (0).

Usage Survey

The usage survey establishes the proportion of beneficiaries that use the boreholes, a key parameter in the emission reduction calculations. As all the boreholes were installed within 1 year of the start of the crediting period and are expected to last the lifetime of the project, minimum samples of 30 for different aged technologies are not necessary.

The first usage surveys in this monitoring period were carried out by field staff between the 11/11/2019 – 22/11/2019 on 110 households. The households that participated in the survey were randomly selected from the borehole user lists. The results confirmed that 100% of the respondents and their family members use the boreholes that were rehabilitated by CO2balance.**Project Survey Analysis**

Project surveys were conducted by 2-3 staff between 11/11/2019 – 22/11/2019 on 110 randomly selected households from across the homogenous VPAs in Kilifi County 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.

SECTION E. Calculation of SDG outcomes

E.1. Calculation of baseline value or estimation of baseline situation of each SDG outcome

Details of equations used to estimate baseline values for SDG outcomes appear below. Calculation is provided in the corresponding Emission Reductions calculations in the 'SDG Calculations' Sheet.

Outcomes for SDG 3 (Good Health and Wellbeing):

Providing access to safe water and removing the need to boil, reduces the amount of non-renewable biomass burned. Therefore, the amount of safe water provided can be taken as a proxy indicator of how these VPAs contribute towards the SDG 3 target of substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.

The quantity of biomass used in the baseline is calculated as follows:

$$P_{b,y} = W_{b,y} * Q_{p,y}$$

$$8.67 = 1.156 * 7.5$$

Where:

- $P_{b,y}$ Quantity of fuel that is consumed in the baseline scenario b during year y (kg/household-day)
- $W_{b,y}$ Quantity of wood fuel or fossil fuel required to boil 1 litre of water using technologies representative of baseline scenario b during year y
- $Q_{p,y}$ Quantity of safe water supplied in the project scenario p during year y, using the "zero or low" emissions' clean water supply technology

Outcomes for SDG 5 (Gender Equality):

The average decrease per household in time spent gathering firewood ($T_{b,y}$) will be taken as a proxy contribution towards the SDG target. The baseline parameter for time spent collecting firewood per household per week is monitored in the baseline project survey. The value for $T_{b,y}$ equals 4.62 hours.

Outcomes for SDG 6 (Clean Water and Sanitation):

The outcome for SDG 6 is quantified as the additional number of persons having access to safe water in the project activity compared to the baseline scenario. The baseline parameter for this SDG includes C_i which is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it (expressed as a percentage).

$$C_j = 5\%$$

Outcomes for SDG 13 (Climate Action):

CO2 emission reductions are the indicator to demonstrate that the project has raised capacity for effective climate change-related planning and management. This outcome is measured using the emission reduction calculations. The baseline indicators are detailed in Section D.1 and are as follows:

Baseline Emissions:

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

$$GS7128: 23,098 = 13,252 * ((0.92 * 112) + 8.692) * 0.0156$$

$$GS7129: 25,219 = 14,469 * ((0.92 * 112) + 8.692) * 0.0156$$

$$GS7130: 22,091 = 12,674 * ((0.92 * 112) + 8.692) * 0.0156$$

$$GS7131: 21,496 = 12,333 * ((0.92 * 112) + 8.692) * 0.0156$$

$$\begin{aligned} \text{GS7367: } 20,332 &= 11,665 * ((0.92 * 112) + 8.692) * 0.0156 \\ \text{GS7368: } 16,757 &= 9,614 * ((0.92 * 112) + 8.692) * 0.0156 \\ \text{GS7369: } 14,379 &= 8,250 * ((0.92 * 112) + 8.692) * 0.0156 \\ \text{GS7370: } 14,228 &= 8,163 * ((0.92 * 112) + 8.692) * 0.0156 \\ \text{GS7371: } 13,843 &= 7,942 * ((0.92 * 112) + 8.692) * 0.0156 \\ \text{GS7372: } 14,479 &= 8,307 * ((0.92 * 112) + 8.692) * 0.0156 \end{aligned}$$

Where:

$$B_{b,y} = (1 - C_j) * N_{j,y} * W_{i,y} * (Q_{j,y} + Q_{j,rawboil,y})$$

$$\begin{aligned} \text{GS7128: } 13,252 &= (1 - 0.05) * 1,609,027 * 0.001156 * (7.5 + 0) \\ \text{GS7129: } 14,469 &= (1 - 0.05) * 1,756,791 * 0.001156 * (7.5 + 0) \\ \text{GS7130: } 12,674 &= (1 - 0.05) * 1,538,823 * 0.001156 * (7.5 + 0) \\ \text{GS7131: } 12,333 &= (1 - 0.05) * 1,497,469 * 0.001156 * (7.5 + 0) \\ \text{GS7367: } 11,665 &= (1 - 0.05) * 1,416,310 * 0.001156 * (7.5 + 0) \\ \text{GS7368: } 9,614 &= (1 - 0.05) * 1,167,278 * 0.001156 * (7.5 + 0) \\ \text{GS7369: } 8,250 &= (1 - 0.05) * 1,001,720 * 0.001156 * (7.5 + 0) \\ \text{GS7370: } 8,163 &= (1 - 0.05) * 991,118 * 0.001156 * (7.5 + 0) \\ \text{GS7371: } 7,942 &= (1 - 0.05) * 964,337 * 0.001156 * (7.5 + 0) \\ \text{GS7372: } 8,307 &= (1 - 0.05) * 1,008,644 * 0.001156 * (7.5 + 0) \end{aligned}$$

Where:

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

E.2. Calculation of project value or estimation of project situation of each SDG outcome

Details of equations used to calculate project value for SDG outcomes appear below. Calculation is provided in the corresponding Emission Reductions calculations in the 'SDG Calculations' Sheet.

Outcomes for SDG 3 (Good Health and Wellbeing):

Providing access to safe water and removing the need to boil, reduces the amount of non-renewable biomass burned. Therefore, the amount of safe water provided can be taken as a proxy indicator of how these VPAs contribute towards the SDG 3 target of substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. Calculations are as follows:

$$\text{HAPR}_y = ((P_{b,y} - P_{p,y}) / P_{b,y}) * U_{p,y}$$

$$100\% = ((8.67 - 0) / 8.67) * 1$$

Where:

HAPR_y Total reduction in Household Air Pollution for project activity in year y (%)
 $P_{b,y}$ Quantity of fuel that is consumed in the baseline scenario b during year y (kg/household-day)
 $P_{p,y}$ Quantity of fuel that is consumed in the project scenario p during year y (kg/household-day)
 $U_{p,y}$ Usage rate in project scenario p during year y

$$P_{b,y} = W_{b,y} * Q_{p,y}$$

$$8.67 = 1.156 * 7.5$$

Where :

$W_{b,y}$ Quantity of wood fuel or fossil fuel required to boil 1 litre of water using technologies representative of baseline scenario b during year y

$Q_{p,y}$ Quantity of safe water supplied in the project scenario p during year y, using the “zero or low” emissions’ clean water supply technology

$$P_{p,y} = W_{b,y} * Q_{p, \text{cleanboil}, y}$$

$$0 = 1.156 * 0$$

Where :

$W_{b,y}$ Quantity of wood fuel or fossil fuel required to boil 1 litre of water using technologies representative of baseline scenario b during year y

$Q_{p, \text{cleanboil}, y}$ Quantity of safe water boiled in the project scenario p during year y, after installation of the project technology

Outcome for SDG 5 (Gender Equality):

The time spent collecting firewood in the project activity is given by the parameter $T_{p,y}$.

$$T_{p,y} = 4.09$$

Where:

$T_{p,y}$ Project time spent collecting firewood per household per week (hours)

Outcomes for SDG 6 (Clean Water and Sanitation):

The number of persons having access to safe water in the project activity is given by the parameter P_y .

$$\text{GS7128: } P_y = 4,416$$

$$\text{GS7129: } P_y = 4,598$$

$$\text{GS7130: } P_y = 4,148$$

$$\text{GS7131: } P_y = 4,140$$

$$\text{GS7367: } P_y = 4,388$$

$$\text{GS7368: } P_y = 3,638$$

$$\text{GS7369: } P_y = 3,573$$

$$\text{GS7370: } P_y = 3,565$$

$$\text{GS7371: } P_y = 3,504$$

$$\text{GS7372: } P_y = 3,697$$

Where:

P_y Number of persons having access to safe water in the project activity.

Outcome for SDG 13 (Climate Action):

CO₂e emission reductions are the indicator to demonstrate that the project has raised capacity for effective climate change-related planning and management contributing to SDG 13. The emissions reductions for the current monitoring period can be found in the corresponding Emission reductions excel document.

E.3. Calculation of net benefits as difference of baseline and project values or direct calculation for each SDG outcome

SDG 3 (Good Health and Wellbeing):

$$HAPR_y = ((P_{b,y} - P_{p,y}) / P_{b,y}) * U_{p,y}$$

$$\text{All VPAs: } 100\% = ((8.67 - 0) / 8.67) * 100\%$$

Where:

- HAPR_y Total reduction in Household Air Pollution for project activity in year y (%)
- P_{b,y} Quantity of fuel that is consumed in the baseline scenario b during year y (kg/household-day)
- P_{p,y} Quantity of fuel that is consumed in the project scenario p during year y (kg/household-day)
- U_{p,y} Usage rate in project scenario p during year y

SDG 5 (Gender Equality):

$$TR_y = T_{b,y} - T_{p,y}$$

$$\text{All VPAs: } 0.53 = (4.62 - 4.09)$$

- TR_y Total reduction time spent collecting firewood for project activity in year y (hours)
- T_{b,y} Baseline time spent collecting firewood per household per week (hours)
- T_{p,y} Project time spent collecting firewood per household per week (hours)

SDG 6 (Clean Water and Sanitation):

$$P_{\text{access}} = P_y * (1 - C_i) * U_{p,y}$$

$$\begin{aligned} \text{GS7128: } 4,195 &= 4,416 * (1 - 0.05) * 1 \\ \text{GS7129: } 4,368 &= 4,598 * (1 - 0.05) * 1 \\ \text{GS7130: } 3,941 &= 4,148 * (1 - 0.05) * 1 \\ \text{GS7131: } 3,933 &= 4,140 * (1 - 0.05) * 1 \\ \text{GS7367: } 4,169 &= 4,388 * (1 - 0.05) * 1 \\ \text{GS7368: } 3,456 &= 3,638 * (1 - 0.05) * 1 \\ \text{GS7369: } 3,394 &= 3,573 * (1 - 0.05) * 1 \\ \text{GS7370: } 3,387 &= 3,565 * (1 - 0.05) * 1 \\ \text{GS7371: } 3,329 &= 3,504 * (1 - 0.05) * 1 \\ \text{GS7372: } 3,512 &= 3,697 * (1 - 0.05) * 1 \end{aligned}$$

Where:

- P_{access} Number of additional persons having access to safe water in the project activity compared to the baseline scenario.
- P_y Number of persons having access to safe water in the project activity.
- C_i Expressed as a percentage, the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it.
- U_{p,y} Usage rate in project scenario p during year y

SDG 13 (Climate Action):

Emission Reductions Calculations per VPA:

GS7128

Total ERs for MP 1	
Emissions Reductions	
2018	535
2019	10,000
Total Emission Reductions for MP 1	10,535
Emission Reductions claimed for MP 1	10,535

GS7129

Total ERs for MP 1	
Emissions Reductions	
2018	1055
2019	10,000
Total Emission Reductions for MP 1	11,055
Emission Reductions claimed for MP 1	11,055

GS7130

Total ERs for MP 1	
Emissions Reductions	
2018	623
2019	10,000
Total Emission Reductions for MP 1	10,623
Emission Reductions claimed for MP 1	10,623

GS7131

Total ERs for MP 1	
Emissions Reductions	
2018	395
2019	10,000
Total Emission Reductions for MP 1	10,395
Emission Reductions claimed for MP 1	10,395

GS7367

Total ERs for MP 1	
Emissions Reductions	
2019	9,534
Total Emission Reductions for MP 1	9,534
Emission Reductions claimed for MP 1	9,534

GS7368

Total ERs for MP 1	
Emissions Reductions	
2019	9,616
Total Emission Reductions for MP 1	9,616
Emission Reductions claimed for MP 1	9,616

GS7369

Total ERs for MP 1	
Emissions Reductions	
2019	7,699
Total Emission Reductions for MP 1	7,699
Emission Reductions claimed for MP 1	7,699

GS7370

Total ERs for MP 1	
Emissions Reductions	
2019	7,671
Total Emission Reductions for MP 1	7,671
Emission Reductions claimed for MP 1	7,671

GS7371

Total ERs for MP 1	
Emissions Reductions	
2019	7,589
Total Emission Reductions for MP 1	7,589
Emission Reductions claimed for MP 1	7,589

GS7372

Total ERs for MP 1	
Emissions Reductions	
2019	7,616
Total Emission Reductions for MP 1	7,616
Emission Reductions claimed for MP 1	7,616

E.4. Summary of ex-post values of each SDG outcome for the current monitoring period

Item	Baseline estimate	Project estimate	Net benefit
SDG 3	50% reduction in exposure to Household Air Pollution due to boiling water	100% reduction in exposure to Household Air Pollution due to no longer boiling water	50% additional reduction in exposure to Household Air Pollution due to no longer boiling water, when compared to the baseline estimate
SDG 5	4.62 hours spent collecting firewood per household per week	4.09 hours spent collecting firewood per household per day	0.53 hours decrease in time spent collecting firewood
SDG 6	People with access to safe water in the baseline: GS7128: 221 GS7129: 230 GS7130: 207 GS7131: 207 GS7367: 219 GS7368: 182 GS7369: 179 GS7370: 178 GS7371: 175 GS7372: 185	People with access to safe water in the project: GS7128: 4,416 GS7129: 4,598 GS7130: 4,148 GS7131: 4,140 GS7367: 4,388 GS7368: 3,638 GS7369: 3,573 GS7370: 3,565 GS7371: 3,504 GS7372: 3,697	Additional people with access to safe water: GS7128: 4,195 GS7129: 4,368 GS7130: 3,941 GS7131: 3,933 GS7367: 4,169 GS7368: 3,456 GS7369: 3,394 GS7370: 3,387 GS7371: 3,329 GS7372: 3,512
SDG 13	Emissions reductions per VPA: GS7128: 10,548 tCO ₂ e/y GS7129: 10,493 tCO ₂ e/y GS7130: 10,493 tCO ₂ e/y GS7131: 10,548 tCO ₂ e/y GS7367: 9,507 tCO ₂ e/y GS7368: 9,589 tCO ₂ e/y GS7369: 7,671 tCO ₂ e/y GS7370: 7,644 tCO ₂ e/y GS7371: 7,562 tCO ₂ e/y GS7372: 7,589 tCO ₂ e/y	Emission reductions per VPA: GS7128: 10,535 tCO ₂ e/y GS7129: 11,055 tCO ₂ e/y GS7130: 10,623 tCO ₂ e/y GS7131: 10,395 tCO ₂ e/y GS7367: 9,534 tCO ₂ e/y GS7368: 9,616 tCO ₂ e/y GS7369: 7,699 tCO ₂ e/y GS7370: 7,671 tCO ₂ e/y GS7371: 7,589 tCO ₂ e/y GS7372: 7,616 tCO ₂ e/y	Emission reductions per VPA: GS7128: 10,535 tCO ₂ e/y GS7129: 11,055 tCO ₂ e/y GS7130: 10,623 tCO ₂ e/y GS7131: 10,395 tCO ₂ e/y GS7367: 9,534 tCO ₂ e/y GS7368: 9,616 tCO ₂ e/y GS7369: 7,699 tCO ₂ e/y GS7370: 7,671 tCO ₂ e/y GS7371: 7,589 tCO ₂ e/y GS7372: 7,616 tCO ₂ e/y

E.5. Comparison of actual value of outcomes with estimates in approved PDD

Ex-ante estimates can be found in the transition annex for these projects as the project began prior to the transition to Gold Standard for the Global Goals.

Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
SDG 3	50% reduction in exposure to Household Air Pollution due to boiling water	100% reduction in exposure to Household Air Pollution due to boiling water
SDG 5	at least 0.5 hours per trip per household time saved	Time spent collecting firewood has decreased during this monitoring period by 0.53 hours per week
SDG 6	Number of additional persons with access to safe water: All VPAs: 3,876	Actual persons with access to safe water: GS7128: 4,195 GS7129: 4,368 GS7130: 3,941 GS7131: 3,933 GS7367: 4,169 GS7368: 3,456 GS7369: 3,394 GS7370: 3,387 GS7371: 3,329 GS7372: 3,512
SDG 13	Ex-ante Emission Reductions per VPA: GS7128: 10,548 tCO ₂ e/y GS7129: 10,493 tCO ₂ e/y GS7130: 10,493 tCO ₂ e/y GS7131: 10,548 tCO ₂ e/y GS7367: 9,507 tCO ₂ e/y GS7368: 9,589 tCO ₂ e/y GS7369: 7,671 tCO ₂ e/y GS7370: 7,644 tCO ₂ e/y GS7371: 7,562 tCO ₂ e/y GS7372: 7,589 tCO ₂ e/y	Actual Emission Reductions of: GS7128: 10,535 tCO ₂ e/y GS7129: 11,055 tCO ₂ e/y GS7130: 10,623 tCO ₂ e/y GS7131: 10,395 tCO ₂ e/y GS7367: 9,534 tCO ₂ e/y GS7368: 9,616 tCO ₂ e/y GS7369: 7,699 tCO ₂ e/y GS7370: 7,671 tCO ₂ e/y GS7371: 7,589 tCO ₂ e/y GS7372: 7,616 tCO ₂ e/y

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

For SDG 3, in the project scenario there was a 100% reduction in exposure to Household Air pollution arising from smoke emitted from boiling water. This is due to no one boiling the borehole water in the project because it is safe for human consumption as determined by annual water quality tests. A 100% reduction is double the estimated reduction of 50% in the ex-ante estimations. This not only frees up time spent previously boiling water but also reduces the negative health implications of smoke related illnesses which are disproportionately suffered by women and children. This impacts positively towards SDG 3 good health and wellbeing.

Time spent collecting firewood reduced by 0.53 hours (32 mins) in the project. This is a slight improvement on the ex-ante estimate of 0.5 hours' time saving. The project presents a time saving for participants and impacts positively to SDG 5 gender equality.

All project participants now have access to safe water in the project. In the baseline, all participants collected water from unsafe sources such as rivers, streams and open wells, and had to boil their water in order to make it safe to drink. In the project, 100% of participants now collect their water from a rehabilitated borehole, no longer requiring them to boil water for purification and positively contributing towards SDG 6 clean water and sanitation. In addition, 5% of users in the project area were already consuming safe water without boiling and were therefore taken into account for the calculation of SDG 6 benefits.

For SDG 13, the ex-ante estimation was 10,000 emission reductions per year per VPA. Not all the boreholes in the VPAs were crediting for a full 12 months and this impacted the total ERs. Hence, some of the VPAs were below 10,000 tCO₂e during this monitoring period. As an average, the VPAs will generate 9,233 ERs for the duration of this monitoring period. Although this does not meet the target of 10,000 tCO₂-e/y, the projects are still achieving a large number of emission reductions during this monitoring period which would not be possible without the project contributing positively to SDG 13 climate action.

SECTION F. Stakeholder inputs and legal disputes

F.1. List all inputs/grievances which have been received for the project during the monitoring period together with their respective answers/actions

There are multiple methods for stakeholders to give feedback. Continuous input/Grievance Expression Process books are held in offices of the Water Area Chief and the Kilifi Sub-county offices for community members to provide feedback. In addition, Telephone numbers for the Kilifi Project Officer and the Project Development Coordinator, in Nairobi, were shared with stakeholders as well as email addresses for relevant CO₂balance staff and the Gold Standard were provided. All of the methods of communication were shared with stakeholders during the LSC.

No Stakeholder feedback or comments have been received during this monitoring period.

F.2. List all inputs/grievances from previous monitoring period where follow up action is to be verified in this monitoring period

There was no previous monitoring period to this one. No Stakeholder feedback or comments have been received during this monitoring period hence no follow up action has been taken during this monitoring period.

F.3. Provide details of any legal contest or dispute that has arisen with the project during the monitoring period

No legal contest or dispute has arisen with the project.