Gold Standard

Gold Standard for the Global Goals
Key Project Information & VPA Design Document (PDD)

July 2017, Version 1

Gold Standard

KEY PROJECT INFORMATION

Title of Project:	VPA 9 Kilifi Borehole Rehabilitation Project (GS 7131)
Title of the PoA:	GS1366 Micro Energy PoA
Brief description of Project:	The Micro-Scale Voluntary Project Activity in Kilifi County (Kenya) is eligible under the Gold Standard methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 1. The project will support the provision of safe water using borehole technology to hundreds of households within Kilifi County. By providing safe water, the project will ensure that households consume less firewood during the process of water purification and as a result there shall be a reduction of carbon dioxide emissions from the combustion process.
Expected Implemetation Date: Expected duration of Project:	01/12/2018 15 years
Project Developer:	CO2balance
Project Representative:	Ilona Coulson-Ashworth
Project Participants and any communities involved:	N/A
Version of PDD: Date of Version:	2 22/02/2019
Host Country / Location:	Republic of Kenya
Certification Pathway (Project Certificatin/Impact Statements & Products	Voluntary Emission Reductions
Activity Requirements applied: (mark GS4GG if none relevant)	GS4GG
Methodologies applied:	TPDDTEC
Product Requirements applied:	None
Regular/Retroactive:	Regular
SDG Impacts:	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
Estimated amount of SDG Impact Certified	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: 10,000 tCO2e

SECTION A. Description of project

A.1. Purpose and general description of project

The Micro-Scale VPA 9 Kilifi Borehole Rehabilitation project is eligible under the Gold Standard methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 1.0. The project will support the provision of safe water using borehole technology to hundreds of households within Kilifi county, Kenya. By providing safe water, the project will ensure that households consume less firewood during the process of water purification and as a result there shall be a reduction of carbon dioxide emissions from the combustion process.

Kilifi County is a largely rural province on the coast of Kenya where local people typically use wood fuel on inefficient three stone fires to purify their drinking, cleaning and washing water. This process results in the release of greenhouse gas emissions from the combustion of wood - this can be avoided if a technology that does not require fuel (wood or fossil) supplies clean water desired by households.

Many existing boreholes were established by government, community groups or community based organizations (CBOs) and have fallen into disrepair because maintenance programmes have been poorly managed, or proven too expensive. CO2balance will be employing local field staff in the communities to manage the project on the ground and will work with the government and communities in Kilifi County to identify broken down boreholes and rehabilitate them so that they deliver clean, safe water. The capacity of communities to maintain their boreholes will also be supported through the project to ensure that the water keeps flowing. The boreholes included under the project will be powered entirely by emission-free technologies such as hand-powered pumps. The depth of the boreholes will be limited to 100m or less.

The number of boreholes per VPA will be limited by the amount of pure water supplied by each unit; based on ex ante calculations, the maximum number of boreholes that can be rehabilitated in one VPA to achieve 10,000 tCO2e is approximately 10, however, the exact number will be determined once actual survey data has been collected. CO2balance will rehabilitate the boreholes and deliver the maintenance programme for all the boreholes included in the project activity to ensure that the quality of the water delivered by the boreholes is fit for human consumption for the entire length of the project, which will be a minimum of 5 years.

The project is funded by marketing the anticipated carbon credits from the wood savings to ethical investors, so borehole owners must agree to transfer the emissions reductions over to CO2balance in return for them supplying the work to renovate the boreholes. This project will be developed under the Gold Standard carbon credit body, which in addition to checking that the carbon credits from this project are real, also measures local social, environmental and economic impact.

A.2. Eligibility of the project under approved PoA

The project is eligible under section 3.1.1 of the GS4GG Principles and Requirements as it follows an established Gold Standard methodology. Concerning point 3.1.1.5, the project does not support geoengineering or entail energy production from fossil fuels or nuclear. Rather it supports a switch away from polluting technologies to an emissions-free means of accessing safe water.

The project is eligible under the Gold Standard Methodology: Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 1.0. By providing safe water through the rehabilitation of broken boreholes, the project will ensure that households consume less firewood by displacing the need to boil water for purification. This will result in a reduction of carbon dioxide emissions.

A.3. Legal ownership of products generated by the project and legal rights to alter use of resources required to service the project

CO2balance UK Ltd is the Co-ordinating/Managing Entity which communicates with the Gold Standard; the project is managed in the Host Country by local CO2balance staff. CO2balance have legal ownership of the carbon credits produced as result of the project. All parties maintain the right to operate the projects in the host country, Kenya. Boreholes are managed by communities, who are recognised as the main users of the boreholes in the project.

A.4. Location of project

A.4.1. Host Country

Republic of Kenya

A.4.2. Region/State/Province etc.

Kilifi County

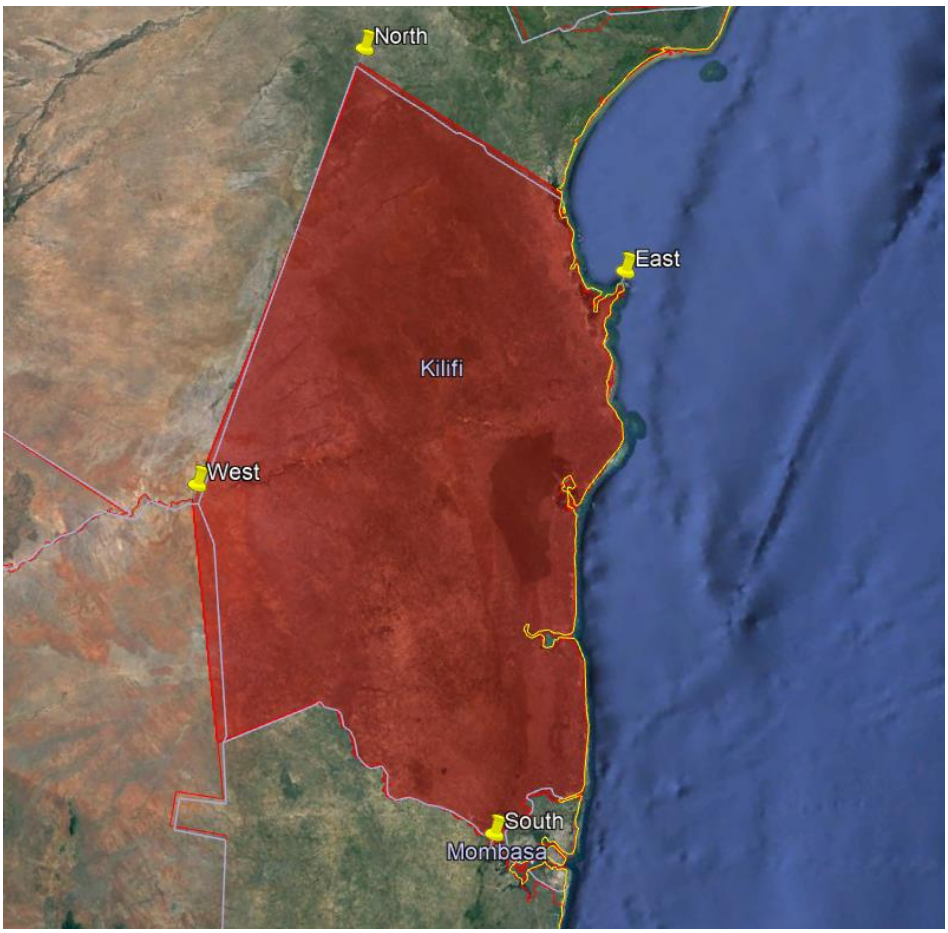
A.4.3. City/Town/Community etc.

Various throughout kilifi County

A.4.4. Physical/Geographical location

Below are details of the physical location to allow unique identification of the project. Kilifi County is marked in red on the Google Earth image. The target area and the fuel collection area are defined as being contained within project boundary, with the outer limits of the project boundary being clearly defined below. As the majority of beneficiaries collect their wood fuel locally in close proximity to their homesteads, the woodfuel collection area and target area are considered the same.

To avoid double-counting each borehole will be assigned a unique ID upon rehabilitation consisting of both a three letter location reference and a sequential number. The location of each borehole will also be recorded using GPS coordinates and this will act as a further mechanism to maintain the unique identification of the boreholes.



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.5. Technologies and/or measures

In this project, identified broken down boreholes will be rehabilitated so that they deliver clean, safe water for human consumption which contributes positively to SDG 6. The reduction in smoke caused by boiling water on traditional fires for purification is predicted to decrease, reducing smoke related respiratory illnesses, contributing positively to SDG 3. Many existing boreholes were installed by government or by community groups or community based organizations (CBOs) and have fallen into disrepair because maintenance programmes have been poorly managed, or proven too expensive. The boreholes included under the project will be entirely human operated and will be fitted with hand pump models that are commonly used in the area such as Afridev handpumps (see below). The depth of the boreholes will be limited to 100m or less.

A comprehensive maintenance programme is required in order to guarantee a consistent supply of pure water from the borehole pumps that have been rehabilitated. Borehole pumps contain moving parts such as chains and bearings which require an annual service and or replacement to prevent against failure. In addition, nuts and bolts commonly work themselves free and require regular replacement – these are checked and generally replaced on an annual basis. Other, more major parts in the pump assembly have a longer lifespan and require a less frequent replacement. Items such as handles, cylinders, top cones, riser pipes, connecting rods are checked over during the annual service and replaced if deemed necessary. The planned maintenance programme is carried out by local technicians under the supervision of a senior technician and will endure the activity of the project.

The boreholes are usually located close to villages. Once repaired, it is predicted that womens time spent collecting water will be reduced contributing positively to SDG 5. As mentioned above, the project location is a largely rural district where people typically use wood fuel on traditional three stone fires in order to purify their drinking water by boiling. The rehabilitation of borheoles proposes to displace the need to boil water by providing safe water from the source. This will achieve a reduction in GHG emissions and aligns with SDG 13.

Borehole Technology

The vast majority of pumps to be fixed are the Afridev handpump as shown below. Other hand pump models that utilize the same basic design may also be included in the project. This includes but is not limited to the India Mark II & III, and the U3 modified pump.

The Afridev pump is a public domain pump that is reliable and popular with the communities.

Sustainable Development

In addition to supplying clean, safe water and greenhouse gas savings, this project will:

- Result in less wood used by households, which will reduce pressure on local ecosystems
- Reduce time spent collecting water and gathering firewood to boil water
- Reduce the incidence of illness caused by unsafe water
- Reduce expenditure on firewood, leaving money free for other household expenses
- Train communities in water, sanitation and hygiene (WASH) techniques
- Support communities to manage and maintain their own boreholes

A.6. Scale of the project

Eligibility Criteria	Description	Means of Verification (Checked at VPA Inclusion)
VPA Location and Project Boundary	The geographical boundary within which the technologies are installed will be within the Project	The location of VPA 9 is specified in Section A.4.4, in which the CME states that the location is within

	Boundary outlined in Section A.4.4.	Kenya; one of the countries outlined in the PoA-DD. Each VPA will be uniquely defined by a range of GPS coordinates and current administrative maps to define the project boundary.
Scale of the Activity	Emission reductions achieved by each one of the activities considered under the micro-scale programme are limited to a maximum of 10,000 tonnes of CO2e in any year of their crediting period.	The total number of emission reductions in this VPA will be limited to 10,000t CO2e.
Technology and Target Group	Each VPA will involve the repair and maintenance of boreholes, to households and/or communities currently cooking with firewood on a traditional three-stone stove, for domestic purposes and/or currently boiling water as a treatment method before consumption.	This VPA will involve the repair and rehabilitation of boreholes that supply water to households currently boiling water as a treatment method (taking into account suppressed demand). Suppressed demand will be determined through a set of questions in the baseline 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.
Technology Output	The baseiline technologies to be displaced will each have continuous energy outputs of less than 150kW per unit. This will be applied to the baseline technology with regards to the water technology units.	Calculations for the specific displaced baseline technology show that they are within the 150kW Limit. The estimated energy output of the baseline technology is 18.79 Kw, however, following the rehabilitation of the borehole is 0 Kw.
Baseline	The characteristics and current biomass/water consumption of households in the baseline scenario will be identified for each VPA.	A modified Water Boiling Test (WBT) has been carried out for the County of Kilifi in Kenya.
Methodology	Each VPA will be in compliance with Gold Standard Methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 1.	The applicability of the methodology is justified in Section B.2 and applies to each VPA.
Additionality	Each VPA will demonstrate additionality according to the criteria outlined in the PoA-DD.	In accordance with the Micro-Programme rules, any activity meeting one of the criteria outlined in Section 4.0 shall be deemed additional; any activities that don't qualify will be subject

		to a full additionality assessment using the CDM "Tool for the demonstration of additionality." This will be conducted at VPA level.
Carbon Transfer	It will be clearly communicated that CO2balance is the entity that is claiming ownership rights of and selling the emission reductions resulting from the project activity.	At the point of technology installation, a Carbon Transfer Form (CTF) will be signed and uploaded to our database stating that the rights to the carbon credits will lie with co2balance. An elected representative from each water resources committee responsible for a borehole will sign a CTF on behalf of all users thereof.
Avoiding Double Counting of Emission Reductions	Each VPA will ensure double counting of emission reductions is avoided, through the unique identification of each technology with an identification number.	Each borehole rehabilitated and installed in this PoA will be GPS referenced ensuring that they are uniquely identifiable to this project.
Avoiding Double Counting of Programme Activities	Each VPA will show that it is exclusive to the PoA and not registered as another project activity or VPA under another PoA.	This VPA is neither registered as a project activity with GS or any other standard or as a VPA of another PoA. The appropriate registries (Gold Standard and CDM) can be accessed to demonstrate this.

A.7. Funding sources of project

There is no public or ODA funding for this project activity, all revenue for the project will be derived from the sales of VERs.

SECTION B. Application of selected approved Gold Standard methodology

B.1. Reference of approved methodology

Gold Standard Methodology: Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 1.0.

B.2. Applicability of methodology

In accordance with the Gold Standard Methodology: Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 1.0, micro scale VPAs listed in the Kilifi County boundary adhere to the following conditions:

Methodology Requirement	Project
1. 'The project boundary can be clearly identified, and the technologies counted in the project are not included in another voluntary market or CDM project activity.	The project area (Kilifi County) has been clearly demarcated using political boundaries recognized in Kenya. Each technology will be recorded using GPS coordinates and individually tagged with an identification code which is stored securely in the project database. Regular project surveys together with distribution records will ensure that the technologies included in the project are not double counted.
2. Technologies have a continuous useful energy output of less than 150kW per unit (defined as total energy delivered usefully from start to end of operation of a unit divided by time of operation). For technologies or practices that do not deliver thermal energy in the project scenario but only displace thermal energy supplied in the baseline scenario, the 150kW threshold applies to the displaced baseline technology.	The project technology does not deliver thermal energy; the rehabilitation and installation of boreholes displace energy supplied in the baseline as they eliminate the need to purify water through boiling; the 150kw threshold therefore applies to the baseline technology. Boreholes displace energy supplied in the baseline as they eliminate the need to purify water through boiling. Based on the results of the WBT, the estimated energy output is 18.79 Kw which is well within the methodological limit of 150kw. This has been proven via calculation.
3. The use of the baseline technology as a backup or auxiliary technology in parallel with the improved technology introduced by the project activity is permitted as long as a mechanism is put into place to encourage the removal of the old technology and the definitive discontinuity of its use.	As noted in the Gold Standard Methodology p.5. 'the removal and continued non-use of three stone fires and other easily constructed traditional devices (the baseline technology replaced by this project activity) is in many cases unlikely and impractical to monitor.' However, local people will be educated on the health and environmental benefits of abandoning inefficient use of the baseline technology. Furthermore a WASH program will be carried out parallel to the project which will help to increase awareness regarding water use, health and hygiene among local communities. This education programme will act as a mechanism to encourage the removal of old technology.
a) The project documentation must provide a clear description of the approach chosen and the monitoring plan must allow for a good understanding of the extent to which the baseline technology is still in use after the introduction of the improved technology, whether the existing baseline technology is not surrendered at the time of the introduction of the improved technology, or whether a new baseline technology is acquired and put to use by targeted end users during the project crediting period.	Overall use of the baseline technology will be monitored in conjunction with that of the project technology, as will the emergence of any other baseline technology by targeted end users. As per the Methodology kitchen surveys will be carried out at regular intervals to determine any changes in baseline technology use. The baseline survey indicated that majority of respondents were using a traditional wood fire to boil water which consists of a three-stone fire.
b)"The success of the mechanism put into place must therefore be monitored, and the approach must be adjusted if proven unsuccessful. If an old technology remains in use in parallel with the improved technology, corresponding emissions must of course be accounted for as part of the project emissions."	Parallel baseline technology use (three stone fires or traditional equivalent) will be revealed during monitoring and its effect on emissions reductions will be captured in the parameter Q, p, clean boil, y and in the usage surveys. The uptake rate U will also be determined by surveys and hence used to account for parallel baseline and project technology use.

4. The project proponent must clearly communicate to all project participants the entity that is claiming ownership rights of and selling the emission reductions resulting from the project activity. This must be communicated to the technology producers and the retailers of the improved technology or the renewable fuel in use in the project situation by contract or clear written assertions in the transaction paperwork. If the claimants are not the project technology end users, the end users should be notified that they cannot claim for emission reductions from the project.	A full explanation will be given to elected representatives of borehole users that co2balance have committed to provide them with a rehabilitated and fully maintained for free on the basis that the emissions reductions will be transferred to CO2balance. This will be recorded using a Carbon Transfer Form, which elected representatives of borehole owners will sign confirming that they understand the agreement and will explain it to borehole users.
5. Project activities making use of a new biomass feedstock in the project situation (e.g. shift from non-renewable to green charcoal, plant oil or renewable biomass briquettes) must comply with relevant Gold Standard specific requirements for biomass related project activities, as defined in the latest version of the Gold Standard rules.	As the technology used in this project has been specifically designed to displace baseline feedstock use via fuelwood, rather than a new biomass feedstock, this criterion is not applicable to this project. The emission reductions from this project will result from a change in quantity of fuel consumed, rather than change of fuel type.
a) Adequate evidence is supplied to demonstrate that indoor air pollution (IAP) levels are not worsened compared to the baseline, and greenhouse gases (as listed in section 2.1) emitted by the project fuel/stove combination are estimated with adequate precision. The project fuel/stove combination may include instances in which the project stove is a baseline stove.	The fuel used in both the project and baseline scenario is the same, as such there are no additional harmful gases released in the project scenario. The baseline technology has also not changed; rather its use for boiling will have been eliminated.
b) Records of renewable fuel sales may not be used as sole parameters for emission reduction calculation, but may be used as data informing the equations in section 2.0 of this methodology if correlated to data on distribution and results of field tests and surveys confirming (a) actual use of the renewable fuel and usage patterns such as average fraction of non-renewable fuels used in mixed combustion or seasonal variation of fuel types, (b) GHG emissions, (c) evidence of CO levels not deteriorating (d) any further factors effecting emission reductions significantly.	Renewable fuels are not sold as part of this project therefore this point is not applicable.

B.3. Project boundary

The physical boundary of the project is show in section A.4.4 of this document.

For the purpose of GHG mitigation/sequestration following table shall be completed (delete if not required)

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Combustion of wood fuel to boil water	CO2	Yes	Important source of emissions
		CH4	Yes	Important source of emissions
		N2O	Yes	Gas included in the calculations. Emissions factors for fuel in stationery combustion by the IPCC
Project scenario	Combustion of wood fuel to boil water	CO2	Yes	Important source of emissions
		CH4	Yes	Important source of emissions
		N2O	Yes	Gas included in the calculations. Emissions factors for fuel in stationery combustion by the IPCC

B.4. Establishment and description of baseline scenario

In Kilifi County, Kenya, local people typically use wood fuel on inefficient three stone fires for cooking and water purification. This process results in the release of greenhouse gas emissions from the combustion of wood. This can be avoided if local communities have access to safe water and therefore do not need to boil water as a treatment method.

A large proportion of Kenyan nationals do not have access to safe water, many of whom depend on boiling as the only treatment method available or are forced to drink dirty water due to suppressed demand factors such as lack of access to fuel, time and financial resources.

CO2balance seeks to register this project as a Gold Standard micro scale project using the methodology "Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 1." Many existing boreholes have been poorly managed, or proven too expensive to maintain properly. In this project CO2balance will work with community groups and local government in Kilifi County to identify broken down boreholes and renovate them so that they deliver clean and safe water. The number of boreholes per VPA will be limited by the amount of pure water supplied by each unit; based on ex ante calculations, the maximum number of boreholes that can be rehabilitated in one VPA to achieve 10,000 tCO2e is approximately 10, however, the exact number will be determined once actual survey data has been collected. CO2balance will rehabilitate and deliver the maintenance programme for each borehole to ensure that the quality of the water delivered by the boreholes is fit for human consumption for the entire length of the project, which will be 5 years.

The baseline situation is not expected to change significantly during the next years considering the current situation in Kenya, its economic development of the last years and predictions for the future. Kenya is a developing country (LMIDC) and is among the poorest countries in the world with a Human Development Index ranking of 142 out of 189 countries worldwide.

B.5. Demonstration of additionality

The table below is only applicable if the proposed project is deemed additional, as defined by the applied approved methodology or activity requirement or product requirement.

Specify the methodology or activity requirement or product requirement that establish deemed additionality for the proposed project (including the version number and the specific paragraph, if applicable).	As demonstrated in the Gold Standard for the Global Goals Community Services Activity Requirements section 2.5.2 - Projects that meet any of the following criteria are considered as deemed additional and therefore are not required to prove Financial Additionality at the time of Design Certification: 1. (a) Positive list (Annex B) 2. (b) Projects located in LDC, SIDS, LLDC 3. (c) Micro-scale projects
Describe how the proposed project meets the criteria for deemed additionality.	This project is a Micro-scale project and so is deemed additional by the relevant activity requirement.

B.6. Sustainable Development Goals (SDG) outcomes

B.6.1. Relevant target for each of the three SDGs

SDG	Target	Indicators	Explain
SDG 3 – Good Health and Well-being	By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.	Total reduction in household air pollution as a result of boiling 1 litre of water for purification	By providing safe water from the borehole, the project removes the need to boil water for purification therefore reducing the amount of non-renewable biomass burned as a result.
SDG 5 - Gender Equality	Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate	Time spent collecting water and firewood	Projects alleviate the strain of domestic work by providing safe water sources close to villages. It is predicted that time spent collecting water will be reduced. Also, time spent collecting firewood is likely to be affected through the removed need for wood fuel to boil water. As a result, the physical burden of collecting water and firewood is lessened.
SDG 6 - Clean Water and Sanitation	By 2030, achieve universal and equitable access to safe and affordable drinking water for all	Proportion of population using safe water	The project provides equitable access to clean affordable drinking water for all those local to the rehabilitated borehole. Anyone is allowed to use the borehole free of charge which will provide monitored safe drinking water for all.
SDG 13 - Climate Action	Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	Total project emissions reductions	The projects will meet SDG 13 by realising a real reduction in CO2e emissions.

B.6.2. Explanation of methodological choices/approaches for estimating the SDG outcome

Outcomes for SDG 3 (Good Health and Wellbeing):

The VPAs are premised on generating Emission Reductions by ensuring that borehole users have safe water, thereby removing the need for them to burn non-renewable biomass in order to boil water to purify it.

This usage of unsafe water can be taken as a proxy cause of Disability Adjusted Life Years (DALYs) in Kenya, meaning that using unsafe water is deemed a significant cause of illness and death in the country. The Global Burden of Disease Study found poor WASH practices to be the second leading driver of death and disability in the country[1]. Therefore, to ensure access to safe water for households that previously relied on unsafe water sources and had no means to purify can be demonstrated as removing a principle cause of illness and death.

The baseline surveys show that boiling is common practice in all project areas, meaning that although people in the baseline did not have access to safe water, many were consuming safe water after purification. The process of boiling water on an inefficient stove or open fire has other health impacts; the burden of diseases from household air pollution (HAP) has been well documented[2,3] and lower respiratory infection is ranked as one of the leading causes of premature death in Kenya[1]. 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 contibute 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 baseline Water Boiling Test in each region shows the amount of biomass used to boil 1 litre of water and the Water Consumption Field Test during the project measures water use. The quantity of biomass used in the baseline can be calculated by combining these figures, and by deducting any safe water boiled, we can calculate the quantity of biomass used in the project scenario. This difference will then be used to calculate the % decrease in fuel use, which is the figure used to calculate the VPAs' contribution to the SDG target.

Calculations are as follows (parameters from sections B.5.1 of the VPA-DD will be applied):

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

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 :

[1] Available online at http://www.healthdata.org/kenya (Accessed 16/3/18)

[2] Smith, K., et al. (2014). 'Millions Dead', Available https://www.annualreviews.org/doi/abs/10.1146/annurev-publhealth-032013-182356 , Accessed 06/04/2018

[3] Burnett, R., et al. (2014). 'An Integrated Risk Function for Estimating the Global Burden of Disease Attributable to Ambient Fine Particulate Matter Exposure', Available https://ehp.niehs.nih.gov/1307049/ , Accessed 06/04/2018

$W_{b,y}$ 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)

Women and girls perform the majority of unpaid domestic work.[4] This leaves them with less time to rest, study and realise their economic potential, leaving them in *time poverty*. In regards to time, women are poorer than men as unpaid domestic duties, such as collecting firewood and water, must be added to their market productive work, making time much more scarce.[5] Women are widely recognised as bing principally responsible for natural resource collection.[6]

These trends demonstrate that reducing the amount of firewood required by households has the potential to reduce the *time poverty* of women, because the time burden of collecting firewood, which falls disproportionately on women, will be reduced. The average % decrease per household in time spent gathering firewood will be taken as a proxy contribution towards the SDG target.

The overall reduction in time spent collecting firewood by the project activity are then calculated as follows:

$TR_y = (T_{b,y} - T_{p,y}) / T_{b,y}$

Where:

TR_y Total reduction time spent collecting firewood for project activity in year y (%)

$T_{b,y}$ Baseline time spent collecting firewood per household per day (hours)

$T_{p,y}$ Project time spent collecting firewood per household per day (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 (P_{access}). The number of persons using each borehole is determined in the sensitization process during the rehabilitation. The percentage of users who already had access to a safe water source will be determined through the baseline survey. Calculations are as follows (parameters from sections B.5.1 of the VPA-DD will be applied):

[4] UN (2017) 'Progress towards the Sustainable Development Goals (E/2017/66)'. Available at https://unstats.un.org/sdgs/files/report/2017/secretary-general-sdg-report-2017--EN.pdf

[5] Charmes, J 'A Review of Empirical Evidence on Time Use in Africa from UN-Sponsored Surveys', in Word Bank (2006) 'Gender, Times Use, and Poverty in Sub-Saharan Africa'. World Bank Working Paper No. 73

[6] Nankhuni (2004) 'Environmental Degradation, Resource Scarcity and Children's Welfare in Malawi: School Attendance, School Progress, and Children's Health'

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

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)

The outcome for SDG 13 (Climate Action), GHG emission reductions, is calculated using the parameters in Section B.6.3 in the VPA-DD.

Baseline emissions

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

Where:

$\mathrm{BE_{b,y}}$	Emissions for baseline scenario b during the year y in tCO_2e
$\mathrm{B_{b,y}}$	Quantity of fuel consumed in baseline scenario b during year y, in tons, as per by-default factors
$\mathrm{fNRB_y}$	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass
$\mathrm{NCV_{b,fuel}}$	Net calorific value of the fuel that is substituted or reduced (IPCC default for wood fuel, 0.015 TJ/ton)
$\mathrm{EF_{b,fuel,co2}}$	CO2 emission factor of the fuel that is substituted or reduced. 112 tCO2/TJ for Wood/Wood Waste
$\mathrm{EF_{b,fuel,nonco2}}$	Non-CO2 emission factor of the fuel that is substituted or reduced

Project emissions

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

Where:

$\mathrm{PE_{p,y}}$	Emissions for project scenario p during the year y in tCO_2e
$\mathrm{B_{p,y}}$	Quantity of fuel consumed in project scenario p during year y, in tons, as derived from the statistical analysis conducted on the data collected during the project performance field tests (cases when no baseline performance field test are performed, e.g. by-default baseline factors)
$\mathrm{fNRB_{,y}}$	Fraction of biomass used during year y for the consid ered scenario that can be established as non-renewable biomass
$\mathrm{NCV_{p,fuel}}$	Net calorific value of the project fuel (IPCC default for wood fuel, 0.015 TJ/ton). This is equal to the baseline fuel NCV in projects which use the same fuel

$EF_{p,fuel,co2}$ CO2 emission factor of the project fuel. This is equal to the baseline fuel EF in projects which use the same fuel, 112 tCO2/TJ for Wood/Wood Waste

$EF_{p,fuel,nonco2}$ Non-CO2 emission factor of the project fuel. This is equal to the baseline fuel EF in projects which use the same fuel

Where:

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

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.

$N_{p,y}$ Project technology-days in the project database for project scenario p through year y

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

$Q_{p,rawboil,y}$ Quantity of raw water boiled in the project scenario p per person per day

$Q_{p,cleanboil,y}$ Quantity of safe water boiled in the project scenario p per person per day

$$ER_y = \left(\left((\Sigma BE_{b,y} - \Sigma PE_{p,y}) * Up,y\right) - LEp,y\right) * (1 - XBoil)$$

Where:

LEp,y Leakage for project scenario p in year y (tCO_2e)

Up,y Culmulative usage rate for technologies in project scenario p in year y, based on culmulative adoption rate and drop off rate evealed by usage surveys (fraction)

XBoil Percentage of premises that would have used other non-GHG emitting technologies like chlorine treatment techniques, if available, in the absence of the project activity

B.6.3. Data and parameters fixed ex ante for monitoring contribution to each of the three SDGs

Relevant SDG Indicator	SDG 13 (Climate Action)
Data/parameter	$EF_{b,co2}$
Unit	tCO_2/TJ
Description	CO_2 emission factor arising from use of wood fuel in baseline scenario
Source of data	Calculated from IPCC defaults; Volume 2: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 2, Table 2.5
Value(s) applied	112 – see GS Methodology
Choice of data or Measurement methods and procedures	Deemed valid by Methodology
Purpose of data	Calculation of baseline emissions
Additional comment	-

Relevant SDG Indicator	SDG 13 (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 comment	-

Relevant SDG Indicator	SDG 13 (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 comment	--

Relevant SDG Indicator	SDG 13 (Climate Action)
Data/parameter	$EF_{p,non\ co2}$
Unit	tCO_2e/TJ
Description	Non-CO_2 (CH_4 and N_2O) 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 comment	-

Relevant SDG Indicator	SDG 13 (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 comment	-

Relevant SDG Indicator	SDG 13 (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 comment	-

Relevant SDG Indicator	SDG 13 (Climate Action)
Data/parameter	$f_{NRB,i,y}$
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/037/ssc_37_an14.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 in EB 67, Annex 22 and and confirmed by DNA. https://cdm.unfccc.int/Reference/Notes/meth/meth_note12.pdf
Purpose of data	Calculation of emission reductions
Additional comment	-

Relevant SDG Indicator	SDG 13 (Climate Action), SDG 3 (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	0.0013600
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 comment	-

Relevant SDG Indicator	SDG 13 (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	0.0013600
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 comment	-

Relevant SDG Indicator	SDG 13 (Climate Action), SDG 6 (Clean Water and Sanitation)
Data/parameter	Cj
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	Deemed valid by Methodology
Purpose of data	Calculation of emission reductions
Additional comment	-

Relevant SDG Indicator	SDG 13 (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%
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 comment	-

Relevant SDG Indicator	SDG 5 (Gender Equality)
Data / Parameter	$Tb_{,y}$
Unit	Hours
Description	Time spent collecting firewood per household per day prior to project
Source of data	Baseline survey
Value(s) applied	1.61
Choice of data or Measurement methods and procedures	Measured by question on time spent collecting firewood in the baseline survey.
Purpose of data	Calculation of SDG 5
Purpose of dataAdditional comment	-

Relevant SDG Indicator	SDG 3 (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	8.33
Choice of data or Measurement methods and procedures	Baseline Water Boiling Test Result.
Purpose of data	Calculation of SDG 3
Additional comment	-

B.6.4. Ex ante estimation of outcomes linked to each of the three SDGs

SDG 3

The impacts of the project towards SDG 3 is measured through the Water boiling Test and the Water Consumption Field test. 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 contibute 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 baseline Water Boiling Test shows the amount of biomass used to boil 1 litre of water and the Water Consumption Field Test during the project measures water use. The quantity of biomass used in the baseline can be calculated by combining these figures, and by deducting any safe water boiled, we can calculate the quantity of biomass used in the project scenario. This difference will then be used to calculate the % decrease in fuel use, which is the figure used to calculate the VPAs' contribution to the SDG target.

$P_{b,y} = 8.33 = 1.190 * 7$

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

It is estimated that the project will reduce fuel use for boiling water by at least 50% per year.

SDG 5

The overall reduction in time spent collecting firewood by the project activity are then calculated as follows:

$TR_y = 31\% = (1.61 – 1.11) / 1.61$

$TR_y = (T_{b,y} - T_{p,y}) / T_{b,y}$

Where:

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

It is estimated that the project will save roughly 0.5 hours per household per day. The project survey will monitor how this time is spent and the impact it has towards Gender Equality.

SDG 6

$P_{safe} = 3,876 = 4,340 * (1 – 0.05) * (1 – 0.06)$

$$P_{safe} = P_y * (1 - C_j) * (1 - X_{boil})$$

Where:

P_{safe}	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.
X_{boil}	Percentage of premises that would have used other non-GHG emitting technologies like chlorine treatment techniques, if available, in the absence of the project activity.

It is estimated that the project will provide access to safe water to an additional 3,876 people.

SDG 13

CO2 emission reductions are the indicator to demonstrate that the project has raised capacity for effective climate change-related planning and management. These are calculated ex-ante according to the description in Section B of the VPA-DD.

Baseline emissions

$BE_{b,y}$ = 13,298 = 7,629.2 * ((0.92* 112) + 8.692) * 0.0156

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

Project emissions

$PE_{p,y}$ = 0 = 0 * ((0.92 * 112) + 8.692) * 0.0156

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

Where:

$B_{p,y}$ = 0 = (1 – 0.05) * 925,941 * 0.001156 * (0 + 0)

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

ER_y = 10,000 = (((13,298 – 0) * 0.8) – 0) * (1 – 0.06)

$$ER_y = \left(\left(\Sigma BE_{b,y} - \Sigma PE_{p,y}\right) * Up, y\right) - LEp, y\ ) * (1 - XBoil)$$

B.6.5. Summary of ex ante estimates of each SDG outcome

SDG 3

Year	Baseline estimate	Project estimate	Net benefit
Year A	71% boil their water for purification	21% boil their water for purification	50% decrease in fuel use for boiling water
Year B	71%	21%	50% decrease
Year C	71%	21%	50% decrease
Year D	71%	21%	50% decrease
Year E	71%	21%	50% decrease
Total	71%	21%	50% decrease
Total number of crediting years	5 years	5 years	5 years
Annual average over the crediting period	71%	21%	50% decrease

SDG 5

Year	Baseline estimate	Project estimate	Net benefit
Year A	1.61 hours collecting firewood	1.11 hours collecting firewood	0.5 hours saved
Year B	1.61 hours	1.11 hours	0.5 hours
Year C	1.61 hours	1.11 hours	0.5 hours
Year D	1.61 hours	1.11 hours	0.5 hours
Year E	1.61 hours	1.11 hours	0.5 hours
Total	1.61 hours	1.11 hours	0.5 hours
Total number of crediting years	5 years	5 years	5 years
Annual average over the crediting period	1.61 hours collecting firewood	1.11 hours collecting firewood	0.5 hours saved

SDG 6

Year	Baseline estimate	Project estimate	Net benefit
Year A	217 people with access to safe water	4,340 people with access to safe water	3,876 additional people with access to safe water
Year B	217 people	4,340 people	3,876 people
Year C	217 people	4,340 people	3,876 people
Year D	217 people	4,340 people	3,876 people
Year E	217 people	4,340 people	3,876 people
Total	217 people	4,340 people	3,876 people
Total number of crediting years	5 years	5 years	5 years

Annual average over the crediting period	217 people	4,340 people	3,876 people

SDG 13

Year	Baseline estimate	Project estimate	Net benefit
Year A	10,000 tCO2e	-10,000 tCO2e	-10,000 tCO2e
Year B	10,000 tCO2e	-10,000 tCO2e	-10,000 tCO2e
Year C	10,000 tCO2e	-10,000 tCO2e	-10,000 tCO2e
Year D	10,000 tCO2e	-10,000 tCO2e	-10,000 tCO2e
Year E	10,000 tCO2e	-10,000 tCO2e	-10,000 tCO2e
Total	50,000 tCO2e	-50,000 tCO2e	-50,000 tCO2e
Total number of crediting years	5 years	5 years	5 years
Annual average over the crediting period	10,000 tCO2e	-10,000 tCO2e	-10,000 tCO2e

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Relevant SDG Indicator	SDG 13 (Climate Action)
Data / Parameter	N p,y
Unit	Project Technology Days
Description	Number of persons consuming water supplied by project scenario p through year y
Source of data	Borehole Project Database
Value(s) applied	Estimated at 925,941. Actual value to be provided in time for each verification.
Measurement methods and procedures	Sum of the total number of people using each borehole in the project multiplied by the number of days crediting each borehole earns in this monitoring period
Monitoring frequency	Continuous
QA/QC procedures	Calculations are double-checked
Purpose of data	Emission reduction calculations
Additional comment	Household lists of borehole users including details for the main contact from the household

Relevant SDG Indicator	SDG 13 (Climate Action), SDG 6 (Clean Water and Sanitation), SDG 3 (Good Health and Well Being)
Data / Parameter	Up,y
Unit	Percentage
Description	Usage rate in project scenario p through year y
Source of data	Annual Usage Survey
Value(s) applied	Estimated at 0.8. Actual value to be provided in time for each verification
Measurement methods and procedures	Annual usage survey will be carried out by staff trained by co2balance to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by co2balance UK Ltd

Monitoring frequency	Annual
QA/QC procedures	Clear guidance is provided to field staff and results are spot checked against the hard copy of the surveys.
Purpose of data	Emission reduction calculations
Additional comment	Questions are asked in a face-to-face survey and designed to establish whether a household can be considered a regular user of the borehole

Relevant SDG Indicator	SDG 13 (Climate Action), SDG 3 (Good Health and Well Being)
Data / Parameter	Qp,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
Source of data	Water Consumption Field Test (WCFT)
Value(s) applied	Estimated at 7.5
Measurement methods and procedures	Method used similar to Kitchen Performance Test in which the volume of water consumed in each household is averaged over 3 days. Volume capped at 7.5 litres per person per day as per the methodology. The WCFT will be carried out by staff trained by co2balance to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by co2balance UK Ltd.
Monitoring frequency	Biennial (Every 2 years)
QA/QC procedures	Clear guidance is provided to field staff and results are spot checked against the hard copy of the surveys.
Purpose of data	Emission reduction calculations
Additional comment	Measured water consumption is limited to drinking, cooking and basic personal hygiene. The quantity of safe water under these categories consumed in the project scenario is quantified through measurements and survey.

Relevant SDG Indicator	SDG 13 (Climate Action), SDG 3 (Good Health and Well Being)
Data / Parameter	Qp,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
Source of data	Water Consumption Field Test (WCFT)
Value(s) applied	Estimated at 0. Actual value to be provided in time for each verification
Measurement methods and procedures	Method used similar to Kitchen Performance Test in which the volume of water consumed in each household is averaged over 3 days. The WCFT will be carried out by staff trained by co2balance to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by co2balance UK Ltd.
Monitoring frequency	Biennial (Every 2 years)
QA/QC procedures	Clear guidance is provided to field staff and results are spot checked against the hard copy of the surveys.
Purpose of data	Emission reduction calculations
Additional comment	Measured boiled water consumed for drinking, cooking and basic personal hygiene considered safe for human consumption prior to boiling. This is assumed from the stated water source.

Relevant SDG Indicator	SDG 13 (Climate Action)
Data / Parameter	Qp,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
Source of data	Water Consumption Field Test (WCFT)
Value(s) applied	Estimated at 0. Actual value to be provided in time for first verification
Measurement methods and procedures	Method used similar to Kitchen Performance Test in which the volume of water consumed in each household is averaged over 3 days. The WCFT will be carried out by staff trained by co2balance to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by co2balance UK Ltd.
Monitoring frequency	Biennial (Every 2 years)
QA/QC procedures	Clear guidance is provided to field staff and results are spot checked against the hard copy of the surveys.
Purpose of data	Emission reduction calculations
Additional comment	Measured boiled water consumed for drinking, cooking and basic personal hygiene considered unsafe for human consumption prior to boiling. This is assumed from the stated water source.

Relevant SDG Indicator	SDG 6 (Clean Water and Sanitation)
Data / Parameter	Quality of Treated Water
Unit	Parameters as per national standards
Description	Performance of the treatment technology
Source of data	Laboratory Tests
Value(s) applied	Certificates supplied at verification
Measurement methods and procedures	The water quality will be tested in line with national standards in Kenya. The water samples will be taken at source by the testing body.
Monitoring frequency	Annually
QA/QC procedures	The first test will be within 6 months of the rehabilitation. At least one test each year conducted by accredited laboratory.
Purpose of data	Criteria of methodology
Additional comment	Water is tested in accredited laboritories. Tested water is collected from source.

Relevant SDG Indicator	SDG 13 (Climate Action)
Data / Parameter	LEp,y
Unit	tCO2e per year
Description	Leakage in project scenario p during year y
Source of data	Baseline and monitoring surveys
Value(s) applied	0
Measurement methods and procedures	Assessed every two years using baseline and monitoring surveys
Monitoring frequency	Biennial
QA/QC procedures	
Purpose of data	Emission reduction calculations
Additional comment	

Relevant SDG Indicator	SDG 5 (Gender Equality)
Data / Parameter	$TP_{,y}$
Unit	hours
Description	Project time spent collecting firewood per household per day (hours)
Source of data	Project Survey
Value(s) applied	1.11
Measurement methods and procedures	Assessed every year using Project Survey
Monitoring frequency	Annual
QA/QC procedures	N/A
Purpose of data	Calculation of SDG 5
Additional comment	-

Relevant SDG Indicator	SDG 6 (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
Source of data	Project Survey and Usage Survey
Value(s) applied	-
Measurement methods and procedures	Project Survey, Usage Survey and Household list
Monitoring frequency	Annual
QA/QC procedures	N/A
Purpose of data	Calculation of SDG 6
Additional comment	-

Relevant SDG Indicator	SDG 3 (Good Health and Well-Being)
Data / Parameter	$P_{p,y}$
Unit	Kg/household
Description	Quantity of fuel that is consumed in the project scenario p during year y (kg/household-day)
Source of data	Baseline and Project Surveys
Value(s) applied	-
Measurement methods and procedures	Baseline Water Boiling Test
Monitoring frequency	Annual
QA/QC procedures	N/A
Purpose of data	Calculation of SDG 3
Additional comment	-

B.7.2. Sampling plan

Cross sampling of devices will be applied across all homogenous VPAs in Kilifi County. Homogenous VPAs are defined as those that are sharing a common baseline. The number of boreholes that will need to be sampled

for a 90/30 confidence/precision will be determined; out of those boreholes, households will be randomly sampled, complying with the minimum sample size for the particular survey/test.

Individual participants will be selected from the borehole user data base using the random selection process outlined in the monitoring plan. See Monitoring Plan document. Sample sizes will be in line with the Gold Standard requirements. The surveys below will be monitored under the cross sampling approach;

- Project Surveys- Completed annually
- Usage Surveys- Completed annually
- Water Consumption Field Tests- Completed every 2 years

The surveys will be conducted so as to ensure that they are within the end date of the respective monitoring periods for each VPA.

B.7.3. Other elements of monitoring plan

Installation Record

A comprehensive installation record will record the following information:

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

The installation record will be backed up electronically, with original documentation being stored in the appropriate office for the respective VPAs.

Project Database

The project database will be derived from the Installation Record, with project technologies differentiated by different project scenarios (if required).

All data collected in relation to the project will be held in the local office and/or on the Project Database for the entire life cycle of the project and a period of 2 years afterwards. The data may be archived during the project in order to maintain clarity and security.

Ongoing Monitoring Studies

The following ongoing monitoring studies are conducted for each project scenario following verification of the associated initial project studies.

a) Project Survey – Completed annually in time for 1st verification

The project survey is conducted on representative end users of the project technology. The survey asks questions on household characteristics, water use, woodfuel use and WASH. The survey determines the following parameters for SDG imapct; $TP_{,y}$ (SDG 5) – time spent on firewood collection in the project scenario. The project survey is conducted on a minimum sample size of 100 households.

b) *Water consumption field test* - Completed every 2 years

The water consumption field test requires a minimum sample of at least 30 households. The test determines three parameters *viz* Q,p,y – the quantity of water supplied in the project scenario using the clean water supply technology; Q p,rawboil,y – the raw or unsafe water that is still boiled after installation of the water supply

technology and Qp, cleanboil,y – quantity of safe water boiled in the project scenario after installation of the water supply technology.

The measurement method used is similar to Kitchen Performance Test in which the volume of water consumed in each household is averaged over 3 days. The WCFT will be carried out by staff trained by co2balance to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by co2balance UK Ltd.

c) *Usage Survey*- Completed annually, on time for any request of issuance

The usage survey provides a single usage parameter Up,y that is weighted based on drop off rates that are representative of the age distribution for project technologies in the installation record. The annual usage survey is conducted on a minimum sample size of 100 households.

d) *Quality of the treated water* - Completed annually, and in time for 1st verification

The quality of the treated water is assessed to ensure that it is fit for human consumption. It will be assessed in accordance with the Kenya Water Standards. The parameters used to assess the water quality will be in line with Kenya Water Standards for potable water and all parameters will be shown to be within levels considered acceptable for domestic human consumption.

e) *Leakage Assessment*- Completed every other year

The potential sources of leakage will be investigated (LEp,y). If the assessment quantifies an increase in fuel consumption by the non-project households attributable to the project activity, then calculations will be adjusted to account for this.

f) *Non-renewable Biomass Assessment Update*- Reassessed at renewal of crediting period

In accordance with the methodology, the NRB assessment will remain fixed for the entire crediting period, although the project proponent may choose to reexamine the assessment at any time.

g) Np,y Project Technology Days

Number of persons consuming water supplied by project scenario p through year y. Sum of the total number of people using each borehole in the project multiplied by the number of days crediting each borehole earns in this monitoring period. The total number of households using each borehole will be determined through information supplied by our NGO partner. Using this method, the total number of people using each borehole will be known and hence a figure for person days can be calculated. All monitoring tasks will be selected at random.

SECTION C. Duration and crediting period

C.1. Duration of project

15 years

C.1.1. Start date of project

01/12/2018

This is the estimated date of the first borehole rehabilitation, which marks the start of the project.

C.1.2. Expected operational lifetime of project

15 years

C.2. Crediting period of project

5 years renewable

C.2.1. Start date of crediting period

02/12/2018

C.2.2. Total length of crediting period

5 years

SECTION D. Safeguarding principles assessment

D.1. Analysis of social, economic and environmental impacts

Safeguarding principles	Assessment questions	Assessment of relevance to the project (Yes/potentially/no)	Justification	Mitigation measure (if required)
Principle 1 – Human Rights	The Project Developer and the Project shall respect internationally proclaimed human rights and shall not be complicit in violence or human rights abuses of any kind as defined in the Universal Declaration of Human Rights.	No	The project will comply with all international human rights laws and legislation.	
	The Project shall not discriminate with regards to participation and inclusion.	No	The project will not discriminate with regards to participation. A wide range of stakeholders were invited to the local stakeholder consultation to take part in the project.	
Principle 2 - Gender Equality	Is there a possibility that the Project might	No	The project will increase women's access to resources	

and Women's Rights	reduce or put at risk women's access to or control of resources, entitlements and benefits?		such as water by making safe water available in the community.	
	Is there a possibility that the Project can adversely affect men and women in marginalised or vulnerable communities (e.g., potential increased burden on women or social isolation of men)?	No	The burden on the whole community of travelling far to collect water and gather firewood for water purification will be reduced. This will also mitigate the social isolation of spending a long time collecting these resources.	
	Is there a possibility that the Project might not take into account gender roles and the abilities of women or men to participate in the decisions/designs of the project's activities (such as lack of time, child care duties, low literacy or educational levels, or societal discrimination)?	No	Equal participation of women and men in decision making will be encouraged by promoting their equal membership on water point committees. These WPCs will be trained to facilitate the participation of members depending on their specific circumstances. They will also assist all communities members to provide feedback on the project, regardless of their situation.	
	Does the Project take into account gender roles and the abilities of women or men to benefit from the	Yes	Both women and men will benefit from the project activities, no group is excluded from participating in the	

	Project's activities (e.g., Does the project criteria ensure that it includes minority groups or landless peoples)?		project activities and the water sources are open to the whole community.	
	Does the Project design contribute to an increase in women's workload that adds to their care responsibilities or that prevents them from engaging in other activities?	No	The project will decrease the workload of women in collecting water and firewood, thereby allowing more time to engage in other activities.	
	Would the Project potentially reproduce or further deepen discrimination against women based on gender, for instance, regarding their full participation in design and implementation or access to opportunities and benefits?	No	The project aims to benefit the whole community equally and women's equal participation in the LSC and water point committees is encouraged.	
	Would the Project potentially limit women's ability to use, develop and protect natural resources, taking into account	No	The project will increase women's ability to use, develop and protect natural resources by making safe water more readily available and enabling women to	

	different roles and priorities of women and men in accessing and managing environmental goods and services? Is there a likelihood that the proposed Project would expose women and girls to further risks or hazards?	 No	participate in project decision-making. No further risks or hazards for women and girls have been identified.	
Principle 3 – Community Health, Saftey and Working Conditions	The Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community.	No	The project will reduce health risks from access to clean and safe water for consumption. This will also increase hygiene in the project area.	
3.4.1 Sites of Cultural and Historical Heritage	Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture (e.g., knowledge, innovations, or practices)?	No	The project area does not include sites or structures of historic and cultural value. Project activities do not compromise historic, cultural or religious practices.	
3.4.2 Forced Eviction and Displacement	Does the Project require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial)?	No	The project does not cause the relocation of people, rather it fixes previously broken boreholes in local communities so that they have a safe local water source.	

3.4.3 Land Tenure and Other Rights	Does the Project require any change to land tenure arrangements and/or other rights?	No	The project will not impact on land tenure arrangements or rights.	
3.4.4 Indigenous Peoples	Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples?	No	No indigenous peoples are present in the project area. The project will take place on land owned ethier by the county government or by local people for which their permission will first be sought.	
Principle 5 – Corruption	The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects.	No	No corruptive activities are taking part as part of the projects. Any record of corruption will be dealt with immediately regarding the project.	
Principle 6 – Economic Impacts 3.6.1 Labour Rights	The Project Developer shall ensure that there is no forced labour and that all employment is in compliance with national labour and occupational health and safety laws, with obligations under international law, and consistency with the principles and standards embodied in the International Labour	No	CO2balance follow national employment laws for in-country staff.	

	Organization (ILO) fundamental conventions. Where these are contradictory and a breach of one or other cannot be avoided, then guidance shall be sought from Gold Standard.			
3.6.2 Negative Economic Consequences	Are there economic impacts and potential risks to the local economy?	No	The project is not expected to have any negative economic impacts or cause any risks.	
4.1.1 Emissions	Will the Project increase greenhouse gas emissions over the Baseline Scenario?	No	The project will reduce greenhouse gas emissions compared to the baseline scenario.	
4.1.2 Energy Supply	Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users?	No	Only hand pumped boreholes that use no electricity are included in the project.	
4.2.1 Impact on natural water patterns and flow	Will the Project affect the natural or pre-existing pattern of watercourses, ground-water and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of	No	There will be no significant change in the volume of water consumed by the households.	

	aquatic connectivity or water scarcity?			
4.2.2 Erosion and/or water body stability	Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion?	No	The water is taken from boreholes at household usage levels. Therefore it is extremely unlikely that there will be additional erosion and/or water body instability or disruption of the natural pattern of erosion.	
4.2.3 Landscape modification and soil	Does the Project involve the use of land and soil for production of crops or other products?	No	No crops or other products will be produced in the project.	
4.3.2 Vulnerability to Natural Disaster	Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions?	No	There will be no impact by the project to natural disasters.	
4.3.3 Genetic Resources	Could the Project be negatively impacted by the use of genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development)?	No	No GMOs will be used in the project and the boreholes would not be affected by GMOs as they are all protected.	
4.3.4 Release of pollutants	Could the Project potentially result	No	As safe ground water is used, there	

	in the release of pollutants to the environment?		is no risk or releasing pollutants to the environment.	
4.3.5 Hazardous and Non-hazardous Waste	Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials?	No	The project does not deal with harzardous or non-hazardous chemicals and/or materials.	
4.3.6 Pesticides and fertilizers	Will the Project involve the application of pesticides and/or fertilisers?	No	No pesticides and/or fertilisers will be used in the project.	
4.3.7 Harvesting of forests	Will the Project involve the harvesting of forests?	No	As the project reduces the consumption of firewood, there is a positive impact on forests.	
4.3.8 Food	Does the Project modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives?	No	The project has no impact on the quantity or nutritional quality of food.	
4.3.9 Animal Husbandry	Will the Project involve animal husbandry?	No	The project will not involve animal husbandry.	

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from stakeholders

A local stakeholder consultation was conducted in Kilifi South on 19th October 2018. In preparation for the meeting, CO2balance identified the key international and local stakeholders that would need to be informed of the project and consulted on the activities to be conducted. Those identified included Gold Standard international NGO partners, government officials from relevant departments in Kenya and members of the communities to be targeted by the project.

Invitations were issued a month in advance via email to international stakeholders, and at least 2 weeks in advance by letter and word of mouth to local stakeholders.

During the meeting, the planned project activities were presented to stakeholders and they were invited to make comments and raise questions. A sustainable development and safeguarding exercise was then conducted to solicit the stakeholders' views on any risks within the project and the contributions that it should make to sustainable development. Stakeholders were also consulted on their recommendations for monitoring the project and on the best approach for conducting the continuous input/grievance mechanism.

The findings of the meeting are currently being documented to be shared with stakeholders and a Stakeholder Feedback Round will be conducted to solicit further feedback.

E.2. Summary of comments received

These comments are presented in section E.3 alongside the responses given to stakeholders.

E.3. Report on consideration of comments received

The questions received during the initial Question and Answer section during the meeting are summarised in the following table:

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
Previously other donors who rehabilitated or sunk the boreholes had promised the community that they would maintain the boreholes but they failed to do so. What if CO2balance does the same?	Yes	It was explained that once CO2balance repair the boreoles then they intend to keep them in working repair for a minimum of 5 years over the lifetime of the project.
Participants brought up the issue that CO2balance is based in Nairobi so how would they know if the boreholes were working in the local communities?	Yes	The facilitator explained to the participants that CO2balance would have a local contact as one of their staff who will be their contact person. This person shall be in touch with all borehole committees who shall keep him posted of any issues with every borehole to ensure that they are all working and if they are not working, it is quickly communicated to ensure a technician is brought in to assess the damages, sources for parts and carry out repairs in the shortest time possible.
Some boreholes in the community are owned by individuals situated on private land who are selling the water from their borehole to community members, equivalent to running water	Yes	It was explained that CO2balance will only rehabilitate boreholes which are not owned by private individuals. CO2balance will rehabilitate government boreholes and community

kiosks. Would CO2balance be rehabilitating these boreholes as part of its project to give free water to the community?		owned boreholes in which all can access the borehole water for household use. The sub-county administrator pledged the county government shall start assessing the ownership of all boreholes in the county to ensure community boreholes are accessible for everyone to use and are not being privatized by individuals illegally.
Some participants raised concerns about the sutainability and management of the project beyond the lifetime of 5 years. Community members were concerned that after this project period the boreholes will return to a state of disrepair.	Yes	It was explained that CO2balance will support the local communities of the boreholes to elect a water point committee who will oversee the operations of the boreholes and communicate if there are any problems with the boreholes. Participants were encouraged to get involved in water point committees where they will receive WASH training and the basics on how to fix and maintain the boreholes. Should there be any spare borehole parts left over after project activities have halted, CO2balance will donate those parts to the communities to use for future repairs.
Community members were very satisfied with the project but wanted to know how they could get involved in the project and what was their role.	Yes	It was explained that the community has a large role to play in the project from collecting water from the repaired boreholes to taking part in water point committees and communitcating with CO2balance staff. The community can aid CO2balance in identifying potential broken boreholes to be repaired as part of the project and give access to the boreholes which are on private lands to be repaired for the local community to use. It was understood they have an important role to play as project participants.
Participants raised the question that some of the boreholes have salty tasting water although there are not many of these, stakeholders wished to know whether	Yes	It was explained that boreholes with very salty water are very few and those with high salinity are unable to be treated to be safe and thus will not be repaired. CO2balance had already

CO2balance could repair these boreholes.		identified the boreholes to be repaired at the start of the project and some of these were not far from the salty boreholes giving those communities access to safe water.

Based on these comments, the project is not going to be altered, but all implementing entities have noted again the need to continue ensuring that boreholes to be rehabilitated are identied with the input of key stakeholders at the community and government level.

It has also been well noted that borehole managers and water point committees receive comprehensive training to enable them to conduct their duties effectively.

Overall comments received from stakeholders were constructive and helpful, re-affirming the approach adopted by the project whilst emphasising areas where care must be taken to ensure sustainability.

Appendix 1. Contact information of project participants

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