Gold standard for the global goals
Monitoring report

June 2017, version 1

Title of the project	GS1247 VPA 65 Zoba Debub Community Boreholes (GS5038) GS1247 VPA 66 Zoba Debub Community Boreholes (GS5039) GS1247 VPA 67 Zoba Debub Community Boreholes (GS5040) GS1247 VPA 68 Zoba Debub Community Boreholes (GS5041) GS1247 VPA 69 Zoba Debub Community Boreholes (GS5042) GS1247 VPA 70 Zoba Debub Community Boreholes (GS5043) GS1247 VPA 119 Zoba Debub Community Boreholes (GS5825) GS1247 VPA 120 Zoba Debub Community Boreholes (GS5826) GS1247 VPA 121 Zoba Debub Community Boreholes (GS5827) GS1247 VPA 176 Zoba Debub Community Boreholes (GS7330) GS1247 VPA 177 Zoba Debub Community Boreholes (GS7331) GS1247 VPA 178 Zoba Debub Community Boreholes (GS7332) GS1247 VPA 179 Zoba Debub Community Boreholes (GS7333) GS1247 VPA 180 Zoba Debub Community Boreholes (GS7334) GS1247 VPA 181 Zoba Debub Community Boreholes (GS7335) GS1247 VPA 182 Zoba Debub Community Boreholes (GS7336)
Gold Standard project id	VPA 65 – GS 5038 VPA 66 – GS 5039 VPA 67 – GS 5040 VPA 68 – GS 5041 VPA 69 – GS 5042 VPA 70 – GS 5043 VPA 119 – GS 5825 VPA 120 – GS 5826 VPA 121 – GS 5827 VPA 176 – GS 7330 VPA 177 – GS 7331 VPA 178 – GS 7332 VPA 179 – GS 7333 VPA 180 – GS 7334 VPA 181 – GS 7335 VPA 182 – GS 7336
Version number of the monitoring report	Version 5
Completion date of the monitoring report	13/01/2020
Date of project design certification	VPAs 65-70: 02/03/2017 VPAs 119-121: 05/04/2019 VPAs 176-182: 18/06/2019
Start date of crediting period	GS5038: 21/10/2016 GS5039: 21/10/2016 GS5040: 23/10/2016 GS5041: 23/10/2016 GS5042: 26/10/2016 GS5043: 22/10/2016 GS5825: 08/05/2017 GS5826: 05/05/2017 GS5827: 05/05/2017 GS7330: 25/10/2017 GS7331: 25/10/2017 GS7332: 25/10/2017 GS7333: 25/10/2017 GS7334: 25/10/2017 GS7335: 25/10/2017 GS7336: 25/10/2017
Duration of this monitoring period	GS5038: (20/10/2017) to (31/05/2019) MP2 GS5039: (20/10/2017) to (31/05/2019) MP2

	GS5040: (22/10/2017) to (31/05/2019) MP2 GS5041: (22/10/2017) to (31/05/2019) MP2 GS5042: (25/10/2017) to (31/05/2019) MP2 GS5043: (21/10/2017) to (31/05/2019) MP2 GS5825: (08/05/2017) to (31/05/2019) MP1 GS5826: (05/05/2017) to (31/05/2019) MP1 GS5827: (05/05/2017) to (31/05/2019) MP1 GS7330: (25/10/2017) to (31/05/2019) MP2 GS7331: (25/10/2017) to (31/05/2019) MP2 GS7332: (25/10/2017) to (31/05/2019) MP2 GS7333: (25/10/2017) to (31/05/2019) MP2 GS7334: (25/10/2017) to (31/05/2019) MP2 GS7335: (25/10/2017) to (31/05/2019) MP2 GS7336: (25/10/2017) to (31/05/2019) MP2
Duration of previous monitoring period	GS5038: (20/10/2016) to (19/10/2017) MP1 GS5039: (20/10/2016) to (19/10/2017) MP1 GS5040: (22/10/2016) to (21/10/2017) MP1 GS5041: (22/10/2016) to (21/10/2017) MP1 GS5042: (25/10/2016) to (24/10/2017) MP1 GS5043: (21/10/2016) to (20/10/2017) MP1 GS5825: N/A GS5826: N/A GS5827: N/A GS7330: (29/10/2016) to (28/10/2023) GS7331: (04/01/2017) to (03/01/2024) GS7332: (18/01/2017) to (17/01/2024) GS7333: (24/02/2017) to (23/02/2024) GS7334: (01/02/2017) to (31/01/2024) GS7335: (26/10/2016) to (25/10/2023) GS7336: (30/12/2016) to (29/12/2023)
Project representative(s)	Ilona Coulson-Ashworth
Host Country	Eritrea
Certification pathway (activity certification/impact certification)	Impact Certification
SDG Contributions targeted (as per approved PDD)	1 – SDG 3 – Good Health and Well-being 2 – SDG 5 - Gender Equality 3 – SDG 6 - Clean Water and Sanitation 4 - SDG 13 - Climate Action
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)	SDG 3: 80% decrease in household smoke (All VPAs) SDG 5: 0.5 hours of time saved by borehole project on average per household per day (All VPAs) SDG 6: 50,879 additional people gain access to safe water GS5038: 2751 GS5039: 2638 GS5040: 2699 GS5041: 2856 GS5042: 2765 GS5043: 2810 GS5825: 2979 GS5826: 2874 GS5827: 3204

	GS7330: 3830 GS7331: 3408 GS7332: 3648 GS7333: 3718 GS7334: 3367 GS7335: 3603 GS7336: 3729 SDG 13: 10,000 tCO2e (All VPAs)
Total amount of certified SDG impact (as per approved methodology) achieved in this monitoring period	SDG 3: 99% decrease in household smoke (All VPAs) SDG 5: 0.29 hours of time saved by borehole project on average per household per day (All VPAs) SDG 6: 50,370 additional people gain access to safe water GS5038: 2723 GS5039: 2612 GS5040: 2672 GS5041: 2827 GS5042: 2737 GS5043: 2782 GS5825: 2949 GS5826: 2845 GS5827: 3172 GS7330: 3792 GS7331: 3374 GS7332: 3612 GS7333: 3681 GS7334: 3333 GS7335: 3567 GS7336: 3692 SDG 13: Capped at 10,000 tCO2e/y per VPA. GS5038: 16,450 tCO2e GS5039: 16,554 tCO2e GS5040: 16,190 tCO2e GS5041: 16,681 tCO2e GS5042: 16,827 tCO2e GS5043: 16,798 tCO2e GS5825: 20,198 tCO2e GS5826: 19,980 tCO2e GS5827: 20,656 tCO2e GS7330: 16,000 tCO2e GS7331: 16,000 tCO2e GS7332: 16,000 tCO2e GS7333: 16,000 tCO2e GS7334: 16,000 tCO2e GS7335: 16,000 tCO2e GS7336: 16,000 tCO2e

SECTION A. Description of project

A.1. Purpose and general description of project

In Eritrea over 45% of the rural population do not have access to safe water and rely exclusively on unprotected wells, lakes and other open water sources that are highly susceptible to contamination. Annexed from Ethiopia in 1962, the country has experienced periodic conflict and continuing tensions in the region.

Armed conflict, mandatory military service and external migration, takes men away from their villages and means that many rural families are headed by women, often widows. Female headed households in Eritrea face several disadvantages and as a result they cultivate less land and have fewer assets. These women then bear the burden of producing food as well as providing care for their families, including travelling to collect firewood and water.

Many existing boreholes in Eritrea and have fallen into disrepair because maintenance programmes have been poorly managed, or proven too expensive leaving people without access to clean water. CO2balance's project partner Vita 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.

Zoba Debub is a largely rural district in which many 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 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.

In total 87 boreholes were rehabilitated as part of these projects between the 20th October 2016 and 2nd March 2018. 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	Lat	Long	Rehabilitation Date	No People
65	5038	ZD037	Adiembahsea	14.60234	39.39475	20/10/2016	590
65	5038	ZD050	Adiferas-Maygoduf	14.73116	39.39709	27/10/2016	587
65	5038	ZD103	Adideraghudi	14.52234	38.80716	27/12/2016	870
65	5038	ZD114	Adenfi	14.63129	38.79645	29/01/2017	390
65	5038	ZD138	Adiraghenay	14.52966	38.42865	18/03/2017	314
66	5039	ZD038	Adighubo	14.58613	39.39523	20/10/2016	535
66	5039	ZD039	Kesadburka	14.60510	39.37565	21/10/2016	272
66	5039	ZD040	Adichoka	14.57931	39.38140	21/10/2016	569
66	5039	ZD045	Adimenekseyto	14.53146	39.48664	24/10/2016	355
66	5039	ZD101	Endagherghish	14.55700	38.75309	25/12/2016	907
67	5040	ZD042	Adimighiderbena	14.60044	39.46406	22/10/2016	226
67	5040	ZD044	Adimesraha	14.61916	39.45731	23/10/2016	727
67	5040	ZD104	Adiguwur	14.52174	38.78847	27/12/2016	519
67	5040	ZD105	Adibaresom	14.53625	38.71119	28/12/2016	449
67	5040	ZD110	Kusmodengolo	14.70787	38.84775	24/01/2017	778
68	5041	ZD043	Adiqelqelmelasa	14.61063	39.47063	22/10/2016	158

68	5041	ZD049	Adiareghen	14.55251	39.34296	26/10/2016	667
68	5041	ZD102	Himbar	14.56032	38.75577	25/12/2016	839
68	5041	ZD120	Adighodo	14.77771	39.12907	18/01/2017	569
68	5041	ZD111	Adihdug	14.58293	38.85257	25/01/2017	623
69	5042	ZD046	Adigolo-Imbasoyra	14.72127	39.50390	25/10/2016	173
69	5042	ZD051	Adikaribosa-maygoduf	14.72284	39.40948	27/10/2016	185
69	5042	ZD106	Adiguer	14.55558	38.77398	28/12/2016	483
69	5042	ZD145	Mekabirtsabla	14.53337	38.50480	22/03/2017	864
69	5042	ZD148	Adihawya	14.55404	38.54628	23/03/2017	1060
70	5043	ZD041	Dibdib	14.63570	39.41110	21/10/2016	572
70	5043	ZD048	Ambeseteghеleba	14.52690	39.36560	26/10/2016	419
70	5043	ZD109	Adishertai	14.56879	38.67112	04/01/2017	522
70	5043	ZD123	Haddishadihalai	15.01517	39.30918	27/02/2017	896
70	5043	ZD151	Adishimandit	14.53306	38.55421	24/03/2017	401
119	5825	ZD162	Adisemharo	14.86439	38.54125	07/05/2017	528
119	5825	ZD165	Adibelesey	15.02274	38.57111	10/05/2017	629
119	5825	ZD178	Adilalayadi	14.86234	38.65809	16/05/2017	490
119	5825	ZD183	Maihans	14.63533	38.79704	10/12/2017	363
119	5825	ZD191	Adiasmeru	14.97780	38.58642	29/12/2017	406
119	5825	ZD199	Adiembarhagoda	14.54391	39.44573	27/01/2018	236
119	5825	ZD204	Embamedhan	14.55520	39.37903	31/01/2018	327
120	5826	ZD158	Adinefas	14.86579	38.42416	04/05/2017	501
120	5826	ZD167	Aditsetserat	15.02267	38.57102	11/05/2017	521
120	5826	ZD180	Areza	14.92754	38.56274	17/05/2017	642
120	5826	ZD189	Dekiwerasi	14.94946	38.61462	27/12/2017	430
120	5826	ZD190	Adiwesek	14.81237	38.41819	28/12/2017	412
120	5826	ZD207	Adinedwe	14.56684	39.47941	11/02/2018	368
121	5827	ZD157	Adinefas-Maiaye	14.866 80	38.40997	04/05/2017	390
121	5827	ZD164	Adimomosh-sebea	15.00224	38.57816	09/05/2017	584
121	5827	ZD176	Adikushet	14.94407	38.66774	15/05/2017	723
121	5827	ZD192	Adighurdi	14.93222	38.58708	31/12/2017	317
121	5827	ZD201	Adiembakom	14.53887	39.43643	28/01/2018	266
121	5827	ZD211	Damba	14.61719	39.37820	02/03/2018	924
176	7330	ZD052	Saloda	14.64671	39.46481	28/10/2016	415
176	7330	ZD112	Betghebriel	14.61149	38.87411	26/01/2017	674
176	7330	ZD127	Dekilefey	14.75073	39.2851	19/02/2017	782
176	7330	ZD129	Arazn	14.63906	39.25501	22/02/2017	787
176	7330	ZD135	Adikolakul	14.54717	38.49318	16/03/2017	217
176	7330	ZD140	Maighorzo 1	14.51071	38.42885	19/03/2017	955

177	7331	ZD108	Kuhulizbi	14.51105	38.63651	03/01/2017	877
177	7331	ZD119	Adimesghan	14.77644	39.15696	18/01/2017	181
177	7331	ZD139	Adihans	14.53787	38.45353	19/03/2017	1095
177	7331	ZD142	Adihidug	14.54723	38.51401	20/03/2017	383
177	7331	ZD152	Aditsekemete	14.52733	38.55903	25/03/2017	872
178	7332	ZD117	Adighad 2	14.79131	39.17464	17/01/2017	491
178	7332	ZD118	Adighad 1	14.79244	39.17344	17/01/2017	455
178	7332	ZD115	Dembesilase	14.63725	38.81214	30/01/2017	988
178	7332	ZD132	Aditelae	14.75135	39.18513	24/02/2017	757
178	7332	ZD137	Adiserenta	14.54437	38.49462	17/03/2017	434
178	7332	ZD146	Meztaeshenfae	14.52633	38.49049	22/03/2017	523
179	7333	ZD130	Wulusho 1	14.63958	39.23034	23/02/2017	725
179	7333	ZD121	Adizebe	14.75382	39.13788	26/02/2017	297
179	7333	ZD122	Adihabenat	14.79504	39.08945	27/02/2017	693
179	7333	ZD134	Adimesihal	14.61430	39.37714	06/03/2017	660
179	7333	ZD136	Endabaynas	14.54377	38.4754	17/03/2017	565
179	7333	ZD147	Adimerobi	14.57015	38.54163	23/03/2017	778
180	7334	ZD116	Adilghese	14.67419	38.84986	31/01/2017	833
180	7334	ZD125	Maichena	14.56999	39.2709	15/02/2017	796
180	7334	ZD128	Chearegahit	14.77176	39.22009	20/02/2017	419
180	7334	ZD131	Wulusho 2	14.63845	39.23017	23/02/2017	594
180	7334	ZD150	Gezaterer	14.53168	38.55079	24/03/2017	725
181	7335	ZD047	Adimelhidaga	14.72299	39.47275	25/10/2016	591
181	7335	ZD113	Unagaaben	14.63448	38.86509	27/01/2017	799
181	7335	ZD124	Ghenetseba	14.83629	39.08263	28/02/2017	711
181	7335	ZD143	Aditsetser	14.55885	38.51297	21/03/2017	1133
181	7335	ZD144	Adiamine	14.54193	38.51299	22/03/2017	369
182	7336	ZD107	Adiburkut	14.51480	38.68100	29/12/2016	877
182	7336	ZD126	Adiflho	14.75765	039.29788	18/02/2017	757
182	7336	ZD133	Unawelesti	14.50053	39.279	25/02/2017	136
182	7336	ZD141	Maighorzo 2	14.51118	38.42827	20/03/2017	982
182	7336	ZD149	Adinaamn	14.53102	38.55626	23/03/2017	977

The date of rehabilitation was confirmed by a Repair Confirmation Form which was signed by the mechanic carrying out the repair along with a village administrator from the local community. 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.

A.2. Location of project

Below is the geographic reference to allow unique identification of the project boundary for the project. The district Zoba Debub, Eritrea is marked in green on the Google Earth images. 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 in green on the Google Earth images. 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.

Project Area Coordinates		
	Latitude	Longitude
GPS1	14.674048°	38.262243°
GPS2	14.912112°	38.222587°
GPS3	15.196781°	38.392505°
GPS4	15.270219°	39.083873°
GPS5	14.841412°	39.670669°
GPS6	14.404751°	39.282490°

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 7 years, twice renewable totaling 21 years as per the approved PDD.

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

Project ID	Start Date	Crediting period start date	Crediting period end date
5038	20/10/2016	21/10/2016	20/10/2023
5039	20/10/2016	21/10/2016	20/10/2023
5040	22/10/2016	23/10/2016	22/10/2023
5041	22/10/2016	23/10/2016	22/10/2023
5042	25/10/2016	26/10/2016	25/10/2023
5043	21/10/2016	22/10/2016	21/10/2023
5825	07/05/2017	08/05/2017	07/05/2024
5826	04/05/2017	05/05/2017	04/05/2024
5827	04/05/2017	05/05/2017	04/05/2024
7330	25/10/2017	29/10/2016	28/10/2023
7331	25/10/2017	04/01/2017	03/01/2024
7332	25/10/2017	18/01/2017	17/01/2024
7333	25/10/2017	24/02/2017	23/02/2024
7334	25/10/2017	01/02/2017	31/01/2024
7335	25/10/2017	26/10/2016	25/10/2023
7336	25/10/2017	30/12/2016	29/12/2023

SECTION B. Implementation of project

B.1. Description of implemented project

Vita has rehabilitated 87 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 boreholes undergo annual water quality testing to ensure the water is safe for human consumption as per national water standards. The water quality is approved by the Ministry of Land, Water and Environment in Zoba Debub.

Furthermore, grievance expression process books placed at all water points have not received any feedback and Vita 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.

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

The Baseline Water Boiling Test (BWBT) measures the amount of biomass required to purify by boiling one litre of water for 10 minutes using technologies and fuels representative of the baseline scenario. The original BWBT conducted in Zoba Debub had a $W_{b,y}$ of 0.3kg. This is the value of the project parameter $W_{p,y}$ with which the project was registered. When comparing to baselines in our other projects including two other WBTs in Eritrea, we noticed that this result was anomalous and when querying it with the team we discovered that kerosene was used by field staff during the tests to light the fire, therefore using less wood. As this figure is set for the length of the project, this will result in a significant underestimate of the emission reductions over the length of the project.

As a result, co2balance project staff have been in contact with GS to request permission to redo the BWBT without the use of kerosene as this is not representative of the fuel use in the baseline or project scenarios. GS staff granted permission to redo the test and it was conducted on 40 households representative of the baseline project scenario in Zoba Debub in August 2018.

The new value from the test is 0.8892kg for parameters $W_{b,y \text{ and }} W_{p,y}$ which is more in line with our other Eritrea projects and has been applied in this monitoring period, in the monitoring report and the accompanying emissions reductions calculations for these projects.

A design change review regarding VPAs 65-70 was approved on the 18th June 2019 which involved applying the new BWBT result in addition to re-bundling VPAs 65-70 to create 7 additional VPAs 176-182.

B.2.3. Date of crediting period

For VPAs 119 – 121, the start date of the crediting period was delayed. The estimated start date of the crediting period at the time of registration was as follows:

GS 5825: 25/04/2017
GS 5826: 25/04/2017
GS 5827: 25/04/2017

Due to unforeseen delays in rehabilitating the borehole technologies, the new crediting period start dates for the projects are as follows:

GS5825: 08/05/2017
GS5826: 05/05/2017
GS5827: 05/05/2017

For all other projects previously verified in this monitoring report, crediting period start dates remain the same.

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

As mentioned in section B.2.2, VPAs 65-70 were re-bundled to create seven additional VPAs due to an increase in the BWBT result. The new BWBT result increased the projected emission reductions of VPAs 65-70 to over credit. A design change review took place to create seven new VPAs using a mix of boreholes from VPAs 65-70.

VPAs 65-70 kept their original project start date as at least the first borehole in each VPA was maintained. Subsequent boreholes were randomly reallocated to new VPAs 176-182 (see table in section A.1) to ensure equal crediting across the 13 VPAs within microscale project requirements.

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. 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 ensures a minimum chance of original data being lost – all original copies of our project documentation are retained in the Eritrean 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 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 90/10 precision (90% confidence interval and 10% 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.

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 after first verification

- **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 Eritrean standards for potable water and all parameters will be shown to be within levels considered acceptable for domestic human consumption.

- **Usage Survey** - boreholes have been installed between 20/10/2016 – 02/03/2018 and are expected to last the lifetime of the project, minimum samples of 30 for different aged technologies will be applied. Overall 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 Assessment -** 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.

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 in July 2018.

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 Zoba Debub (GS 5038-43; 5825-27; 7330-36). 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 (Safe Water and Sanitation)
Data/parameter:	C_i
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)	0.00%
Choice of data or measurement methods and procedures	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. 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_2e/TJ
Description	Non-CO_2 (CH_4 and N_2O) 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_2e/TJ_{NCV})	Default Emissions factor (t_CO_2e/TJ_{NCV})
CH_4	300	25	7,500	7.5000
N_2O	4	298	1,192	1.1920
			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_2e/TJ
Description	Non-CO2 (CH4 and N2O) 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_2e/TJ_{NCV})	Default Emissions factor (t_CO_2e/TJ_{NCV})
CH_4	300	25	7,500	7.5000
N_2O	4	298	1,192	1.1920
			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:	$fNRB_{j,y}$
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)	0.97

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	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action), SDG 3.9.1 (Good Health and Well-Being)
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)	0.0008892
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: *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
Purpose of data	Calculation of emission reductions.
Additional comments	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action)
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)	0.0008892
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: *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
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)	0%
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 saved by borehole project on average per household per day prior to project (hours)
Source of data	Baseline survey
Value(s) applied)	0
Choice of data or measurement methods and procedures	Measured by question in the baseline survey.
Purpose of data	Calculating time saving by the project.
Additional comments	-

Relevant SDG Indicator	SDG 3.9.1 (Good Health and Well-Being)
Data/parameter:	Pb,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)	6.669
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 (Safe 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	N/A
Source of data	Borehole Project Database
Value(s) of monitored parameter	GS5038: 1,620,339 GS5039: 1,553,782 GS5040: 1,584,313 GS5041: 1,676,472 GS5042: 1,614,760 GS5043: 1,652,280 GS5825: 1,914,779 GS5826: 1,859,515 GS5827: 1,987,556 GS7330: 2,236,720 GS7331: 1,990,272 GS7332: 2,130,432 GS7333: 2,171,312 GS7334: 1,966,328 GS7335: 2,104,152 GS7336: 2,177,736
Monitoring equipment	Project Database
Measuring/reading/recording frequency:	Annual
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 (Safe 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	N/A
Source of data	Usage Survey
Value(s) of monitored parameter	99%
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:	N/A
Purpose of data:	Calculation of usage.
Additional comments:	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action), SDG 3.9.1 (Good Health and Well-Being)
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	*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:	Biennial
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. Last survey took place between 05/09/2018 – 27/09/2018.
QA/QC procedures:	N/A
Purpose of data:	Calculation of emission reductions.
Additional comments:	-

Relevant SDG Indicator	SDG 13.B.1 (Climate Action), SDG 3.9.1 (Good Health and Well-Being)
Data/parameter:	$Q_{p,cleanboil,y}$
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	N/A
Source of data	Water Consumption Field Test (WCFT)
Value(s) of monitored parameter	0
Monitoring equipment	WCFT Survey
Measuring/reading/recording frequency:	Biennial

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:	N/A
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	N/A
Source of data	Water Consumption Field Test (WCFT)
Value(s) of monitored parameter	0
Monitoring equipment	WCFT Survey
Measuring/reading/recording frequency:	Biennial
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:	N/A
Purpose of data:	Calculation of emission reductions.
Additional comments:	-

Relevant SDG Indicator	SDG 6.1.1 (Safe Water and Sanitation)
Data/parameter:	Quality of Treated Water
Unit	Parameters as per national standards
Description	Performance of the treatment technology
Measured/calculated/default	N/A
Source of data	Laboratory Tests
Value(s) of monitored parameter	Pass
Monitoring equipment	Laboratory equipment
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	The Water Resource Department from the Ministry of Land, Water & Environment has certified each water supply as in line with national standards.
QA/QC procedures:	N/A

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	tCO2e per year
Description	Leakage in project scenario p during year y
Measured/calculated/default	0
Source of data	Baseline and Monitoring surveys
Value(s) of monitored parameter	0
Monitoring equipment	Desk based research
Measuring/reading/recording frequency:	Biennial
Calculation method (if applicable):	Assessed every two years using baseline and monitoring surveys. Last Leakage assessment took place in July 2018 with no Leakage sources identified.
QA/QC procedures:	N/A
Purpose of data:	Calculation of leakage.
Additional comments:	-

Relevant SDG Indicator	SDG 5.4.1 (Gender Equality)
Data/parameter:	$TP_{,y}$
Unit	hours
Description	Project time saved by borehole project on average per household per day (hours)
Measured/calculated/default	0
Source of data	Project Survey
Value(s) of monitored parameter	0.29
Monitoring equipment	Project Survey
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Assessed every year using Project Survey Question 32
QA/QC procedures:	N/A
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 time saved by borehole project on average per household per day for project activity in year y (hours)
Measured/calculated/default	0
Source of data	Project Survey and baseline survey
Value(s) of monitored parameter	0.29
Monitoring equipment	Project Survey
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Assessed every year using Project Survey Question 32
QA/QC procedures:	N/A
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	0
Source of data	Project Survey and baseline survey
Value(s) of monitored parameter	99%
Monitoring equipment	Project Survey
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Assessed every year using Project Survey
QA/QC procedures:	N/A
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	0
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	0
Source of data	Project Survey and baseline survey
Value(s) of monitored parameter	GS5038: 2723 GS5039: 2612 GS5040: 2672 GS5041: 2827 GS5042: 2737 GS5043: 2782 GS5825: 2949 GS5826: 2845 GS5827: 3172 GS7330: 3792 GS7331: 3374 GS7332: 3612 GS7333: 3681 GS7334: 3333 GS7335: 3567 GS7336: 3692
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:	N/A
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	0
Source of data	Usage Survey and Household list

Value(s) of monitored parameter	GS5038: 2751 GS5039: 2638 GS5040: 2699 GS5041: 2856 GS5042: 2765 GS5043: 2810 GS5825: 2979 GS5826: 2874 GS5827: 3204 GS7330: 3830 GS7331: 3408 GS7332: 3648 GS7333: 3718 GS7334: 3367 GS7335: 3603 GS7336: 3729
Monitoring equipment	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:	N/A
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.

Water Consumption Field Test

The Water Consumption Field Test was carried out on a randomly selected sample of 34 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 18/09/2018 – 27/09/2018. 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 10.63 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. Therefore the annual usage survey has been conducted using a minimum sample size of 100.

The first usage surveys in this monitoring period were carried out by 2-3 staff between the 01/09/2018 - 27/09/2018. The households that participated in the survey were randomly selected from the borehole user lists. The results confirmed that 99% of the respondents and their family members use the boreholes that were rehabilitated by Vita.

Project Survey Analysis

Project surveys were conducted by 2-3 staff between 01/09/2018 – 26/09/2018 on 123 randomly selected households from across the homogenous VPAs in Zoba Debub 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:

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

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

Outcome for SDG 5 (Gender Equality):

The average time saved per household due to the presence of the borehole project. $T_{b,y}$ baseline parameter assumed to be 0 before the project activity will be taken as a proxy contribution towards the SDG target.

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).

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:

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

Where:

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

Where:

$N_{j,y}$	Number of person.days consuming water supplied by project scenario p through year y
C_j	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:

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

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

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

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

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

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

$Q_{p,cleanboil,y}$ 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 overall time saved by borehole project on average per household per day in the project activity is calculated as follows:

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

Where:

TR_y Total time saved by borehole project on average per household per day for project activity in year y (hours)

$T_{b,y}$ Baseline time saved by borehole project on average per household per day in year y (hours)

$T_{p,y}$ Project time saved by borehole project on average per household per day in year y (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. Calculations are as follows:

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

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_j 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

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):

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

All VPAs: ((6.669-0)/6.669) * 0.99 = 99%

SDG 5 (Gender Equality):

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

All VPAs: 0.29 = 0.29 – 0

SDG 6 (Clean Water and Sanitation):

$P_{access} = Py * (1 - Ci) * U_{p,y}$

GS5038: 2751 * (1-0) * 0.99 = 2723
GS5039: 6858 * (1-0) * 0.99 = 2612
GS5040: 7047 * (1-0) * 0.99 = 2672
GS5041: 6873 * (1-0) * 0.99 = 2827
GS5042: 7028 * (1-0) * 0.99 = 2737
GS5043: 7171 * (1-0) * 0.99 = 2782
GS5825: 6845 * (1-0) * 0.99 = 2949
GS5826: 6845 * (1-0) * 0.99 = 2845
GS5827: 6845 * (1-0) * 0.99 = 3172
GS7330: 6845 * (1-0) * 0.99 = 3792
GS7331: 6845 * (1-0) * 0.99 = 3374
GS7332: 6845 * (1-0) * 0.99 = 3612
GS7333: 6845 * (1-0) * 0.99 = 3681
GS7334: 6845 * (1-0) * 0.99 = 3333
GS7335: 6845 * (1-0) * 0.99 = 3567
GS7336: 6845 * (1-0) * 0.99 = 3692

SDG 13 (Climate Action):

Emission Reductions Calculations per VPA:

GS5038

Total ERs for MP2	
Emissions Reductions	
2017	2313
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,450

GS5039

Total ERs for MP2	
Emissions Reductions	
2017	2417
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,554

GS5040

Total ERs for MP2	
Emissions Reductions	
2017	2053
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,190

GS5041

Total ERs for MP2	
Emissions Reductions	
2017	2544
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,681

GS5042

Total ERs for MP2	
Emissions Reductions	
2017	2690
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,827

GS5043

Total ERs for MP2	
Emissions Reductions	
2017	2661
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,798

GS5825

Total ERs for MP1	
Emissions Reductions	
2017	4762
2018	10,000
2019	5,436
Emission Reductions claimed for MP1	20,198

GS5826

Total ERs for MP1	
Emissions Reductions	
2017	4736
2018	10,000
2019	5,244
Emission Reductions claimed for MP1	19,980

GS5827

Total ERs for MP1	
Emissions Reductions	
2017	4811
2018	10,000
2019	5,845
Emission Reductions claimed for MP1	20,656

GS7330

Total ERs for MP2	
Emissions Reductions	
2017	1863
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,000

GS7331

Total ERs for MP2	
Emissions Reductions	
2017	1863
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,000

GS7332

Total ERs for MP2	
Emissions Reductions	
2017	1863
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,000

GS7333

Total ERs for MP2	
Emissions Reductions	
2017	1863
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,000

GS7334

Total ERs for MP2	
Emissions Reductions	
2017	1863
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,000

GS7335

Total ERs for MP2	
Emissions Reductions	
2017	1863
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,000

GS7336

Total ERs for MP2	
Emissions Reductions	
2017	1863
2018	10,000
2019	4,137
Emission Reductions claimed for MP2	16,000

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	0% reduction in exposure to Household Air Pollution due to no longer boiling water	99% reduction in exposure to Household Air Pollution due to no longer boiling water	99% additional reduction in exposure to Household Air Pollution due to no longer boiling water
SDG 5	0 hours of time saved by borehole project on average per household per day	0.29 hours of time saved by borehole project on average per household per day	0.29 hours of time saved by borehole project on average per household per day
SDG 6	0 people with access to safe water	People with access to safe water: GS5038: 2751 GS5039: 2638 GS5040: 2699 GS5041: 2856 GS5042: 2765 GS5043: 2810 GS5825: 2979 GS5826: 2874 GS5827: 3204 GS7330: 3830 GS7331: 3408 GS7332: 3648 GS7333: 3718 GS7334: 3367 GS7335: 3603 GS7336: 3729	Additional people with access to safe water: GS5038: 2723 GS5039: 2612 GS5040: 2672 GS5041: 2827 GS5042: 2737 GS5043: 2782 GS5825: 2949 GS5826: 2845 GS5827: 3172 GS7330: 3792 GS7331: 3374 GS7332: 3612 GS7333: 3681 GS7334: 3333 GS7335: 3567 GS7336: 3692
SDG 13	Baseline Emission Reductions of: GS5038: 16,450 tCO2e GS5039: 16,554 tCO2e GS5040: 16,190 tCO2e GS5041: 16,681 tCO2e GS5042: 16,827 tCO2e GS5043: 16798 tCO2e GS5825: 20,198 tCO2e GS5826: 19,980 tCO2e GS5827: 20,656 tCO2e GS7330: 16,000 tCO2e GS7331: 16,000 tCO2e GS7332: 16,000 tCO2e GS7333: 16,000 tCO2e GS7334: 16,000 tCO2e GS7335: 16,000 tCO2e GS7336: 16,000 tCO2e	Project Emission Reductions of: GS5038: 0 tCO2e GS5039: 0 tCO2e GS5040: 0 tCO2e GS5041: 0 tCO2e GS5042: 0 tCO2e GS5043: 0 tCO2e GS5825: 0 tCO2e GS5826: 0 tCO2e GS5827: 0 tCO2e GS7330: 0 tCO2e GS7331: 0 tCO2e GS7332: 0 tCO2e GS7333: 0 tCO2e GS7334: 0 tCO2e GS7335: 0 tCO2e GS7336: 0 tCO2e	Net benefit Emission Reductions of: GS5038: 16,450 tCO2e GS5039: 16,554 tCO2e GS5040: 16,190 tCO2e GS5041: 16,681 tCO2e GS5042: 16,827 tCO2e GS5043: 16798 tCO2e GS5825: 20,198 tCO2e GS5826: 19,980 tCO2e GS5827: 20,656 tCO2e GS7330: 16,000 tCO2e GS7331: 16,000 tCO2e GS7332: 16,000 tCO2e GS7333: 16,000 tCO2e GS7334: 16,000 tCO2e GS7335: 16,000 tCO2e GS7336: 16,000 tCO2e

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.

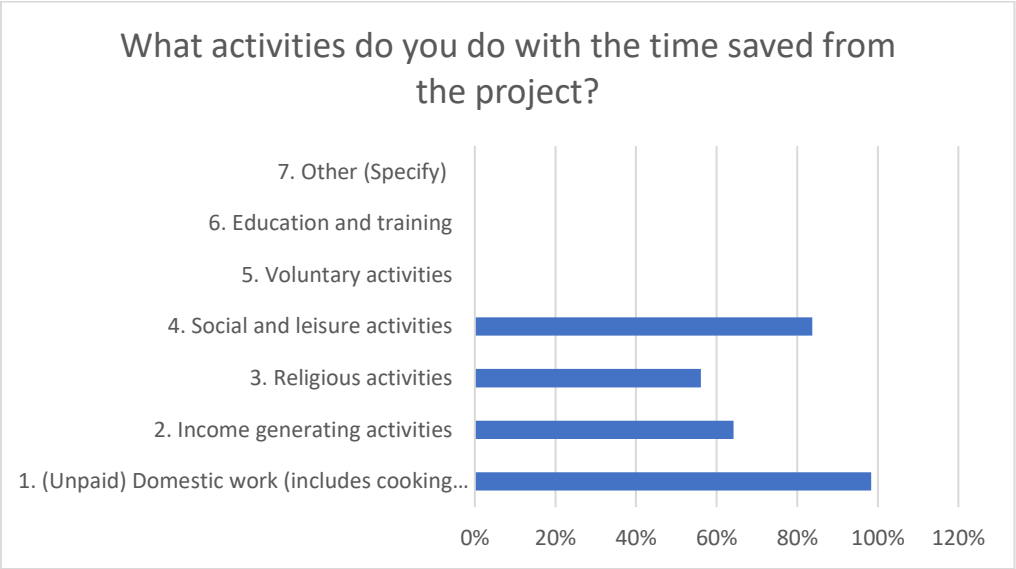
Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
SDG 3	80% reduction in exposure to Household Air Pollution due to boiling water	99% reduction in exposure to Household Air Pollution due to boiling water
SDG 5	at least 0.5 hours of time saved by borehole project on average per household per day	0.29 hours of time saved by borehole project on average per household per day
SDG 6	Number of additional persons with access to safe water: GS5038: 2751 GS5039: 2638 GS5040: 2699 GS5041: 2856 GS5042: 2765 GS5043: 2810 GS5825: 2979 GS5826: 2874 GS5827: 3204 GS7330: 3830 GS7331: 3408 GS7332: 3648 GS7333: 3718 GS7334: 3367 GS7335: 3603 GS7336: 3729	Actual persons with access to safe water: GS5038: 2723 GS5039: 2612 GS5040: 2672 GS5041: 2827 GS5042: 2737 GS5043: 2782 GS5825: 2949 GS5826: 2845 GS5827: 3172 GS7330: 3792 GS7331: 3374 GS7332: 3612 GS7333: 3681 GS7334: 3333 GS7335: 3567 GS7336: 3692
SDG 13	Ex-ante Emission Reductions of: GS5038: 16,110 tCO2e GS5039: 16,110 tCO2e GS5040: 16,055 tCO2e GS5041: 16,055 tCO2e GS5042: 15,973 tCO2e GS5043: 16,082 tCO2e GS5825: 20,630 tCO2e GS5826: 20,712 tCO2e GS5827: 20,712 tCO2e GS7330: 15,973 tCO2e GS7331: 15,973 tCO2e GS7332: 15,973 tCO2e GS7333: 15,973 tCO2e GS7334: 15,973 tCO2e GS7335: 15,973 tCO2e GS7336: 15,973 tCO2e	Actual Emission Reductions of: GS5038: 16,450 tCO2e GS5039: 16,554 tCO2e GS5040: 16,190 tCO2e GS5041: 16,681 tCO2e GS5042: 16,827 tCO2e GS5043: 16798 tCO2e GS5825: 20,198 tCO2e GS5826: 19,980 tCO2e GS5827: 20,656 tCO2e GS7330: 16,000 tCO2e GS7331: 16,000 tCO2e GS7332: 16,000 tCO2e GS7333: 16,000 tCO2e GS7334: 16,000 tCO2e GS7335: 16,000 tCO2e GS7336: 16,000 tCO2e

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

These projects were design certified prior to transition to Gold Standard for the Global Goals, hence all ex-ante estimates of SDG outcomes are derived from the relevant transition annex. All SDG targets were either met or exceeded and had positive SDG impacts.

For SDG 3, in the project scenario there was a 99% 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. This not only frees up time spent previously boiling water but also reduces the negative health implications of smoke related illnesses which are disproportionally suffered by women and children. This impacts positively towards SDG 3 good health and wellbeing.

Time saved by respondents of the borehole project was 0.29 hours (17.4 minutes) for SDG 5 contribution. With this time saving, project beneficiaries were able to do other activities. 98% of respondents recorded using the time saving to complete domestic work as well as 64% spending time on income generating activities. 56% of survey respondents spent more time on religious activities and 84% on social and leisure activities which can be viewed as a measure of empowerment.



In addition, the Usage survey confirms that 100% of participants do not treat or process their water for purification purposes in the project, thus a large time saving could be derived from the reduced need to collect woodfuel for boiling water in addition to the time saved in collecting water from boreholes nearby to homesteads.

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, 99% 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.

For SDG 13, the ex-ante estimation was 10,000 emission reductions per year per VPA. This reduction was met in each VPA, 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

No Stakeholder feedback or comments has 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

No Stakeholder feedback or comments were received during the previous 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

N/A